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Grafting and stionic effect studies in grape

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Abstract

Rootstocks have become a major component in modern day viticulture due to resurgence of biotic and abiotic stresses in conventional as well as non-conventional areas. The association of scion with rootstock requires use of different grafting/ budding methods. Different grafting and budding methods have been tried in grape with varying success rates. Hence, to standardize the same for a new cultivar Pusa Urvashi, various rootstocks (Pusa Navrang, Dogridge A, SO4 and H-144) involving different grafting methods (wedge, side and bench grafting) were tried. The factors like grafting month (February, March and August) and grafting height (15, 30 and 45 cm.) under glasshouse conditions were studied. The highest success of graft take was registered in wedge (87.0%) followed by side (62.5%) in all the three months, while minimum success was recorded with bench grafting (48.0%) in February month. The graft take was the maximum at the height of 15 cm, while the minimum was noted at 45 cm. Of the three grafting months, February was found best with respect to percentage graft success and survival after six months. For all the scion/rootstock combinations, distinct stionic influence was noted and there were marked differences in vegetative growth parameters of the composite grape plants.

Introduction

Grape (*Vitis vinifera* L.) is one of the most important commercial fruit crops of the world owing to its excellent fruit quality and varied uses. It is also favoured for being a good source of minerals and vitamins. With the global climate change, grape cultivation in newer as well as conventional areas has spotlighted the problems of unfavourable growing

conditions including soil selected ones. Most of the grape cultivation in India is on self-rooted hardwood cutting-derived plants. However, this system is gradually being phased out due to different biotic and abiotic stresses. Soil-borne diseases and nematodes are the other maladies, which severely hamper the grape production. In such situations, propagation through conventional means, *i.e.* cuttings needs to be replaced with some other vegetative propagation methods like grafting and budding to produce composite plant (scion on rootstock). In composite plants, stionic influence helps in exploiting the desired /needed vigour and tolerance against different biotic and abiotic stresses, which is turn, enhances the productivity and vitality of the vine. For these considerations, standardization of different grafting methods using Pusa Urvashi as a scion cultivar was attempted.

Materials and Methods

The studies were conducted at the Division of Fruits and Horticultural Technology, IARI, Pusa, New Delhi during 2003 and 2004. One-year-old cutting derived plants uniform size and vigour of four rootstocks, namely Pusa Navrang, Dogridge A, SO4 and H-144 of were selected for grafting. The scion stick was taken from the Pusa Urvashi vines maintained in the germplasm block.

Three grafting methods namely wedge, side and bench and three seasons of grafting, i.*e.* February, March and August were selected for the study. The grafting was performed at the different heights, *i.e.* 15, 30 and 45 cm and growing condition was glasshouse. The experiment was laid out in Randomized Block Design with three replications comprising 25-30 units per treatment.

Observations on grafting success were recorded at regular intervals. The data on bud sprouting was recorded and the average time taken for a bud to sprout from the date of grafting was worked out and expressed in days. Data on success percentage and vegetative growth were recorded 60 days after grafting. The internodal length and diameter of sprout was measured between fifth and sixth node on the selected grafted vines. Leaf area of was recorded on Li-Cor portable leaf area meter. Girth of stock and scion were recorded 5.0 cm above and below the graft union point respectively. The stock-scion ratio was calculated from the data with respect to the scion and stock girth. The length of sprout was measured from the graft point up to the highest point of the sprouted vine and the number

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of leaves was also counted and the mean was worked out. Total chlorophyll was estimated following the standard method in the fully developed leaves after 60 days of transplanting the grafted plants.

Results and Discussion

Of the different grafting methods tried, wedge grafting gave the highest success (87.0%). It was significantly superior to side (62.5%) and bench grafting (48.0%) (Table 1).These finding is in agreement with those of Click (2000). Comparatively, the higher success in wedge grafting might be due to the formation of early and better graft union also due to better contact of cambial layers of the two partners, i.e. stock and scion. Grafting done during February gave the highest overall success in bud sprouting followed by the same method, performed during August or March (Table 1). February proved to be the optimum time for grafting of grape under north Indian conditions. These findings are in conformity with those of Click (1998). The higher success in February might be because of the optimum temperature and higher relative humidity prevailing during the period following grafting. These favorable conditions cause rapid sap flow in stock and scion, which might have favoured the healing process and faster establishment of continuity in cambial and vascular tissues for better graft take. Since, the maximum success was registered in wedge grafting the further experiments were conducted following it only. Wedge grafting took the minimum number of days (19.40) for bud sprouting followed by side and bench grafting (Table 2). These findings are in agreement with those of Singh and Chaudhary (1984). The lesser time taken in wedge graft to sprout might be due to better contact of cambial layers of stock and scion resulting in early callus formation

Table 1: Graft take (%) in grape as influenced by different methods and time of grafting.

Method	Month			Mean
	February	March	August	
Wedge	87.00 (68.87)	66.66 (54.09)	80.12 (63.51)	77.96 (61.96)
Side	62.50 (51.65)	47.13 (43.34)	50.15 (45.06)	53.26 (47.06)
Bench	48.00 (43.85)	0.00 (0.00)	0.00 (0.00)	16.00 (23.58)
Mean	65.83 (54.21)	38.16 (38.12)	43.42 (41.21)	
CD at 5%				
Grafting month (G)	4.25			
Grafting method (M)	9.45			
T X M	14.59			

Table 2. The effect of different grafting heights on graft take and vegetative growth in grape cv. Pusa Urvashi.

Grafting height (cm)	Graft take (%)	Sprouting time (days)	Total shoot length (cm)	Sprout diameter (cm)
15	87.00	19.40	136.21	0.37
30	79.50	20.20	122.72	0.30
45	67.33	22.51	109.43	0.33
CD at 5%	12.67	1.45	12.47	NS

Table 3. Effect of rootstock combinations on success rate and vegetative growth characters of cv. Pusa Urvashi.

Rootstock	Success (%)	Sprouting time (days)	Total shoot length (cm)	Sprout dia.(cm)	Stock/scion ratio	Total no. of leaves/sprout	Leaf area (cm^2)	Internodal length (cm)
Pusa Navrang	87.00	19.40	136.21	0.37	0.95	25.42	1.22	4.75
Dogridge A	76.25	23.50	118.14	0.28	0.89	17.20	1.34	4.11
H-144	81.10	24.52	121.40	0.34	0.93	19.61	1.43	3.65
SO4	75.50	28.04	86.77	0.32	0.89	21.83	1.28	3.96
CD at 5%	7.89	5.45	8.65	0.004	0.01	3.14	0.06	0.067

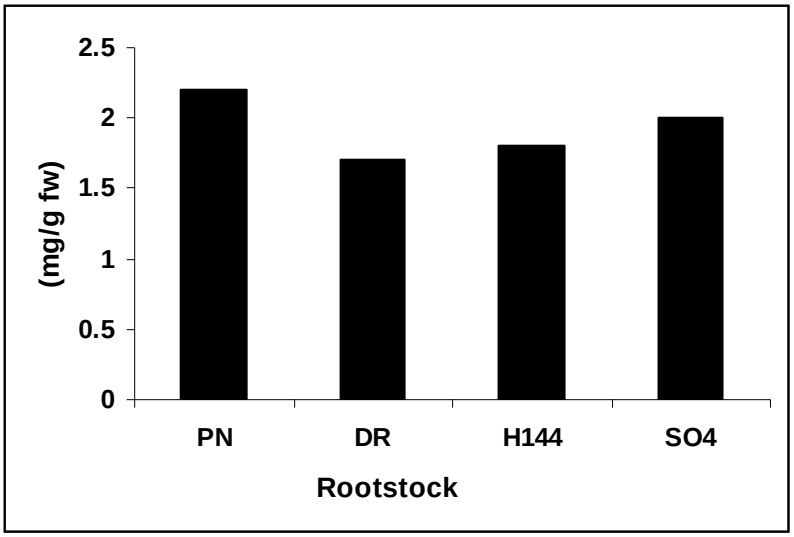

Figure 1. Effect of different rootstocks on total chlorophyll content in grape cv Pusa Urvashi.

and initiation of early subsequent growth. The grafting height of 15 cm gave the maximum success followed 30 and 45 cm (Table 2). Higher success on lower grafting height may be due to the better cambial growth. Earlier, Kumar *et al*. (2000) also reported 100 cm height to be good for grafting in mango.

Pusa Navrang as rootstock was proven most compatible with Pusa Urvashi as scion partners with respect to most of the characters *viz.*, success rate, bud sprouting, total shoot length and diameter of sprout (Table 3). With regard to the vegetative characters, Pusa Navrang was the most vigorous rootstock followed by H-144. Leaf area was the maximum on H-144 followed by Dogridge A and SO4 (Table 3). This effect may be due to the genotype of the rootstocks used for the study.

The total leaf chlorophyll was found to be influenced by the stionic combination and Pusa Navrang was found to induce highest level (2.2 mg/g) compared to Dogridge (1.7 mg/g FW). This effect may be due to the genotype of the rootstock.

It could be concluded from the study that of the different grafting methods and other factors studied, wedge grafting gave the highest success compared to side and bench grafting. Highest bud sprouting was also recorded in wedge grafting performed in February followed by the same method during March and August. The maximum graft take was obtained when preformed at the height of 15 cm irrespective of the months.

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Effect of type of milk, coagulants with concentration and coagulation temperature on quality of paneer

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Abstract

Paneer, prepared from standardized buffalo (6% fat, 9% SNF), cow (4% fat, 8.5% SNF) and mixed milk (5% fat, 9% SNF) using two different coagulants, viz. citric acid and calcium lactate at 1 and 2% concentrations each and coagulated at 80° and 85°C, was assessed for sensory quality on a 9-point hedonic scale. Results revealed that the paneer samples made from buffalo milk using one per cent citric acid at 80°C coagulation temperature elicited maximum scores for appearance, flavour, body and texture and overall acceptability, followed by paneer made from mixed milk using same processing parameters. The minimum sensory and overall acceptability scores were obtained for cow milk. However, a good quality paneer could also be prepared from cow milk using one per cent citric acid at 80°C coagulation temperature.

Introduction

The market for value added indigenous dairy products is poised for a rapid growth. This development marks the second wave of India's White Revolution, which is transforming the face of dairy industry. The first wave made India the world's biggest milk producer and the biggest market. The second wave is boosting the organised sector and will make it a significant segment of the industry with its market share doubling from the present 10-12 per cent of milk processed. A new market of over Rs. 50,000 million is

expected largely from ethnic foods such as flavoured milk, dahi, paneer, butter milk, lassi, gulabamun, shrikhand and kheer. The consumers in general are looking for foods, particularly dairy foods, as a means of health and happiness (Ajeja *et al.,* 2002).

During recent years, paneer, a heat-cum-acid coagulated product, has become quite popular because of its high nutritive value, taste and excellent frying characteristics. Paneer contains almost all the proteins and fats of milk besides an adequate amount of minerals and fat soluble vitamins. It is an ideal food for expectant and nursing mothers, infants, growing children, adolescent and adults, being rich source of energy and animal proteins. It is a good source of all essential amino acids to the vegetarians. With its high protein and low sugar content, it is also recommended to diabetic persons. Although, the buffalo milk is best suited for paneer manufacture but good quality of paneer has also been made from cow or mixed milk with suitable treatments and/or modifications. The present study was therefore, undertaken to assess the effect of different types of milk alongwith different coagulants, their concentration and various coagulation temperatures on the sensory quality of paneer with a view to standardize the process.

Materials and Methods

Procurement of milk

The buffalo and cow milk were obtained from the University Dairy and standardized to 6.0 per cent fat and 9.0 per cent SNF, and 4.0 per cent fat and 8.5 per cent SNF, respectively. The mixed milk was prepared by mixing 50 per cent buffalo milk and 50 per cent cow milk and standardized to 5.0 per cent fat and 9.0 per cent SNF level for preparation of paneer.

Coagulants, concentration and coagulation temperature

Two coagulants, *viz.* citric acid and calcium lactate at 1 and 2 per cent concentration each were used for coagulating milk at two different temperatures, namely, 80° and 85°C for preparation of paneer from each type of milk.

Preparation of paneer

The paneer was prepared as suggested by Bhattacharya *et al.*,(1971) and subsequently modified by Sachdeva (1983) with further modification on per requirement of the project.

The standardized cow, buffalo and mixed milk were heated to 100°C for 5 minutes and then cooled to 80° or 85°C. Citric acid or calcium lactate (1 and 2 per cent) were added to milk at 80° or 85°C. The milk was agitated continuously till clear whey separated out. The curd was left for 5-10 minutes in the whey without agitation. The

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whey was then drained through muslin cloth and the coagulated mass was pressed in a hoof by applying pressure of 2 kg/cm^2. It was then dipped in chilled water for one hour and packaged in LDPE sachets.

Sensory evaluation: A 9-point hedonic scale was used to evaluate the flavour, body and texture, appearance and general acceptability of paneer by a selected panel of 5 experienced judges (BIS, 1971).

Results and Discussion

The paneer samples prepared from different types of milk using citric acid and calcium lactate as coagulants at two coagulation temperatures were assessed for sensory quality by a panel of judges in terms of flavour, body and texture, appearance and overall acceptability. The flavour score of paneer has been laid down in Table 1.

Table 1: The effect of different types of milk, coagulants with concentration and temperature of coagulation on flavour score of paneer

	B_1	B_2	B_3	B_4	C_1	C_2	Mean
A_1	8.70	8.40	8.50	8.20	8.55	8.35	8.45
A_2	8.40	8.10	8.20	7.90	8.25	8.05	8.15
A_3	8.10	7.90	7.80	7.60	7.95	7.75	7.85
B_1				8.50	8.30	8.40	
B_2				8.20	8.00	8.10	
B_3				8.30	8.10	8.20	
B_4				8.00	7.80	7.90	
Mean					8.25	8.05	

A_1 Buffalo milk, A_2 Mixed milk, A_3 Cow milk, B_1 Citric acid (1%), B_2 Citric acid (2%), B_3 Calcium lactate (1%), B_4 Calcium lactate (2%), C_1 Coagulation temperature (80°C), C_2 Coagulation temperature (85°C)

	A	B	C	AB	AC	BC
SE(d)	0.0020	0.0024	0.0017	0.0041	0.0029	0.0033
CD at 5%	0.0041	0.0047	0.0034	0.0082	0.0058	0.0087

The results (Table1) indicated that the maximum flavour score (8.45) was noted for paneer made from buffalo milk (A_1), followed by paneer made from mixed milk (8.15) and the minimum (7.85) from that of cow milk. The concentration of coagulants also affected the flavour score of paneer, being maximum in paneer (8.40) prepared with citric acid at one per cent level (B_1) and minimum in paneer (7.90) prepared using 2 per cent calcium lactate (B_4) coagulants. As regards the coagulation temperature, the highest flavour score of paneer (8.25) was found at 80°C (C_1) and minimum score (8.05) at 85°C coagulation temperature (C_2).

Body and texture: The paneer samples prepared from buffalo milk (A_1) elicited maximum (8.35) body and texture score, followed by mixed milk (8.05) and cow milk (7.75). The data in Table 2 further indicated that one per cent concentration of citric acid (B_1) yielded maximum score (8.30) for body and texture, while 2 per cent citric acid (B_2) and one per cent calcium lactate (B_3) yielded almost similar scores but 2 per cent calcium lactate (B_4) produced minimum score (7.90) for body and texture, which are important attributes of paneer and form basis for acceptance of the product with regards to frying characteristics.

Table 2: The effect of different type of milk, coagulants with concentration and temperature of coagulation on body and texture score of paneer

	B_1	B_2	B_3	B_4	C_1	C_2	Mean
A_1	8.60	8.30	8.40	8.10	8.45	7.25	8.35
A_2	8.30	8.00	8.10	7.80	8.15	7.95	8.05
A_3	8.00	7.70	7.90	7.50	7.85	7.65	7.75
B_1				8.40	8.20	8.30	
B_2				8.10	7.90	8.00	
B_3				8.20	8.00	8.10	
B_4				7.90	7.70	7.90	
Mean					8.15	7.95	

A_1 Buffalo milk, A_2 Mixed milk, A_3 Cow milk, B_1 Citric acid (1%), B_2 Citric acid (2%), B_3 Calcium lactate (1%), B_4 Calcium lactate (2%), C_1 Coagulation temperature (80°C), C_2 Coagulation temperature (85°C)

	A	B	C	AB	AC	BC
SE(d)	0.0041	0.0047	0.0033	0.0082	0.0058	0.0089
CD at 5%	0.0082	0.0095	0.0067	0.00165	0.1164	0.0134

Colour and appearance: The results in Table 3 revealed that the maximum colour and appearance score of paneer (8.20) was noted in buffalo milk (A_1) and minimum (7.85) in cow milk (A_3). The paneer from mixed milk (A_2) was slightly superior to cow milk paneer (7.95 score). Different coagulants and their concentrations affected the appearance of product to some extent. One per cent citric acid (B_1) elicited the best product, two per cent citric acid (B_2) or one per cent calcium lactate (B_3) produced almost comparable products but two per cent calcium lactate (B_4) yielded inferior product (7.70 score).

The coagulation temperature, 80°C (C_1) yielded better appearance score (8.05) than 85°C (C_2) temperature (7.82). The various parameters (type of milk, coagulant, concentration and coagulation temperature) had significant ($p<0.01$) effect on quality of paneer.

Overall acceptability: The results on overall acceptability (Table 4) of the product, based on individual data for appearance, flavour, body and texture as compiled in Table 4 suggested that maximum overall acceptability score (8.80) was obtained for paneer made

from buffalo milk coagulated with one per cent citric acid at 80°C temperature (A_1 B_1C1), followed by mixed milk paneer (8.50) using same parameters of coagulant, concentration and coagulation temperature ($A_2B_1C_1$). The minimum overall acceptability score (7.50) was obtained for cow milk coagulated with 2 per cent calcium lactate at 85°C temperature ($A_3B_4C_2$). However, a good quality paneer could also be prepared from cow milk using one per cent citric acid as coagulant at 80°C temperature ($A_3B_1C_1$).

Table 3: The effect of different type of milk, coagulants with concentration and temperature of coagulation on colour and appearance score of paneer

	B_1	B_2	B_3	B_4	C_1	C_2	Mean
A_1	8.33	8.20	8.30	8.00	8.35	8.06	8.20
A_2	8.20	7.90	8.00	7.70	8.05	7.85	7.95
A_3	7.80	7.60	7.70	7.40	7.75	7.55	7.85
B_1					8.30	7.98	8.14
B_2					8.00	7.80	7.90
B_3					8.10	7.90	8.00
B_4					7.80	7.60	7.70
Mean					8.05	7.82	

A_1 Buffalo milk, A_2 Mixed milk, A_3 Cow milk, B_1 Citric acid (1%), B_2 Citric acid (2%), B_3 Calcium lactate (1%), B_4 Calcium lactate (2%), C_1 Coagulation temperature (80°C), C_2 Coagulation temperature (85°C)

	A	B	C	AB	AC	BC
SE(d)	0.0356	0.0412	0.0291	0.0713	0.0504	0.0582
CD at 5%	0.0717	0.0828	0.0585	0.1434	0.1014	0.1171

Table 4: ABC Mean for overall acceptability of paneer

		C_1	C2
A_1	B_1	8.80	8.60
	B_2	8.50	8.30
	B_3	8.60	8.40
	B_4	8.30	8.10
A_2	B_1	8.50	8.30
	B_2	8.20	8.00
	B_3	8.30	8.10
	B_4	8.00	7.90
A_3	B_1	8.20	8.00
	B_2	7.90	7.70
	B_3	8.00	7.80
	B_4	7.70	7.50

The above results brought out clearly that best quality paneer was prepared from buffalo milk (6 per cent fat and 9 per cent SNF) using citric acid as coagulant at one per cent concentration and 80°C coagulation temperature. Ramasamya *et al.* (1997) also reported that best quality paneer could be obtained by using buffalo milk having 6.0 per cent fat. Shukla *et al.*, (1984) and Pal and Yadav (1991) also observed that mixture of cow and buffalo milk in 1:1 ratio with 5 per cent fat yielded superior quality paneer than cow milk alone. Such reports substantiate the results of present investigation. Further, a coagulation temperature of 80°C and one per cent concentration of citric acid have been found optimal for making good quality paneer from buffalo milk (Shukla *et al.*, 1984; Sachdeva and Singh, 1988). These reports also corroborate present data.

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Farming Performance of Different Categories of Goat Farmers in Southern Rajasthan

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Abstract

An ex-post-facto research design was followed to measure the farming performance among different category of goat farmers in Udaipur district of southern Rajasthan. It was observed that majority of small farmers belonged to low farming performance category, medium farmers belonged to medium farming performance category and large goat farmers belonged to high farming performance category. One-way analysis of variance indicated that there was significant difference in the farming performance among the three categories of goat farmers.

Introduction

Since independence, several technologies have been evolved for increasing productivity of the crop as well as animals by improving the adoption behaviour of the farmers. Livestock development has always been a major concern in the Indian economy along with agriculture. The livestock sector contributes 8% to the India's GDP, contributing about 66% of the share from animal husbandry sector. This has been possible due to varying extension approaches adopted from 1951 onwards (Tiwari et al 2005). The development of entrepreneurship especially among the goat farmers is an imperative for a country embarking on socio-economic development programme. The entrepreneurial qualities generate income, develop self confidence, and give satisfaction. It comprises qualities of an individual for planning, organizing and monitoring ones own venture profitably while creating self employment and engaging others there in. Goat farming as an enterprise demands certain managerial skills and prediction of performance of goat keepers. Duly keeping the above facts in view in the absence of studies on farming performance of goat farmers in relation to management attributes, the present study was designed with the specific objectives to measure the farming performance among different categories of goat farmers.

Methodology

An ex-post-facto research design was followed to predict the farming performance of goat farmer. The Udaipur district of southern Rajasthan was selected for the study. The Mavali, Vallabhnagar, Nathdwara and Girva tehsils were selected. Further in each selected tehsil two villages were randomly selected. The farmers were categorized into three categories based on animal holdings viz., small (1-5 goats), medium (6-15 goats) and large (>15 goats) as suggested by Kumar and Deoghore (2003). From each category and village fifteen farmers were selected by proportionate random sampling method. Thus a total samples comprising of 120 respondents were selected. These respondents were further categorized into small (60), medium (40) and large (20) goat breeders based on their animal holdings. The data were collected by personal interview method through structured interview schedule and the same were analyzed for mean and standard error as per standard procedure (Snedecor and Chochran, 1994).

Results and Discussion

Farming performance of different categories of goat farmers was measured and the respondents were categorized into three different groups namely low, medium and high performance groups.

Result presented in Table 1 revealed that majority of the small goat farmers (66.67 per cent) had low farming performance followed by medium (25 per cent) and only 8.33 percent had high performance. But nearly half of the medium goat keepers (47.00%) had medium farming performance followed by one third (30.00%) and 22.5 per cent as high and low farming performance respectively. Among large holding goat farmers nearly 60.00 per cent had high farming performance, followed by 30.00 percent medium and only 10.00 percent had low farming performance. This might be due to the fact that majority of the small farmers had low experience, achievement, motivation, innovativeness, knowledge and management orientation and opposite results in case of large holding goat farmers. The findings were in line with findings of Bhagat and Singh (1995) and Reddy and Reddy (2002).

Further pooled data comprising 120 respondents engaged in goat farming practices revealed that 42.50 percent farmers had low farming performance while

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Table 1:. Distribution of respondents by farming performance

N= 120

S. No.	Farming performance	Goat farmers category					
		Small		Medium		Large	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1.	Low	40	66.67	09	22.50	02	10.00
2.	Medium	15	25.00	19	47.50	06	30.00
3.	High	05	08.33	12	30.00	12	60.00
	Total	60	100	40	100	20	100

one third i.e., 33.33 per cent farmers witnessed with medium farming performance with regard to goat forming practices. Very little only about 24.17 per cent goat farmers were enumerated for having high farming performance(Table 2). The results are in agreement with the findings of Reddy and Reddy (2002).

Table 2: overall farming performances of farmers

Farming performance	Goat farmers	
	Frequency	Percentage
Low	51	42.50
Medium	40	33.33
High	29	24.17
Total	120	100.00

To find out the existence of significant difference if any, in the farming performance among the three categories of goat farmers 'F' ratio and't' values were worked out and are presented in table 2 and 3, respectively.

Table 3: Analysis of variance:

S.No.	Group	Mean	F- Ratio
1.	Small	5.23	
2.	Medium	8.10	74.1919*
3.	Large	11.98	

* Significant at 0.01 level of probability.

Table 4: 't' values among categories of goat farmers

S.No.	Farmers categories	't' values
1.	Small (60) Vs Medium (40)	6.073*
2.	Medium (40) Vs Large (20)	5.271*
3.	Small (60) Vs Large (20)	10.446*

·*Significant at 0.01 level of probability:

Figures in parenthesis indicate numbers of goat farmers

Further it could be inferred from Table 3 and 4 that the 'F' ratio and 't' values for all the groups were significant at 0.01 level of probability. The findings were in line with findings of Reddy (1992) and Hemalatha and Reddy (2001).

Conclusion

The respondents were categorized based on number of animals and this difference might be the reason for difference in the farming performance among these three categories. The differences in the distribution of three types of respondents into three categories of farming performance might be attributed to the difference in goat farm size'

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A Comparative study of work stress of the farm women Caused by selected farm activities

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Abstract

Agriculture in developing countries heavily dependent on manual labour and major contribution comes from womens, Agriculture is physically ardous occupation and exposes the workers to various risk factors associated with musculo skeletal disorders. Hence, in present study work stress caused due to four selected farm operation (weeding, harvesting, carrying and winnowing) were assessed through 5 point scale and task frequency chart. Fifty farm women were selected randomly from student's farm and seed technology farm of C.S.A.U.A.&T., Kanpur. Findings suggests that carrying is most stressful activity among all selected farm operations. It may because of carrying requires various kind of tasks involving body different kind of motions against the gravitational force.

Introduction

Agriculture is the largest industry in India and women participate in almost all agricultural operations, such as transplanting, weeding, threshing etc. Nearly half of the available global human resources in women. The women in India like in many others developing countries are silent workers labouring hard from dawn to dusk on the interest of their farms and homes Further, on an average upper body strength is 40.75 per cent less in females than in males while lower body strength is 5.30 per cent less in females (Falkel *et al.* ; 1986). Female's internal organs are more vulnerable to infections, external trauma and environmental irritants (Abbot, 2003). Whole body vibration affects women more than men because of anatomical and physiological characteristics. Agriculture is physically arduous occupation exposes the worker to various risk-factors that have been associated with musculo-skeletal disorders. A clear empirical link exist between good occupational health practices, a healthier labors force and improved productivity. Indeed, work place interventions such as proper occupational hygiene and ergonomics practices have been presented to break the cycle of poverty, improved productivity, income and consequently living conditions. In present study an attempt has been made to find out the work stress of the farm women caused by selected farm activities, so that, on the basis of findings of the study, appropriate ergonomics intervention can be made for reducing the work stress and enhancing the working efficiency, health and comfort of the farm women.

Materials and Methods

Two farm i.e. student's farm and seed technology farm of C.S.A.U.A&T., Kanpur (U.P.) were chosen purposively for the study. Total fifty farm women were selected randomly from both selected farms. Stress rating (five point scale, Varghese *et al*, 1996) and task frequency chart were used for the assessment of work stress caused by farm work Further, weeding, harvesting, carrying and winnowing were the farm activities selected purposively for the study because of the intensive involvement of the farm women in these activities in Kanpur Nagar.

Results and Discussion

1.Assessment of the work stress caused by selected farm activities throughstress rating.

Five point scale (very severe, severe, moderate, low, very low) was used to find out the stress level of selected farm activities (Verghese, 1994).

From the Table 1, It is clear that farm women were rated the carrying activity as most stressed farm activity followed by harvesting, weeding and winnowing respectively.

2.Observatory analysis of farm activities on the basis of task frequency.

All the agricultural activities require considerable efforts in the form of pushing, pulling, lifting carrying, trusting, walking etc. These kinds of efforts require spinal deviation from its natural alignment, when the person works in a distorted position, by sudden heavy exertion the disc becomes seriously damaged making the backbone to pain severely with further sudden jerks and pulls. The disc is torn away making the fluid (viscose fluid) to flow away on sciatic nerve causing the severe sciatic pain. With the going away of fluid from discs, the back bone becomes less flexible and continue to pain at the time of work and after the work. Considering this fact, work stress caused by various farm activities was assessed through tasks frequency of various activities requiring spinal deviation during the whole work period

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Table 1: Distribution of the farm women on the basis of stress rating given by the farm women to different activities.

N = 50

S. No.	Activity	Stress rating				
		Very Severe	Severe	Moderate	Low	Very low
1.	Weeding	19 (38%)	25 (50%)	4 (8%)	2 (4%)	-
2.	Harvesting	22 (44%)	24 (48%)	4 (8%)	-	-
3.	Carrying	23 (46%)	27 (54%)	-	-	-
4.	Winnowing	2 (4%)	8 (16%)	22 (44%)	14 (28%)	4 (8%)

Table 2: Distribution of respondents on the basis of task frequency in different farm activities.

Task Frequency	Weeding				Harvesting				Carrying				Winnowing			
	N	S	M	Mean	N	S	M	Mean	N	S	M	Mean	N	S	M	Mean
Above shoulder height	50x1			1	50x1			1			50x3	3	50x1			1
Below shoulder height	50x1		50x1					1		50x2		2			50x3	3
Below knees				3	50x1			3		50x2		2	50x1			1
In the non-strength writ position			50x1	3			5x3	3	50x1			1	50x1			1
With the elbow near/above shoulder height	50x1			1			50x3	1			50x3	3			50x3	3
Involving mechanical stress			50x1	3	50x1			3			50x3	3		50x2		2
Involving hand/finger pinches			50x1	3			50x3	3	50x1		50x3	3			50x3	3
Involving pulling	50x1			1	50x1		50x3	1	50x1			1	50x1			1
Involving pushing	50x1			1	50x1			1			50x3	1	50x1			1
Involving carrying		50x1		2	50x1			1		50x2		3	50x1			1
Involving twisting	50x1			1	50x1			1		50x2		2	50x1			1
Involving lifting		50x1		2	50x1			1			50x3	2	50x1			1
Involving walling		50x1		2		50x2		2				3	50x1			1
Total Mean				1.846				1.692				2.230				1.538

of selected activities.

Table 2 reveals that mean value of total frequency of various tasks was maximum for carrying followed by weeding. harvesting and winnowing.

Thus, on the basis of results of table (1) and table (2). It is obvious that carrying is the most stressful activity among all the selected farm activities. Findings of the study conducted by Eilistrm and Nechamson (1970) showed that postures such as stooping and lifting or carrying loads caused damage to the spinal discs and included health hazards on the supporting system of the spine. Further, static positioning, forward bending, heavy lifting, carrying, kneeling and body vibration were also observed as occupational risk factors by Meyers *et al*., 1995. Biomechanical researches carried out by Fadi *et al*.,(2005) showed that high spinal compression forces occur in stooped posture and that sustained or repeated flexion of the spine and may disturb the neuromuscular stability of the lower back and increase the risk of fatigue, leading the back more vulnerable to injury.

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Effect of conjunctive use of organic sources with phosphorus fertilizer on chemical composition of wheat crop

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Abstract

An experiment was undertaken to study the interaction between P and farmyard manure (FYM) on grain yield and uptake of major nutrient i.e. N, P, K and S wheat in a sandy loam soil. The grain and straw yields of wheat increased significantly with increasing level of P and farmyard manure application. With the increase in the level of P applicant ion there was significant increase in the concentration and uptake of N, P and K but decrease in the concentration of S in the grain and straw of wheat. Application of FYM minimized the antagonistic effect of P on S, with the increasing level of farmyard manure application there was significant increase in the uptake of all the major nutrients.

Introduction

Wheat is the most dominant rabi crop in India occupying about 50 % of the total area under food crops and more than 70 % of the total food grain production in he country in rabi season. Low organic matter coupled with low native soil phosphorus concentration is a major constraint limiting the productivity of wheat based cropping systems on alluvial soil in the Indo-Gangatic Plain of India. As continuous rising of crops depletes the soil of its plant nutrients, it is essential to replenish these losses. Farmyard manure has been used for restoring the fertility of the soil Sen et. al.,1962. The use of commercial fertilizer is currently becoming more common to achieve the same objective. Besides supplying nutrients, the manures and fertilizer influence the crops in several other ways and may also bring about marked changes in the soil health. Phosphorus exerts many and a varied function in plant metabolisms and hence adequate phosphorus supply to the plant seriously affects numerous metabolic processes. However, it appears that he most important function is its formation of pyrophosphate bonds, which allows energy transfer. Most of the phosphate in the plant occurs in inorganic form, and small proportion as organic (Singh et, al.,1998).

Further the Wheat *(Triticum aestivum L.)* yields are reduced by the use of alone inorganic fertilizers in many countries worldwide. The main objective of this study, therefore was to determine the effects of graded levels of P with and without organic manure Wheat yield and its nutrient uptake Singh et. al.,1998.

Materials and methods

Experiment was undertaken at R.B.S. College farm, Bichpuri, Agra during 1998. The experimental soil had pH 8.1, organic carbon 0.45%, EC 0.12 dsm^{-1}, available N 288.00 kg ha^{-1}, available P 22.30 kg ha-1, available K 237.60 kg ha^{-1} and clay content of 18.76% with sandy loam texture. About 6 kg soil was packed in each pot. Wheat seeds (Cv. UP 368) were sown in each pot uniformly. Basal application of N and K was done in each pot @ 120 kg N ha^{-1} and 60 kg K_2O ha^{-1} as urea and murate of potash respectively. Organic matter I nth form of well decomposed FYM and phosphorus in the DAP were applied as per treatments. The experiment was laid out in a factorial randomized block design with two factors i.e. P and Organic manure. There four levels of P viz. 0.30, 60, 90, kg P2O5 ha^{-1} and four levels of organic manure viz. 0, 0.25, 0.5 and 1.0% on dry weight basis were applied. The N contributed by DAP was taken into account and the quantities of urea was adjusted accordingly treatment were replicated in three. Watering was done uniformly through out the growing period of crops. The crop was harvested and the grain and straw yield per pot was recorded.

After harvesting the plants samples were air dried followed by oven dry at 70^0C. After grinding in a Wiley the samples were stored in wide mouth glass stopped bottle with proper labeling. The soil samples were collectively from each pot after harvesting. The soil samples were air-dried and grinded by a wooden pastel and mortar. The grind material was passed through 2 mm sieve and stored in polythene bags. Soil and plants were analyzed for its parameter following standard procedure (Jackson.1973).

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Result and Discussion

Yield

Higher doses of P application up to 60 kg P_2O_5 ha^{-1} caused a significant enhancement in grain and straw yields of wheat (Table 1). However, phosphorus application @ 90 kg P_2O_5 ha^{-1} have not proved significantly superior over that at 60 kg P_2O_5 ha^{-1} in increasing grain and straw yields of wheat. The percent enhancement with 30, 60, and 90 kg P_2O_5 ha^{-1} over control were found 12.5, 24.1, and 28.5 in grain yield and 11.9, 20.2 and 22.1 in straw yield of wheat, respectively. This finding is in consistence with the observations of other scientist Gupta et. al., 1993. Each added dose of organic matter levels up to 0.50 percent caused a significant enhancement in grain and straw yield of wheat (Table 1). With the increase in organic matter application to 0.25, 0.50 and 1.0 percent the percent enhancements of grain yield over control were 10.8, 17.7 and 19.5 respectively and the percent enhancement of straw yield over control were 9.9, 16.1, 17.8 respectively same results found by Somawanshi et.al.,1980 and Kanuwar et. al.,1962. The interaction affect of phosphorus and organic matter on grain and straw yield of wheat was not significant.

Nitrogen uptake

There was significant response of phosphorus application on nitrogen uptake by wheat (Table 2). Higher N uptake value was recorded under 90 kg Pha^{-1}. A significant positive response of phosphorus on nitrogen uptake by wheat was attributed to an increase in the yield as well as improvement in N content of the crop. These finding were also supported (Gupta et, al., 1993). Application of organic matter significantly improved the N uptake by wheat grain and straw and there was significant interaction between phosphorus and organic matter on N uptake by wheat.

Phosphorus uptake

There was increase in P uptake by wheat with the increase in the level of P application (Table 2). The maximum P uptake was observed when P was applied @ 90 significant increased in P uptake due to its application was the combined effect of higher yield along

Table 1: Effect of Phosphorus and organic matter levels on the grain and straw yield (g/pot)

Organic matter (%)	Phosphorus level (kg ha^{-1})							
	P_0		P_{30}		P_{60}		P_{90}	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
O_0	5.44	8.43	6.42	10.12	7.10	10.65	7.30	10.80
$O_{0.25}$	6.20	9.61	7.10	10.86	7.80	11.77	7.99	11.74
$O_{0.50}$	6.78	10.44	7.40	11.32	8.18	12.18	8.51	12.50
$O_{1.0}$	6.8	10.59	7.51	11.41	8.29	12.43	8.69	12.68
Mean	6.32	9.76	7.11	10.93	7.84	11.76	8.12	11.93
		P	O	P x O				
SEm (±)		0.15	0.15	0.34				
C.D. at 5%		0.45	0.45	NS				

Table 2: Effect of Phosphorus and organic matter application on total uptake of N, P, K and Sulphur (mg/pot)

Organic matter (%)	Phosphorus level (kg ha^{-1})															
	P_0				P_{30}				P_{60}				P_{90}			
	N	P	K	S	N	P	K	S	N	P	K	S	N	P	K	S
O_0	150.3	18.0	199.8	33.9	181.3	24.0	242.1	38.5	203.1	32.0	260.9	39.4	212.2	38.7	271.3	37.7
$O_{0.25}$	174.9	21.3	232.9	44.6	202.8	26.5	267.1	49.0	232.6	37.2	294.0	50.9	238.9	43.2	299.5	49.6
$O_{0.50}$	194.5	24.0	257.9	52.1	218.2	30.0	282.9	54.0	247.7	39.6	209.3	57.1	264.5	48.0	322.8	56.6
$O_{1.0}$	199.6	25.3	265.1	59.2	227.2	31.0	288.6	61.5	258.6	42.3	218.7	62.9	274.7	51.0	322.5	62.3
Mean	179.8	22.2	238.9	47.4	207.4	27.9	270.2	50.8	235.5	37.7	245.7	52.6	247.6	45.2	306.5	51.5
				P		O		P x O								
SEm (±)				0.65		0.65		4.32								
C.D. at 5%				1.9		1.9		NS								

with improvement in P content. A favorable effect on P uptake with P application in field crops has been reported by Mandal et.al., 1990 and Sinha, 1973. Organic matter applications significantly encouraged the P uptake by wheat crop (Table 2). A favorable effect of organic matter application on P uptake value by wheat crop has also been reported by Gupta et. al., 1993 and Mandal et.al., 1990. Interaction effect of P X organic matter and P uptake by wheat crop was found non significant.

Potassium uptake

With the increase in the level of P application there was significant increase in K uptake by wheat over control also reported by Singh et.al.,1998 (Table 2). Organic matter application significantly increased the K uptake by wheat. Each added levels of organic matter application up to percent caused a significant enhancement in K uptake by wheat. However organic matter application @ 1.0 percent was statistically similar with organic matter application @ 0.5 percent in enhancing the K uptake by wheat. Favorable effect of organic matter addition on K uptake by wheat were also reported by Singh et. al., 1998. Interaction effect of P and organic matter on K uptake by wheat crop was not significant.

Sulphur uptake

Phosphorus application significantly enhanced the sulphur uptake by wheat over control (Table 2). However, all the P levels were statistically similar with respect to S uptake by wheat. It is to be noted that though the S content in wheat declined with the increase in the level of P. However, such trend was not observed in the uptake of S by wheat. Organic matter applications have a marked positive effect on sulphur uptake by wheat. All the added levels of organic matter caused a significant enhancement in S uptake by wheat. Favorable effect of organic matter application on S uptake by field crop has also been reported by Subba rao et.al.,1996. There was no significant interaction of P and organic matter on S uptake by wheat crop.

Conclusions

Thus from the present investigation of may be concluded that with the increases in the level of P application there was significant increase in the concentration and uptake of N, P and K but decrease in the concentration of S in wheat grain and straw. The antagonistic effect of P on S is minimized by organic matter application. With increase in the level of organic matter there was significant increase in the concentration and uptake of N, P, K and S in wheat the grain and straw yields of wheat increased significantly with the increase in the levels of P and organic matter application.

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Comparative performance of potato genotypes in relation to zinc and cytozyme application

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Abstract

A field study was conducted during winter season of 1999-2000 and 2000-2001 to find out the effect of graded dose of zinc and cytozyme spray on the yield and yield attributes of different potato (Solanum tuberosum *L.) genotypes. Twenty four treatment combinations comprising of 3 potato genotypes i.e. , 'Kufri Badshah', 'Kufri Bahar' and 'G-4', four levels of zinc (0, 10, 20 and 30 kg/ha) and two levels of cytozyme (with and without spray) were evaluated in split plot design. Among three genotypes ;Kufi Bahar' gave significantly higher tuber yield (306.9 q/ha) over two other genotypes and out yield 'Kufri Badshah' and 'G-4' with a margin of 4.3 and 8.7%. Almost similar trends were observed in growth parameters (shoot length, No. of shoots and No. of leaves per plant, leaf area index and fresh weight of shoots per plant). Among graded dose of zinc application, 20 kg Zn/ha resulted in significantly higher tuber yield (310.5 q/ha), shoot length, No. of shoots and No. leaves per plant, leaf area index and fresh weight per plant. However, difference at 30 kg Zn/ha was not significant with 20 kg Zn/ha. The application of 0.2% cytozyme spray at 30 days after tubers planting, gave significantly higher tuber yield (310.0 q/ha) and all growth parameters over control.*

Introduction

Greatest changes in Indian agriculture is to enhance food production on sustainable lines keeping pace with food needs of ever increasing billion plus human population and simultaneously addressing natural resources and environmental issues. On the basis of area and production of potato, India stands 4th and 3rd, respectively in the world. India produced 22.63 million tonnes of potatoes from 1.29 m. ha of land with an average yield of 18.23t/ha (average of 1998-99 – 2000-2001). Uttar Pradesh is one of the important state, in which Agra, Mainpuri, Farukhabad and Jaunpur are some of the districts where potato is grown on a large area. However, the productivity of potato tuber is quite low because of non-availability of high yielding varieties, injudicious use of fertilizer including of micronutrients and use of photo-synthesis improver chemicals such as cytozyme etc.

Yield potential of different potato genotypes may differ under different agro-climatic conditions because of their inherent capacity (Rana *et al.*, 1996). Zinc plays an inevitable and imperative role in the productivity of potato tubers. The adequate supply of zinc increases tuber yield appreciably (Trechan and Sharma, 1999). Agro-chemicals such as cytozyme carrying elements enzymes, cyto kinins and other growth promoting chemicals may have beneficial effect on growth and yield of crops. Singh, *et al.*, (1981) reported increase in potato tuber yield due to the cytozyme application. The information on this aspect related to potato genotypes for this region is quite meagre. Hence a study was conducted to find out the effects of graded doses of zinc and cytozyme on the growth parameters, yield and yield attributes of different genotypes of potato.

Material and Methods

A study was conducted for two years in Rabi season of 1999-2000 and 2000-01 at RBS College, Bichpuri's Research Farm. The experimental soil was analysed using standard chemical procedure. Mechanical analysis showed that the soil was sandy loam type and contained 58% sand, 22.6% silt and 19.4% clay. Soil moisture characteristics indicated a permanent wilting point 9.5%, field capacity 18.5% with an average bulk density of 1.55 g/cc of surface layer. Soil pH was 7.8 and it contained 0.39% organic carbon, available N, P_2O_5 and K_2O 195.2, 29.9 and 304.3 kg/ha, respectively. The average minimum temperature varied between 4.6 and 15.3^oC, average maximum temperature 14.4 and 32.7^oC and relative humidity between 77 and 96% during the crop seasons.

Twenty four treatments comprising 3 genotypes of potato, i.e. Kufri Badshah, Kufri Bahar and G-4, four levels of zinc (0, 10, 20 and 30 kg/ha) and two levels of cytozyme spray (with 0.2% spray and without spray) were evaluated in split plot design, keeping the genotypes and cytozyme spray in main plot and zinc levels in sub plot with three replications. All the treatments received N, P_2O_5 and K_2O @ 120, 80 and 80 kg/ha, respectively through urea, diammonium phosphate and

muriate of potash, respectively. Full dose of phosphorus and potash and half dose of N was applied as basal dressing before planting of tubers and rest half dose of N was applied as top dressing through urea in two equal installments after Ist and IInd irrigation. The calculated amount of zinc sulphate as per treatments was also applied along with the other fertilizers as basal dressing. The tubers on an average size of 2.4 cm diameter were planted on ridges at 45 x 15 cm apart on October 25th and October 27th during 1999 and 2000, respectively. Prior to planting, the tubers had been rested for two weeks after taking out from the cold storage with a view to swelling up of buds (eyes) and were thoroughly treated with the solution of Areton before planting on ridges. The freshly prepared 0.2% cytozyme solution was carefully sprayed on crop after 30 days of planting. The plots in which cytozyme was not to be applied were screened off by the polythene sheets to prevent the drift of cytozyme solution.

Results and Discussion

In general, yield of potato was higher during 1999-2000 than 2000-2001 the higher yield during first year may most probably because of conducive environmental conditions i.e. rainfall, temperature and sunshine hours. These environmental factors affect the relative crop growth individually as well as in association with others. The mineral absorption by the roots of potato also have the bearing on the interception of light by the plants. Bright sunshine hours per day during crop growth and development stage reviewed that tuber nutritional uptake might have been responsible for higher tuber yield during 1999-2000 than 2000-2001.

Performance of genotypes

Growth parameters such as shoot length, No. of shoots and No. of leaves per plant, leaf area index and fresh weight of shoot per plant were significantly influenced by different genotypes. Among three genotypes. 'Kufri Bahar' produced significantly higher tuber yield during both the years (Table 1). Yield attributes were also significantly higher of 'Kufri Bahar' compared to other genotypes. Improvement in growth and yield attributes in Kufri Bahar' was owing due to its genetic potential compared to other genotypes. In two years average, genotype, 'Kufri Bahar' gave significantly higher tuber, yield (306.9 q/ha) over other genotypes and out yielded 'Kufri Badshah' and 'G-4', with a margin of 4.3 and 8.7%, respectively (Table-2) 'Kufri Badshah' ranked second. Tuber yield is a function of yield attributing characters. Hence, significant increase in tuber yield of 'Kufri Bahar' may be due to increased yield attributes as compared to other two genotypes. Genotype differences in potato in respect of tuber yield were also reported by Sinha *et al.* (1996). Similarly, the higher yield of shoot biomass (51.2 q/ha) was recorded with Kufri Bahar' compared to other genotypes. Growth parameters were also recorded higher with 'Kufri Bahar' genotype as compared to other genotypes.

Effect of Zinc

Appreciable improvement in yield attributing characters of Potato was noted owing to the application

Table 1 : Effect of genotypes, cytozyme spray and application of zinc on shoot, No. of shoots per plant, No. of leaves per plant, leaf area index and fresh weight of shoots per plant at peak stage of growth (Average of two years).

Treatments	Notation	Shoot length (cm)	No. of shoots/ plant	No. of leaves/plant	Leaf area Index	Fresh wt. of shoots/plant (g)
Genotypes						
Kufri Badshah	V_1	34.71	2.61	30.46	1.38	120.53
Kufri Bahar	V_2	37.35	3..48	36.82	1.57	158.35
G-4	V_3	32.42	2.08	25.32	1.29	82.82
SEm±		0.24	0.06	0.12	0.004	1.23
CD at 5%		0.76	0.18	0.37	0.011	3.88
Cytozyme levels						
Control	C_o	32.82	2.52	29.25	1.41	109.76
Cytozyme	C_1	35.83	2.93	32.49	1.42	131.38
SEm±		0.20	0.05	0.10	0.003	1.01
CD at 5%		0.62	0.15	0.30	0.009	3.17
Zinc levels (kg/ha)						
0	Z_o	34.05	2.56	29.26	1.37	111.51
10	Z_1	34.36	2.66	30.14	1.41	116.34
20	Z_2	35.44	2.82	32.03	1.43	127.20
30	Z_3	35.47	2.86	32.05	1.44	127.23
SEm±		0.26	0.06	0.10	0.006	0.89
CD at 5%		0.18	0.15	0.27	0.018	2.46

Table 2: Tuber yield and yield contributing characters as affected by potato genotypes, Zinc and Cytozyme application

Treatments	Tuber yield (q/ha)			Shoot biomass (q/ha)	Stolens /plant	Length of longest stolen (cm)	No. of tubers /plant	Av. Fresh tuber wt. (g)
	1999-00	2000-01	Mean					
Genotypes:								
Kufri Badshah	331.9	281.8	306.9	48..0	13.2	15.2	15.5	49.3
Kufri Bahar	351.6	288.7	320.2	51.2	14.4	16.8	19.8	64.4
G-4	322.1	267.1	294.6	45.8	12.2	14.2	12.4	40.3
CD at 5%	2.2	2.0	3.1	1.4	0.7	0.3	0.9	0.55
Cytozyme levels:								
Without cytozyme application	322.2	276.8	304.5	45.8	12.9	15.1	15.0	48.5
With cytozyme application (0.2%)	338.1	281.6	309.9	50.9	13.7	15.8	16.8	54.1
CD at 5%	1.8	1.5	2.7	1.2	0.6	0.2	0.7	0.45
Zinc levels (kg/ha):								
0	331.5	270.1	300.8	45.4	12.9	15.1	15.0	48.7
10	334.7	278.5	306.6	46.9	13.0	15.3	15.5	50.2
20	337.2	283.8	310.5	50.9	13.6	15.6	16.5	53.1
30	337.3	284.5	310.9	50.5	13.6	15.7	16.5	53.2
CD at 5%	1.4	1.7	2.8	0.8	0.6	0.2	0.7	0.50

of zinc. Significant increase in the yield attributing characters such as number and fresh weight of tubers/ plant, number of stolen and longest stolen/plant were observed with every increase in the level of Zinc up to 20 kg/ha. However, there was no significant difference in yield attributes between 20 and 30 kg Zinc/ha.

Significant improvement in yield attributes, reflected in tuber yield of potato. Accordingly, the potato yield increased significantly with the increasing levels of Zn up to 20 kg/ha during both the years (Table 2). However, at higher level of zinc application, i.e. 30 kg/ ha, the yield difference was not significant compared to 20 kg Zinc/ha, which is an indicator of the fact that 20 kg Zinc/ha is sufficient enough to maintain the auxin contents in the plants which help in photosynthesis and other activities. These results are in conformity with those reported by Sharma and Grewal (1990); Trechan and Sharma (1999). The yield increase on an average basis owing to 10, 20 and 30 kg Zn/ha was 1.9, 3.2 and 3.4%, respectively over control. Almost similar trends were observed in respect of growth parameters such as shoot length, No. of shoots and No. of leaves per plant, leaf area index and fresh weight of shoots per plant (Table 1).

Effect of Cytozyme

The application of 0.2% aqueous solution of cytozyme as foliar spray at 30 days after planting of tubers increased the growth parameters (shoot length, No. of shoots and No. of leaves per plant, leaf area index and fresh weight of shoots per plant) and shoot biomass (q/ha) as compared to without cytozyme application. In fact, plant vigorous is responsible for the availability of plant resources i.e. light, moisture and nutrients. Hence, the yield attributes such as number of tubers and fresh weight of tubers and number and length of stolen/plant were increased significantly due to the application of cytozyme than without application of cytozyme. This has directly reflected on the yield of potato tubers and increased the tuber yield (309.9 q/ha) significantly over control (Table-2). Almost similar results were reported by Singh, *et al.*, (1981). The effect of cytozyme application was seen appreciably on different growth parameters (Table-1).

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Economic Evaluation of Soybean based cropping systems in humid south eastern plain of Rajasthan

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Abstract

The field experimentation was under taken for four consecutive years (2004-05 to2007-08) in randomized block design with six replications on ARS, Kota. The objective of the study was to elucidate the performance of different cropping sequences viz. soybean-wheat, soybean-chickpea, soybean-coriander and soybean- onion in heavy textures, non calcareous soils. The results obtained revealed that soybean-onion sequence was the sustainable and high remunerative to boost up the productivity and profitability of farmers in irrigated areas of humid south eastern plain of Rajasthan.

Introduction

Cropping sequences are paramount importance of the farmer from the point view of his farm economy. The need for good land use, planning and adoption of suitable cropping system is essential for ensuring the most rational use of land and increasing the productivity per unit area per unit time, yield advantage, employment generation, efficiency in terms of natural resource use and economic advantage are of prime importance during these days due to alarming level of increased population. The choice of crops in cropping systems depends upon the availability of water as well as quality of water, need of farmers and soil type.

Hence, the study was undertaken to evaluate yield potential and the economics of major soybean based cropping sequences in heavy textured, non- calcareous soil in humid south eastern plain of Rajasthan.

Materials and Methods

The field experiment was conducted at *Agricultural Research Station, Ummedganj, Kota* (Rajasthan) in clay loam soils (vertisols) having pH 7.95, EC 0.42 dS / m, Organic carbon 0.56 % , available N, P_2O_5, K_2O 324, 23.5, 277 kg/ha, respectively. The experimental site was situated at an elevation of 258 m above the mean sea level at 25°13' north latitude and 75° 25' east longitude, having mean rainfall 732.4 mm. The object study was to analyse the economic performance of soybean based cropping sequences over a period of four years from 2004-05 to 2007-08, four cropping sequences comprised of soybean-wheat and soybean-chickpea, soybean-coriander and soybean-onion in randomized block design with six replications. Physical data were transformed into economics data by taking into account the prevailing market price of inputs and output. In order to reduce yield of heterogeneous crop sequences to a common dominant soybean grain yield equivalent were computed taken into account of the yield equivalents of different crops. To work out the economics of cropping sequences, the data were subjected to statistical analysis to arrive at sustainable value index (SVI) and index of variability (IV). Accordingly profitability ranking of cropping sequences was done by superimposing SVI, IV, net returns (NRS) and benefit cost ratio (BCR) values before to recommend the best cropping sequences adopted by farmers for sustainable crop production.

Results and Discussion

The data of Table 1 indicated that the maximum soybean grain equivalent yield of 111.50 q ha^{-1} $year^{-1}$ was recorded with soybean-onion sequence followed by soybean-coriander sequence with mean soybean equivalent yield 46.46 q $ha^{-1}year^{-1}$. The yield of soybean-onion sequence was significantly higher than other crop

Table 1: Yield potential of various crop sequences (mean of four years (2004-2005 to 2007-08)

Crop sequence	Mean seed yield (q/ha)		Maize equivalent yield (q/ha/year)
	Kharif	*Rabi*	
Soybean-wheat	17.85	39.40	43.70
Soybean–chickpea	18.94	15.52	40.56
Soybean–coriander	18.36	14.94	46.47
Soybean –onion	19.89	244.33	111.50

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Table 2: Economics of different crop sequences in terms of net return, benefit cost ratio, Index of variability and sustainable valve index.

Crop sequence	Mean maizeequivalent (q/ha/year)	Av.net return (Rs./ha /annum)	IV(%)	SVI	BCR	Rank
Soybean-wheat	43.70	31681	30.49	0.48	1.51	IV
Soybean–chickpea	40.56	33326	24.64	0.55	1.84	II
Soybean–coriander	46.47	37393	36.1	0.52	1.85	III
Soybean–onion	111.50	69768	24.35	0.63	2.20	I

sequences. It is also concluded that inclusion of spices crop in the sequence earned the higher net return through diversification of cropping systems to the other sequence tried. The results (Table 2) elucidated that among the sequences the highest net return (Rs. 69768) and B.C ratio (2.2) was obtained under soybean-onion sequence. Inclusion of spices crop in the sequence showed higher benefit: cost ratio. Similar results were also reported by Gangwar and Dubey (1997). The next best sequence was soybean –coriander with mean net return (Rs 37393) with B.C ratio (1.85) and lowest net return (Rs31681) and B.C ratio (1.51) was obtained from soybean- wheat sequence.

Soybean- onion sequence considered to be best among others with the highest SVI (0.63) and lowest IV (24.35 %), followed by soybean-chickpea with SVI (0.55) and IV (24.64 %). The rank indicated that soybean-onion and soybean-chickpea were the most sustainable crop sequences which showing the close conformity with the finding of Biradar et al.(1995), Gaikwad *et al*,(1995)and Rajkumar et al,(2003) for evaluating the performance of a cropping sequence. The soybean onion crop sequence was the most profitable due to higher yield of onion, fluctuation in price of vegetable and spices is the major constraints to increase the income of farmers

It is thus concluded that progressive farmers having the facility of resources and risk bearing capacity may adopt soybean-onion and soybean-chickpea system for higher net returns and productivity. The other farmers who can not bear risk may adopt soybean-wheat system for regular income. Declaration of minimum support price of spices crops could be beneficial for enhancing crop productivity, sustainability and profitability, so that diversification of the cropping system can be made sustainable in the interest of the farmers of humid south eastern plain of Rajasthan.

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Population dynamics of major insect species of mustard (Brassica Compstris sariah) towards weather parameters

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Abstract

A field experiment on incidence of major insect species of infesting Mustard crop toward weather parameters was conducted during 2000-01 and 2001-02.The peak activity of Phyllotreta cruciferae *was observed during 45th standard meteorological week during both the years, whereas the population of* Athelia proxima *reached at its peak during 50th standard meteorological week .The maximum infestation of* Lipaphis erysimi *was recorded in 7th standard meteorological week during the study period. Correlation studies between insect pest and weather parameters indicated that the flea beetle population was negatively correlated with relative humidity and positively correlated with maximum and minimum temperatures, respectively. Saw fly population was negatively associated with minimum temperature and relative humidity and positively associated with maximum temperature and rainfall. The aphid population was negatively correlated with mean maximum, minimum temperature and positively correlated with relative humidity and rainfall*

Introduction

Rapeseed mustard is a commercially important oilseed crop cultivated semi-arid regions of India. This crop is infested by varied insect species (Rai 1976), amongst which *Lipaphis erysimi* (Kalt.) *Phyllotreta cruciferae* (Geoz.) and *Athelia proxima* (Klug.) become a limiting factor in the realization of full yield potential of a genotype. The seasonal incidence studies help in planning need based application of insecticides, besides revealing the peak activity of insect pest during the crop growth. Indiscriminate use of insecticides for its management leads to irreversible ill effects like resistance, resurgence, residue problems. Their occurrence is very much depending on weather parameters like temperature fluctuations, relative humidity and rainfall. A constant monitoring of pest under field condition is thus an essential measure for timely prevention of sudden outbreak of epidemic and devising suitable pest management strategy. With the view the present study was taken up to understand the population dynamics of major insect pest of mustard crop in relation to weather parameters.

Materials and Methods

A field experiment was conducted during two consecutive *rabi* seasons of 2000-01 and 2001-02 at farmers field of Morena district of India. *Brassica comastris* cultivar *Varuna* to be sown in a plot size of 10x10 m^2 on 15th October during both the years and ten insect species were considered as experimental materials. Experimental area was divided into 5 replicates and from each replicate ten plants were selected randomly for recording observations. All the agronomical practices were followed to raise a healthy crop except the application of pesticide. The insect species which attended major pest status were further assessed under the study. The population of Flee beetle (*Phyllotreta cruciferae*) and Saw fly (*Athelia proxima*) were counted from the leave of the selected plants, while the population of Mustard aphid (*Lipaphis erysimi* Kalt.) was recorded on selected upper 10cm twig portion. The statistical interpretations were undertaken to correlate the meteorological observation with the pests' population on mustard.

Results and Discussion

Among ten insect species associated with the crop, three species attained major pest status *viz Phyllotreta cruciferae* (Geoz.) *Athelia proxima* (Klug.) and *Lipaphis erysimi*, (Kalt.). The population of *Phyllotreta cruciferae* ranged from 0.6 to 3.5 beetles/ ten plants and were started to appear in 43rd standard week and remained active up to 48th standard week during both the years and reached at peak level (3.5 and 3.4) during 45th standard week when the maximum, minimum temperature and relative humidity were 30.5 ^{0}C, 12.5 ^{0}C and 60% respectively (Fig.1). The population of *Athelia proxima* ranged from 0.3 to 4.5 larvae/ ten plants was initiated from 45th standard week and continued up to 52nd standard week. The population increased gradually and reached at its peak (4.5 and 4.0) during 50th standard week during both the years (Table-1). Mathur and Singh (1983) reported that the population of *A. proxima* reached its peak level in the month of December. The activity of *L. erysimi* was studied to appear in 50th standard weeks and continued up to 9th standard weeks during both the years. The population ranged from 5.30 to 274.6 aphids/10 cm twig length over ten plants in 2000-01 and 4.6 to 270.3 aphids/

Table 1: Seasonal incidence of Major insect pests of Mustard.

SMW	Flea beetle			Saw fly			Mustard aphid		
	2000-01	2001-02	Mean	2000-01	2001-02	Mean	2000-01	2001-02	Mean
43	0.6	0.6	0.6	0.6	0.3	0.4	-	-	-
44	2.3	2.1	2.2	1.3	1.0	1.1	-	-	-
45	3.5	3.4	3.4	2.0	1.5	1.7	-	-	-
46	2.1	2.0	2.0	2.5	2.8	2.6	-	-	-
47	1.2	1.1	1.1	3.3	3.0	3.1	-	-	-
48	0.1	0.2	0.1	4.5	4.0	4.2	-	-	-
49	-	-	-	3.5	3.0	3.2	-	-	-
50	-	-	-	2.5	2.3	2.4	15.3	12.5	13.9
51	-	-	-	1.0	0.6	0.8	42.4	28.5	35.5
52	-	-	-	-	-	-	79.6	50.3	64.9
01	-	-	-	-	-	-	120.7	90.6	105.6
02	-	-	-	-	-	-	150.7	120.0	135.3
03	-	-	-	-	-	-	190.3	162.4	176.3
04	-	-	-	-	-	-	215.6	213.6	214.6
05	-	-	-	-	-	-	274.6	270.3	272.4
06	-	-	-	-	-	-	156.7	154.7	155.7
07	-	-	-	-	-	-	85.9	85.3	85.6
08	-	-	-	-	-	-	25.4	30.6	28.0
09	-	-	-	-	-	-	5.3	4.6	4.9

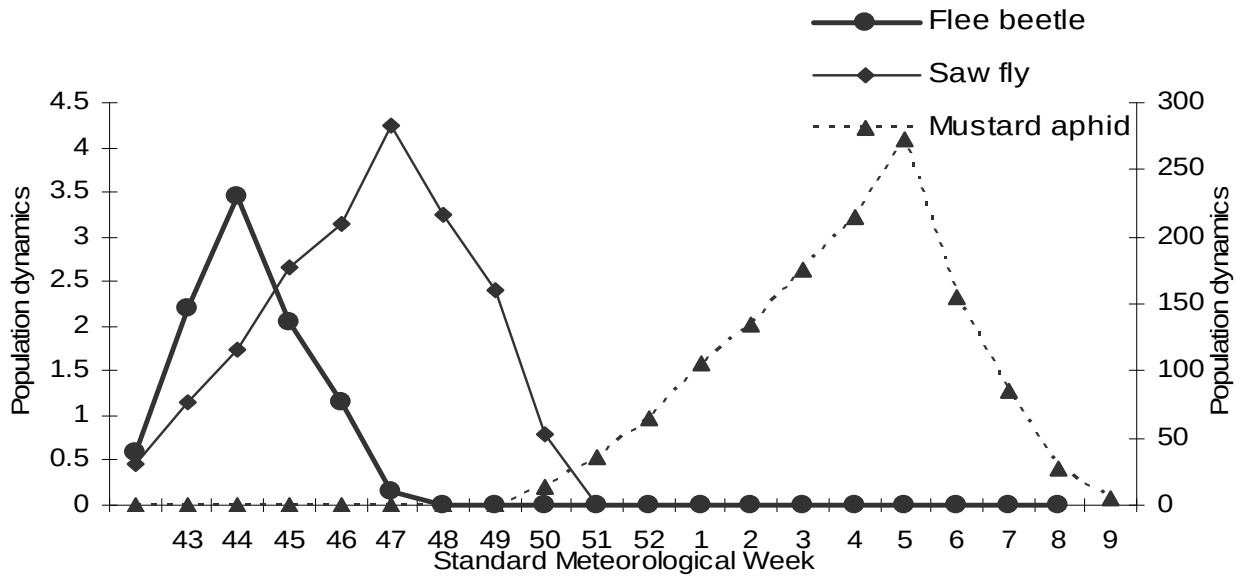

Fig.1: Population dynamics of Major insect pests of Mustard

10 cm twig length over ten plants in 2001-02. The population of the aphid went on increasing steadily and reached at its peak (274.6 and 270.3) in 7th standard weeks during both the years, respectively (Table 1). Gami *et al*. (2002) reported varying periods of peak activity of mustard aphid depending on ecological situation.

The flea beetle population was negatively correlated (r= - 0.116) with relative humidity and positively correlated (r= 0.235, 0.219) with maximum

and minimum temperatures, respectively. Saw fly population was negatively associated with minimum temperature (r= -0.061) and relative humidity (r= - 0.114) and positively associated with maximum temperature (r= 0.013) and rainfall (r= 0.099) (Table.1). The aphid population was negatively correlated with mean maximum (r= - 0.442), minimum temperature (r= - 0.435) and positively correlated with relative humidity (r=0.055) and rainfall (r= 0.152) (Table 2). The present results are in conformity with the finding of Chandra and Kushwaha (1986) and Ahuja (1990).

Table 2: Correlation coefficient of weather parameters with population dynamics of Phyllotreta cruciferae, Athelia proxima and Lipaphis erysimi

Weather parameters	Population Dynamics		
	Phyllotreta cruciferae	Athelia proxima	Lipaphis erysimi
Max.Temperature	0.235	0.013	-0.442*
Min. Temperature	0.219	-0.061	-0.353
Relative humidity	-0.116	-0.114	0.055
Rainfall	-	0.099	0.152

* Significant at 5 % level; ** Significant at 1 % level;

Conclusion

It was concluded that Saw fly population was negatively associated with minimum temperature and relative humidity and positively associated with maximum temperature and rainfall. The aphid population was negatively correlated with mean maximum, minimum temperature and positively correlated with relative humidity and rainfall. The peak activity of *Phyllotreta cruciferae Athelia proxima* and *Lipaphis erysimi* reached their highest level during 45th , 50th and 7th Standard meteorological week during both the years.

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Pesticidal effects on Environment: An overview

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Abstract

The advent of synthetic organic pesticides enables us to gain an upper hand in the struggle against the pests of our crops. These pesticides used widely in agriculture are generally biocides having innate ability to cause injury to all living organisms as well as to the quality of our environment. The presence of residues of these pesticides in food commodities and their components of the environment has proved toxic to humans, domestic animals, birds, aquatic fauna and flora, wild life, non-target organisms of the agro-ecosystem. The pesticides causing also affect in the soil and water also. There have been numerous reports of loss of human life due to pesticide poisoning. Pesticide residues above tolerance limits have been reported in cereals, vegetables, fruits, vegetable oils, spices and even in human and animal milks. The present study presents the effect of pesticides on the environment.

Introduction

The human race needs a place to live with clean air and water, food which is not harmful, and an environment which will not threaten our health and safety. Since we share this planet with many other living creatures, we also have an obligation to protect the earth's resources from degradation. Few people will argue with the statement that pollution will grow as our planet's population grows. It is important that sensitivity and awareness of these problems also grow. Population increases will require more food, fiber, and building materials and will create an increasing demand on the earth's finite resources. An additional effect of the population crunch will be an increase in environmental sensitivity and government regulations to protect the environment from pesticide pollution.

The production of pesticides started in India in 1952 with the establishment of a plant for the production of BHC near Calcutta, and India is now the second largest manufacturer of pesticides in Asia after China and ranks twelfth globally**33**. There has been a steady growth in the production of technical grade pesticides in India, from 5,000 metric tonnes in 1958 to 102,240 metric tonnes in 1998.

Pesticides enhance public health and the environment when they are used properly and wisely. For example, they have been used to control pests which could be harmful to man. Rats carrying plague or mosquitoes carrying malaria are two good examples. These control programs are necessary, especially in crowded cities and countries with large numbers of people. However, pesticides can also harm public health and the environment. Any pesticide which is off-target is a pollutant and can be dangerous. The benefits of pesticide use are meaningless if pollution occurs through misuse and/or carelessness.

The synthetic organic insecticides/pesticides used widely in agriculture/forestry are general biocides having innate ability of cause injury to all living organisms as well as to the quality of environment. The presence of residues of these pesticides in food commodities and other components of environment as proved toxic to humans, domestic animals, birds, fishes and non target fauna of agro-forestry ecosystem. In addition to these side effects, the insect pest problems I ay crops have aggravated following continuous application of pesticides. This, in turn, has further increased the consumption of pesticides resulting in the phenomenon of pesticide treadmill. These days the pollution of the environment is a problem of great important and is of everybody's concern.

Human toxicity and health effects

The most serious effect of pesticides is those of human life and health. It has been reported that 3 million acute poisoning cases caused by pesticides occur worldwide every year; 2 million of these are suicide attempts and the rest occupational or accidental poisoning cases. Despite the restriction and regulations on pesticides use, India accounts for one-third of the total poisoning cases in the world.

In India the first major accident involving pesticides, 108 people died due to parathion poisoning in Kerala in 1953. The world's worst industrial disaster involving a chemical plant was the Bhopal Gas Tragedy at the Union Carbide Plant in Bhopal (MP) during 1984. The at least 3000 people due to inhaling of vapour of methyl isocynate, leaked from this company. More than 30,000 peoples were disabled to varying degree. Cases of blind ness, cancer disease of liver and nervous system from pesticide poisoning have been identified in cotton growing areas of Maharashtra and Andhra Pradesh. Since the

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pesticides are poisonous and if are intensely applied of the agriculture/forestry crops for protecting them against noxious pests, and the problem then increased my folds. The pesticides may accumulate in the environment and contaminate all the system i.e. air, water, soil, plants, animals etc. by being transported from one system to another (Dhaliwal and Arora, 2006).

Wildlife

Fish, birds, and mammals are assets to man and an essential part of the ecosystem. Parks, farmland, lawns, golf courses, etc., generally provide habitat for wildlife, as well as surrounding wooded areas and waterways. Therefore, care should be taken to protect these areas when applying any pesticide.

A major problem for most wildlife is the destruction of habitat, usually the result of industrial, agricultural, residential, or recreational development. If wildlife habitat is threatened or destroyed by incidental exposure to pesticides, the wildlife is in danger as well. Reproduction wildlife can be affected by sub-lethal doses of pesticides in diets. Since all living things are part of a complex, delicately balanced network, the removal of a single species can set off a harmful chain reaction affecting many others, thus recovery is difficult or perhaps even impossible.

(a) Animals

Widespread application of pesticides can eliminate food sources that certain types of animals need, causing the animals to relocate, change their diet, or starve (Miller, 2004) Animals may be poisoned by pesticide residues that remain on food after spraying, for example when wild animals enter sprayed fields or nearby areas shortly after spraying.

(b) Birds

Birds are common examples of nontarget organisms that are impacted by pesticide use. Rachel Carson's landmark book *Silent Spring* dealt with the topic of loss of bird species due to bioaccumulation of pesticides in their tissues. There is evidence that birds are continuing to be harmed by pesticide use. Poisoning from pesticides can travel up the food chain; for example, birds can be harmed when they eat insects and worms that have consumed pesticides. Reductions in bird populations have been found to be associated with times and areas in which pesticides are used. In another example, some types of fungicides used in peanut farming are only slightly toxic to birds and mammals, but may kill off earthworms, which can in turn reduce populations of the birds and mammals that feed on them (Miller, 2004)

(c) Aquatic life

Fish and other aquatic biota may be harmed by pesticide-contaminated water (cone, 2000). Pesticide surface runoff into rivers and streams can be highly lethal to aquatic life, sometimes killing all the fish in a particular stream.

Application of herbicides to bodies of water can kill off plants on which fish depend for their habitat. The application of herbicides to bodies of water can cause fish kills when the dead plants rot and use up the water's oxygen, suffocating the fish. Insecticides are more toxic to aquatic life than herbicides and fungicides (Kole et al., 2001). Market samples of various fish species at Ludiana (Punjab, India) were invariably contaminated with DDT and HCH residues. Fish samples at Bombay (Maharshtra, India) contained upto 34.1 ppm of DDT. Such residues are ultimately passed on to humans (singh and Dhaliwal 1994).

(d) Honeybees

Honeybees help pollinate commercial crops and home gardens. The particular pesticide and the application method can reduce the chances of bee kills (Table 1).

At the time of application, weeds in bloom also may attract bees to the area, increasing the chances of bee kills. Ideally, pesticides should be applied when there is no wind and bees are not "working" plants in the area. Laboratories studies with 50 insecticides revealed that 33 of these were highly toxic and 12 others moderately toxic to the honey bees (Dhaliwal and Arora 2006). The pollination of flowers of flower is chiefly done by the activities of bees the danger of pesticides to bees comes not only from direct contact poisoning, but also from the lacking of poisoned nectar in the hives. The application of carbaryl in southern California to eradicate the pink boll worm is believed to have destroyed 30,000 honey colonies (Matcalf and Lackman, 1975).

(e) Amphibians

Some scientists believe that certain common

Table1: Classification of insecticide on the basis of their toxicity to honey bees

Highly toxic	Moderately toxic	Non-toxic
Cararyl, Carbofuron, Carbophenthion, Cypermethrin, Deltamethrin, Dichlorvos, Fenitrothion, DDVP, Paration, Monochrotophos, Phorate, Oxydemeton methyl, Quinolphos, Phosphomidon, Thioeton, Pemethrin, Dimethoate	Cabryl, Diazinon, Phenthion, HCH, Hinosan Lindane, Malathion, Metasysox, Methyl demeton, Methyl parathion, Mevinphos, Trichlorophon	Endosulfan, Menazone, Phosalone

Source: Verma (1990)

pesticides already exist at levels capable of killing amphibians. They warn that the breakdown products of these pesticides can be 10 to 100 times more toxic to amphibians than the original pesticides. Direct contact of sprays of some pesticides can be highly lethal to amphibians. A study showed that exposing tadpoles to endosulfan, an organochloride pesticide at levels that are likely to be found in habitats near fields sprayed with the chemical kills the tadpoles and causes behavioral and growth abnormalities. In the past several decades, decline in amphibian populations has been occurring all over the world, for unexplained reasons which are thought to be varied but of which pesticides may be a part.

Effect on soil fertility

One spoonful of healthy soil has millions of tiny organisms including fungi, bacteria, and a host of others. These microorganisms play a key role in helping plants utilize soil nutrients needed to grow and thrive. Microorganisms also help soil store water and nutrients, regulate water flow, and filter pollutants (Marx et al., 1999). Overuse of chemical fertilizers and pesticides have effects on the soil organisms that are similar to human overuse of antibiotics. Indiscriminate use of chemicals might work for a few years, but after awhile, there aren't enough beneficial soil organisms to hold onto the nutrients.

Contamination of Air, Soil, and Non-target Vegetation

Pesticide sprays can directly hit non-target vegetation, or can drift or volatilize from the treated area and contaminate air, soil, and non-target plants. Many pesticides can volatilize (that is, they can evaporate from soil and foliage, move away from the application, and contaminate the environment(Marx et al., 1999). As much as 80-90 percent of an applied pesticide can be volatilized within a few days of application (Majewski and Capel, 1995).

Surface Water Contamination

Pesticides can reach surface water through runoff from treated plants and soil. Contamination of water by pesticides is widespread. More than 90 percent of water and fish samples from all streams contained one, or more often, several pesticides (Kole et al., 2001). Pesticides were found in all samples from major rivers with mixed agricultural and urban land use influences, and 99 percent of samples of urban streams (Bortleson and Davis, 1987-95).

Ground Water Contamination

Pesticides, including herbicides, can and do leach to contaminate ground water. According to the USGS, at least 143 different pesticides and 21 transformation products have been found in the ground water, including pesticides from every major chemical class. Over the past two decades, detections have been found in the ground water of more than 43 states (Waskom, 1994). During one survey in India it has been found that 58% of drinking water samples drawn from various hand pumps and wells around Bhopal are contaminated with Organ Chlorine pesticides above the EPA standards(Kole and Bagchi, 1995).

Insecticide residue

Only a small amount of the pesticide (1.0%) applied to a crop reaches the target pests and the remaining (> 99.0%) enters different components of the environment to contaminate soil, water, air, food, feed, forage and other commodities. Nearly 100% f human population has been found to contain some residues of pesticides like, DDT, BHC and other insecticides. Monitoring survey of different part of India have revealed the widespread contamination of all types of food products, vegetable oils, milk and milk products, spices and honey with pesticide residue. In milk sample, 37% were contaminated with DDT above the MRL of 0.05 mg/ kg. In contrast to this, only 1-2% of the sample of food commodities at the global level contained residues above MRL. In India even human breast milk samples were found to be contaminated with high levels of residues of DDT, BHC and aldrin (Dhaliwal and Arora, 2006).

Besides, DDT, BHC, other organochlorine, organophosphates and carbamates have also been found in many of the samples of food stuffs in India. Alarmingly, recent report of an international coordinated research programme have indicated that un extractable residues of some phosphatic, carbamates compounds used in stored grain are not only biologically available but also affect the cholineestarage (ChE) activity and serum enzyme levels in experimental animalsHance and Hassan, 1994).

Toxicity of non-target organisms

Most of the popular insecticides/pesticides used in forestry and agriculture are non-toxicant, which affect all living organisms in a similar manner. The whole range of living organism including natural enemies, pollinators, domestic and wild animals, birds, fish and other aquatic and terrestrial organism and even soil fauna are affected by the use of pesticides.

Insecticide resistance

Resistance is the development of an ability to tolerate a dose of an insecticide, which would prove lethal to the majority of the individuals in a normal population of the same species. The first report of resistance to insecticide appeared in 1908, when it was demonstrated that sanjose scale *Quadraspidiotus perniciosus* had become to resistance to Lime sulpher. More than 500 species of insect pest have developed insecticidal resistance and 17 of these are resistance to all the available groups of insecticides including, DDT,

BHC other hydrochlorine compounds, organophosphates, carbamates and synthetic pyrethroids. In Asian countries, the first report of development of pesticides resistance was reported from India, where singhara beetle, *Galerucell birmanica* was found resistance to DDT and HCH (Dhaliwal and Arora, 2006).

Insect resurgence

Resurgence refers to an abnormal increase in pest population or damage following pesticide application often foe exceeding the economic injury level. Resurgence of insect pests following application of insecticides has been known for long time. As early as 1956, Ripper tabulated more than 50 insect pest and mites whose populations showed resurgence after insecticidal treatments with diverse chemicals (Jayraj, 1987). Maximum number of resurgence found in order Homoptera (44%) followed by Lepidoptera (24%) and then after phytophagous mites (26%).

Other harmful effect of pesticides

Commonly cultivated crops, vegetables and fruit plants have been found to be affected with injudicious use of pesticides right from germination through growth to harvest. Inflammable fumigant insecticides may cause accidental fires and explosions in buildings and godowns (Srivastava, 1998). Pesticides may affect plant directly by affecting their growth and indirectly by imparting an off flavour to their edible parts.

Conclusion

Pesticides have been an integral part of the process by reducing losses from the weeds, diseases and insect pests that can markedly reduce the amount of harvestable produce. The pesticides are usually noticed as a quick, inexpensive and easy method and solution for managing insect pests, pathogens and weeds in urban landscapes. If the credits of pesticides include enhanced economic potential in terms of increased production of food and fibre, and amelioration of vector-borne diseases, then their debits have resulted in serious health implications to man and his environment. There is now overwhelming evidence that some of these chemicals do pose potential risk to humans and other life forms and unwanted side effects to the environment. Pesticides have contaminated almost every part of our environment. Pesticide residues are found in soil, air, surface and ground water across the nation, and urban pesticide uses contribute to the problem. Pesticide contamination poses significant risks to the environment and non-target organisms. he best way to reduce pesticide contamination in our environment to apply when there is no wind, evening application, avoid to spray during bloom, use safer herbicides, recommended doses of pesticides and other alternative methods such as cultural, mechanical, physical and biological control must be given priority to keep our environment safe.

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A preliminary survey on wild medicinal plants of Moradabad district (U.P.)

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Abstract

The wild plants have their own medicinal value and are used by rural people to treat different diseases or ailments like wounds, cuts, stomach pain, diabetes, fever, cold,poisonous bites, asthma etc. In the present study 68 plant species belonging to 63 genera and 42 families have been enumerated. Asteraceae and Malvaceae are dominant families with 7 species each. Generally, fresh part of the plant is used for the preparation of medicine. When fresh plant parts are not available, dried parts are also used. Attention should be made on proper exploitation and utilization of these wild important plant species.

Introduction

Medicinal plants play an important role in human life from ancient times. India is one of the twelve mega-biodiversity countries of the world having rich vegetation with a wide variety of plants with medicinal value. Wild medicinal plants have good values in treating many diseases including infectious diseases, jaundice, etc. There are more than two thousand five hundred plant species in India having documented medicinal value (Verma & Chauhan, 2006).These medicinal plants and their raw materials are used in the prevention, treatment and cure of health disorders by rural people of India. Generally they have a strong belief in the efficacy and success of wild plants. They collect and preserve locally available wild plant species. They often use their own herbal system to cure several diseases or ailments (Punjwani & Patel, 2006).

Attempts have been made by various workers such as Nayar (1964), Singh & Maheshwari (1983), Singh & Maheshwari (1992), Singh & Singh (2005), Tomar (2007), Singh (2008) and Vijay et. al.(2009) to collect information on the wild plants used for treatment of various diseases in different rural areas of Uttar Pradesh. There is no report on medicinal use of wild plants in Moradabad district. Therefore it is necessary to collect the information about the knowledge of wild medicines, preserved in rural areas of Moradabad district before it is permanently lost. In such a way, the present study denoted that plants used as medicine by rural people in the study area.

Study area

The study area is located between 28^0 50/ to 28^0 83 / N latitude and 78^0 47/ to 78^0 78/ E longitude at an altitude of about 186 m above the mean sea level. The area is characterized by periodic occurrence of hot summers, moderate rains and cold winters. The maximum and minimum atmospheric temperatures are 44.2^0C and 4^0C respectively. The average rainfall varies between 800 to 1000 mm .The relative humidity is up to 90% in monsoon season and in drier part of the year it decreases to less than 20%.The maximum population of the district resides in rural areas. They use folk methods to cure different diseases through wild plants. But due to urbanization of the area, the traditional knowledge of wild medicinal plants is now disappearing day by day. Keeping in view, we have started work on wild medicinal plants of Moradabad district. The survey area map enclosed for reference (Fig.1).

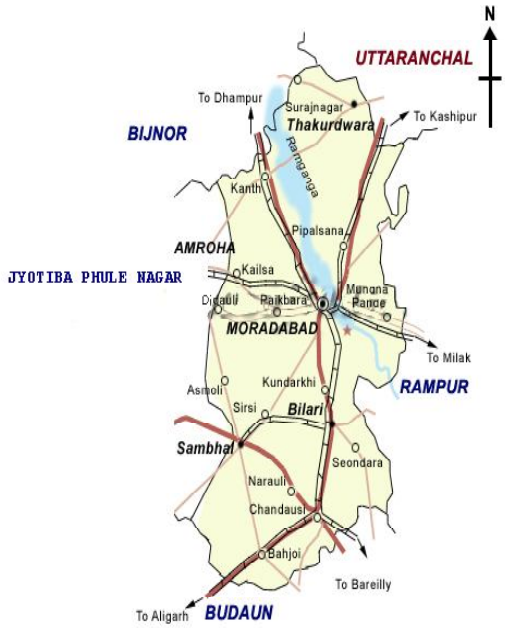

Fig.1-Map of Moradabad

Materials and Methods

For the purpose of collection and documentation of wild medicinal plants of Moradabad district, several

field trips were conducted during July2008- June2009. During the field work, the information about medicinal uses of plants were obtained from elderly people, local medicine man (Baidya Raj) and other reliable sources. Questionnaire was specifically prepared for a dialogue with the rural people. A temporary note was also prepared for the collection of the information, which was converted into the data bank and used wherever applicable. For authentic identification of collected plant specimens, flora of British India vol.1-7 (Hooker,1872-97)and wild medicinal plants of India (Dhiman,2005) were consulted. The collected and identified specimens have been deposited in the Botany Department, Hindu College, Moradabad.

Results and Discussion

Sixty-eight different species of plants has been documented (Table1.) as being used singly or in combination with each other or other materials for the treatment of different

diseases or ailments by rural people of the study area. Rural people using these wild plants to cure diseases like jaundice, scorpion bite, piles, whooping cough, constipation, fever, cuts and burns, dental problems etc. Medicines were prepared in the form of powder, decoction, paste and juice. It was also observed that some plants were used in more than one form of preparation. Among different plant parts used by rural people, the leaves are most frequently used for the treatment of diseases. Generally fresh parts of the plant are used for the preparation of medicine. When fresh plant parts are not available, dried parts are also used. We divide the species list into the following categories of growth form or habit of plants :herbs, undershrubs, shrubs, climbers and trees (Fig2).

Asteraceae and Malvaceae are dominant families with 7 species each (Fig 3.).

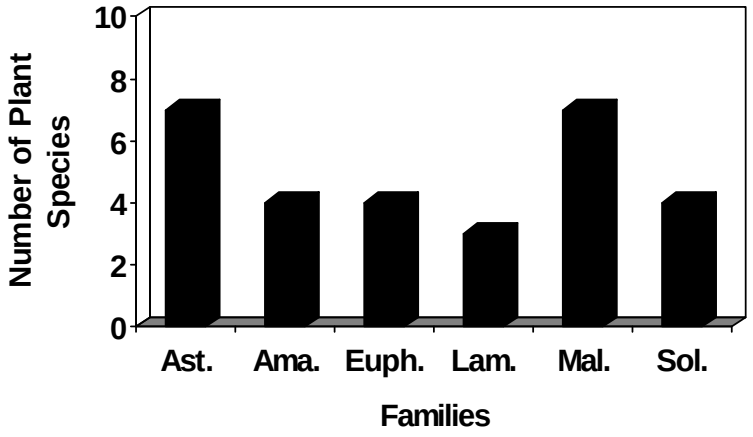

Fig 3. Species Rich Plant Families of Moradabad

(Ast=Asteraceae, Ama=Amaranthaceae, Euph=Euphorbiaceae, Lam=Lamiaceae, Mal=Malvaceae & Sol=Solanaceae.)

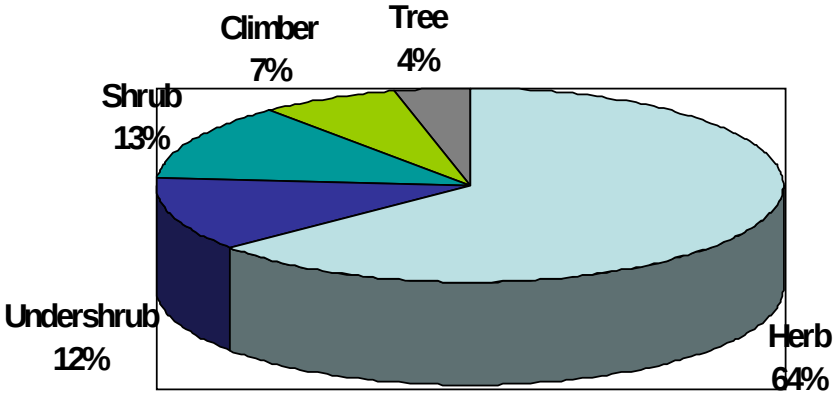

Fig.2. Growth Form of Wild Medicinal Plants

Table 1.List of Plant species widely used by villagers of Moradabad and their use

S.N.	Name of Species	Family	Parts used	Diseases
1.	Abrus precatorius L.	Mimosaceae	Leaf	Blood purifier
2.	Abutilon indicum (L) Sw.	Malvaceae	Leaf	Boils
3.	Achyranthes aspera L.	Amaranthaceae	Root	Scorpion bite
4.	Acalypha indica L.	Euphorbiaceae	Whole plant	Emetic
5.	Aerva lanata (L) Juss	Amaranthaceae	Whole plant	Cough & Cold
6.	Ageratum conyzoides L.	Asteraceae	Leaf	Antitetanic
7.	Alternanthera sessilis (L)R Br.	Amaranthaceae	Leaf	Stomach-ache
8.	Albizia lebbeck (L)Benth.	Mimosaceae	Bark	Piles
9.	Amaranthus spinosus L.	Amaranthaceae	Root	Eczema
10	Anagalis arvensis L.	Primulaceae	Leaf	Wounds/ fever
11	Andrographis paniculata (Burm.f.) Wall.	Acanthaceae	Whole plant	Whooping cough
12	Argemone maxicana L.	Papaveraceae	Root	Snake bite
13	Artemisia capillaries Thunb.	Asteraceae	Whole plant	Antiseptic/burn
14	Asphodelus tenuifolious Cav.	Liliaceae	Root bark	Tonic
15	Azadirachta indica A.Juss.	Meliaceae	Leaf	Skin disease
16	Boerhaavia diffusa L.	Nyctaginaceae	Root	Jaundice
17	Bryophyllum pinnatum (Lamk) Oken.	Crassulaceae	Leaf	Swelling
18	Calotropis procera(Willd)Drey.	Asclepiadaceae	Flower	Constipation
19	C.gigantia (L) R.Br.	Asclepiadaceae	Root bark	Dysentry
20	Cannabis sativa L.	Cannabinaceae	Leaf	Wounds/ Sores
21	Cassia obtusifolia L.	Caesalpiniaceae	Leaf	Eczema
22	Centella asiatica L.	Apiaceae	Whole plant	Fever
23	Chenopodium ambrosioides L.	Chenopodiaceae	Whole plant	Dysentry
24	Cissampelos pareiera L.	Menispermaceae	Root	Toothache
25	Cleome gynandra (L) DC.	Cleomaceae	Leaf	Headache
26	Clerodendrum indicum (L)Kurz.	Verbenaceae	Stem	Fever
27	Coccinia grandis L.	Cucurbitaceae	Fruit	Diabetes
28	Cuscuta reflexa Roxb.	Cuscutaceae	Seed	Stomach -ache
29	Cynodon dactylon L.	Poaceae	Whole plant	Cuts/ Wounds
30	Cyperus rotundus L.	Cyperaceae	Tubers	Stomach-ache
31	Datura metal L.	Solanaceae	Leaf	Asthma
32	Dioscorea bulbifera L.	Dioscoreaceae	Bulb	Diabetes
33	Eclipta prostrata L.	Asteraceae	Root	Emetic
34	Euphorbia hirta L.	Euphorbiaceae	Whole plant	Dysentry
35	Evolvulus alsinoides L	Convolvulaceae	Leaf	Asthma
36	Ficus religiosa L	Moraceae	Seed	Boils
37	Fumaria parvifolia Lam.	Fumariaceae	Whole plant	Blood purifier
38	. Ipomoea carnea (Mart ex choisy)Austin.	Convolvulaceae	Leaf	Swelling
39	Lawsonia inermis L.	Lythraceae	Leaf	Crack in feet
40	Leucas aspera Spreng.	Lamiaceae	Whole plant	Cold & cough
41	L.cephalotes(Roxb)Spreng.	Lamiaceae	Flower	Cold & cough
42	Malvastrum coromandelianum(L)Garcke.	Malvaceae	Leaf	Wounds/ sores
43	Oldenlandia corymbosa L.	Rubiaceae	Whole plant	Jaundice
44	Oxalis corniculata L.	Oxalidaceae	Whole plant	Boils
45	Ocimum basilicum L.	Lamiaceae	Leaf	Cold & cough
46	Phalaris minor L	Poaceae	Leaf	Ear- ache
47	Phyllanthus fraternus Web.	Euphorbiaceae	Whole plant	Jaundice
48	Physalis minima L.	Solanaceae	Fruit	Dropsy
49	Polygonum plebejum R.Br.	Polygonaceae	Seed	Emetic
50	Portulaca oleracea L	Portulacaceae	Whole plant	Constipation

51 Ricinus communis L.	Euphorbiaceae	Leaf	Swelling
52 Sida acuta Burm f.	Malvaceae	Root	Urinary disease
53 S.cordata (Burm f.)Bor.	Malvaceae	Whole plant	Arthritis
54 S. cordifolia L.	Malvaceae	Root –bark	Stomach-ache
55 S. rhombifolia L.	Malvaceae	Whole plant	Tuberculosis
56 Solanum nigrum L.	Solanaceae	Whole plant	Piles
57 S. surratense Burm.f.	Solanaceae	Root	Cold & cough
58 Spergula arvensis L.	Caryophyllaceae	Leaf	Skin disease
59 Spilanthes indica L.	Asteraceae	Flower	Toothache
60 Tribulus terrestris L.	Zygophyllaceae	Fruit	Kidney
61 Trianthema portulacastrum L.	Aizoaceae	Root	Constipation
62 Tridex procumbens L.	Asteraceae	Leaf	Wounds & cuts
63 Triumfetta rotundifolia Lam.	Tiliaceae	Whole plant	Swelling
64 Urena lobata L.	Malvaceae	Flower	Sore throat
65 Veronica anagallis-aquatica L.	Scrophulariaceae	Whole plant	Healing burns
66 Vernonia conyzoides DC.	Asteraceae	Leaf	Fever
67 Xanthium strumarium L.	Asteraceae	Whole plant	Malaria
68 Zizphus mauritiana Lamk.	Rhamnaceae	Leaf	Boils

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Physico-chemical quality of milk cake

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Abstract

The samples of milk cake marketed in different zones of Agra city and prepared in the laboratory as control samples were examines and analysed for physical quality viz. colour, flavour and body and texture and for chemical quality viz. total solids, moisture, fat, lactose, sucrose, acidity and ash content. The control samples prepare in laboratory were superior to market samples in respect to physical and chemical quality.

Introduction

The common indigenous concentrated milk products of Northern India are rabri, khurchan, khoa and milk cake etc. Milk based sweets like Gulabjamun, Ladoo, Burfi etc. and Bengoli sweets like resgoola and sandesh are also popular throughout India.

Milk cake is an indigenous milk product popular in Northern India. It is prepared from danedar form of Khoa and sugar mix, but a part of mass is caramalised more intensively and then layered between the less caramalised portion of the product. The product occupies its importance from both dietary and economic point of view. The product is typified by well defined grains and having more pronounced caramal flavour.

Material and Methods

Preparation of control samples:

The control samples of milk cake were prepared in the laboratory using the method of Sukumar, De (1988).

The samples of milk cake collected from market and prepared in the laboratory were examined and analysed for following attributes of quality.

1. Physical quality

The samples of milk cake were examined by a panel of judges drawn from the dept of AH & Dairying, R.B.S. College Bichpuri Agra for colour, flavour and body and textures.

2. Chemical analysis

The total solids and moisture of the product were determined as described by IS : 2802-1964. The fat content of product was determined by Roese Gottlieb Method (IS : 4079-1967). The lactose content of product was determined according to the method of originally due to schaffer and Hartman and described by Knowles and Watkin (1947). The sucrose content of milk cake was determined according to "Lane Eynon Method." The ash content of product was determined according to AOAC (1970). The acidity of product was determined according to IS : 1165-1967.

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Result and Discussion

The sensory/physical quality of milk cake prepared in the laboratory was good to that of collected from market (from different zones) in respect to colour, flavour and Body texture (Table-1). The control samples having light brown colour, pleasant flavour and semihard body and texture, while market samples having caramelrised and dark brown colour, cooked and burnt flavour and hard body and texture.

The total solids content of mlk cake was higher in market samples (77.05±2.85% in zone I and 74.10±1.61% in zone II) than that in control samples (73.30±1.61%). The literature is meager on milk cake to compare the data. However, these results are in fair agreement of Dustur and Lakhani (1971) reported for total solid in khoa. Similarly, the moisture content was slightly higher in control samples 26.70±1.61% than market samples as 23.60±3.35 and 25.90±6.97%, respectively in samples of zone I and II. The fat content of product was 16.40±0.66% in zone I and 17.20±0.91% in zone II. In control samples it was 23.60±0.66%, which was higher than that in market samples. The published literature on fat of milk cake is not available. However, the results on present finding on fat content are slightly lower in both type of samples than that reported by Dustur and Lakhani (1971), Ghodekar *et al.* (1974), Jailakhani and De (1979), Kumar and Srinivasan (1982) and Ghatak and Bandyopadhyay (1989) for Khoa samples. However, control samples had fat content in tune of Rajorhia (1971) reported for Khoa samples. The lactose content was higher (19.33±1.18%) in control samples than that 13.74±1.53 and 14.29±0.69% respectively in market samples of zone I and II. Published literature is not available on lactose content of milk cake. However, these results are higher than that of Ghodekar *et al.* (1974) reported for khoa and lower than that of Jai Lakhani and De (1979) reported for fat content in Khoa prepared form goat milk. The sucrose content of market samples as 29.34±1.18% in zone I and 25.40±1.58% in zone II was higher than 24.52±0.91% in control samples. The published literature is not available on sucrose content of milk cake to compare

Table 1: Physical (Sensory) quality of milk cake.

Sample	Colour			Flavour			Body and Texture		
	Zone I	Zone II	Control	Zone I	Zone II	Control	Zone I	Zone II	Control
1. Caramalised	Dark Brown	Light Brown	Cooked	Burnt	Pleasant	Hard	Semi Hard	Semi Hard	
2. Brown	Brown	Light Brown	Burnt	Cooked	Pleasant	Loose	Hard	Semi Hard	
3. Caramalised	Dark Brown	Light Brown	Cooked	Pleasant	Pleasant	Semi Hard	Loose	Semi Hard	
4. Dark Brown	Caramalised	Light Brown	Burnt	Cooked	Pleasant	Hard	Semi Hard	Semi Hard	
5. Brown	Brown	Light Brown	Pleasant	Burnt	Pleasant	Loose	Hard	Semi Hard	

Table 2 : Chemical composition of milk cake.

Market	T.S.%	Moisture %	Fat %	Lactose %	Sucrose %	Acidity %	Ash %
Zone I	77.05+2.84	23.60±3.35	16.40±1.53	13.74±1.53	29.34±1.18	0.36±0.03	2.75±0.62
Zone II	74.10±6.97	25.90±6.97	17.20±0.91	14.29±0.69	25.40±1.58	0.47±0.03	3.50±1.29
Control	73.30±1.61	26.70±1.61	23.60±0.66	19.33±1.18	24.52±0.95	0.22±0.02	2.45±0.47

Table 3 : Analysis of variance.

S.V.	D.F.	T.S.		Moisture		Fat		Lactose		Sucrose		Acidity		Ash	
		M.S.S	F. Value	M.S.S	F. Value	M.S.S	F. Value	M.S.S	F. Value	M.S.S	F. Value	M.S.S	F. Value	M.S.S	F. Value
Zone	2	19.50	0.16NS	12.95	0.10NS	77.86	21.63**	47.39	5.36*	32.96	3.27*	0.079	14.80*	1.46	0.30NS
Error	12	123.42		130.02		3.60		8.83		10.06		0.0054		4.76	

the present findings. The acidity content 0.36±0.03% and 0.47±0.05% in market samples of zone I and II was higher than 0.22±0.02% in control samples. Published data are not available on acidity of milk cake to compare present data. However, present results on acidity are lower in both the market and control samples than that reported by Ghatak and Bandopadhyay (1989) for acidity of khoa samples. The ash content of 2.75±0.62% in zone I 3.50±1.29% in zone II of market was higher than 2.45±0.47% in control samples. Data on this aspect are not available to compare present findings. However the results of market samples are in fair agreement and sightly lower in control samples than that reported by Dustur and Lakhani (1971) for ash content of Khoa samples.

The analysis of variance (Table-3) revealed that the total solids, moisture of market and control samples differed insignificantly. But the fat content, lactose, sucrose and ash content differed significantly at ($p \leq 0.01$) and ($p \leq 0.05$) in market in control samples. The acidity of milk cake of market samples and control samples differed significantly ($p \leq 0.05$). But the ash content did not differed significantly.

It is concluded from present findings that control samples were superior in all respect of physical and chemical quality to that of market samples. It is generally found that halwais prepared the samples of product from admixed milk of low quality. A good quality milk cake could be made using buffalo milk by making danedar khoa and adding sugar as per likeness of the consumer.

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Effectivness of Home Science articles in Hindi Magzine Vanita

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Abstract

Effective communication makes the process of communication easier through influencing the reader about quality of content, area of coverage, get-up, cover page, and advertisement. So the present study was conducted to explore effectiveness of home science articles in hindi magzine vanita. The twelve volumes of the magazine from January 2002 to December 2002 were selected. Primary data were collected through interview schedule from Shikohabad of Firozabad district. Percentage, mean, and mode were used as statistical measure. It is concluded the maximum percentage of women gave the first rank to articles based on "Foods & Nutrition". Articles effectiveness to different aspects, 43.33 per cent were in the favour of subject matter and gave first rank to the subject matter. In case of get up of magazine, 53.33 per cent gave response "Good". Fifty-six per cent women liked the form of articles. In case of finding changes in themselves, 50 per cent found change in themselves after reading magazine. Maximum percentage of women found change in their related to all subjects of Home Science and maximum percentage of women gave first rank to "Food & Nutrition". Forty per cent women were giving suggestions to editor related to improve the coverage of magazine. The most of the articles were appeared without mentioning their source. Therefore, it is suggested that while giving such information, the editor should try to give main source of information.

Introduction

An effective communication always creates a situation to learn something and take it seriously in behaviourial change. Therefore, mass media information is usually considered to develop a system in undeveloped countries. Especially the literature is becoming more popular among women community of India with new technological advancements in the field of Home science, which have made a revolutionary changes in Indian Women. It is effective in creating awareness when the peoples' interest has been aroused in the new ideas. In this context literature plays the vital role in communicating actual and original messages to the women with the interest aroused. The readers are found to be interested to compare articles with their friends and neighbours. It is the evaluation stage. At this juncture she would like to discuss and find out the interesting facts from articles by communicating with different people and gathering their virtues. Therefore, considering the above facts, the present study was conducted to assess effectiveness of Home Science articles in Hindi magazine "VANITA".

Methodology

Exploratory type of research design was used in the present study. Agra division comprises seven districts. Out of which, Firozabad district was selected purposively. Firozabad block comprises 8 blocks. Out of these blocks, Shikohabad was selected randomly. Thirty respondents were selected, who were either reader or subscriber of the magazine. Hindi magazine "VANITA" was selected purposively. The twelve volumes of the magazine from January 2002 to December 2002 were selected for its analysis of content and coverage of Home Science articles. Collected data were coded, tabulated, analysed and interpreted. Percentage was used as statistical measure.

Results and Discussion

The data presented in table 1 clearly indicate that maximum percentage of women (30 per cent) in selected area gave the first rank to the articles of 'Food & Nutrition' while 26.67 per cent women gave the first rank to the article of 'Clothing & Textile' and 23.33per cent women gave the first rank to the articles of 'Human Development'. The minimum percentage of women (20 per cent) gave the first rank to the articles of 'Home Management'.

According to rank order, 40 per cent women gave IInd rank to the articles based on 'Food & Nutrition'. Twenty-three per cent gave IInd rank to the articles based on "Human Development" and "Clothing & Textile" respectively. Only 13.33 per cent women gave IInd rank to the articles based on "Home Management".

In case of IIIrd rank, 33 per cent women gave IIIrd rank to the articles based on "Clothing & Textile" and 30 per cent gave IIIrd rank to the articles based on "Home Management". Twenty per cent women gave IIIrd rank to the articles based on "Human Development", while 16.67 per cent women gave IIIrd

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Table 1: Showing distribution of respondents on the basis of rank of articles of different subject related to Home Science. (N=30)

Rank	Food& Nutrition		Human Development		Home Management		Clothing & Textile	
	No.	%	No.	%	No.	%	No.	%
I	9	30.00	7	23.33	6	20.00	8	26.67
II	12	40.00	7	23.33	4	13.33	7	23.33
III	5	16.67	6	20.00	9	30.00	10	33.33
IV	4	13.33	10	33.33	11	36.67	5	16.67
	30	100.00	30	100.00	30	100.00	30	100.00

rank to the articles based on 'Food & Nutrition'.

In reference of IVth rank, 36 per cent sampled women gave IVth rank to the articles based on "Home Management" and 33 per cent gave IVth rank to the articles based on "Human Development". Approximately 16 per cent women gave IVth rank to the articles based on "Clothing & Textile" and only 13 per cent women gave IVth rank to the articles based on 'Food & Nutrition'.

When we compared the rank of different subject of Home Science, we found that the maximum number of women (30 per cent) gave the first rank to the articles of 'Food & Nutrition'. So in this study we observed that the area of 'Food & Nutrition' is quite effective to study and adopt the recommendations given in the articles for public or family use.

Table 2: Showing distribution of respondents according to high level of effectiveness of articles (on the basis of different aspects). (N=30)

S.No.	Aspects	Respondents Number	%age
1	Cover page and coverage	2	6.67
2	Subject matter	13	43.33
3	Language	5	16.67
4	Cover page & coverage + Subject matter + Language	10	33.33
	Total	30	100.00

This table reveals that the highest percentage of sampled women (43.33per cent) in selected area were in the favour of subject matter and 33.33per cent women were in the favour of cover page and coverage + subject matter and language too. Sixteen per cent and 6.67per cent women were in the favour of language and cover page, and coverage respectively.

The data presented in table 3 clearly indicate that majority of sampled women (50 per cent) in selected area gave the first rank to subject matter while 33.33per cent women gave the first rank to the language and 16.67per cent women gave the first rank to the coverage with cover page.

About 36 per cent women gave IInd rank to language, while 33 per cent gave IInd rank to Subject matter and 30 per cent gave IInd rank to cover page& coverage.

Table 3: Showing distribution of respondents according to rank of different aspects. (N=30)

Rank	Cover page & coverage		Subject matter		Language	
	No.	%	No.	%	No.	%
I	5	16.67	15	50.00	10	33.33
II	9	30.00	10	33.33	11	36.67
III	16	53.33	5	16.67	9	30.00
	30	100.00	30	100.00	30	100.00

Approximately 53 per cent women gave IIIrd rank to cover page& coverage, while 30 per cent women gave IIIrd rank to Subject matter and only 16 per cent gave IIIrd rank to Subject matter.

It was cleared from the study that subject matter of the articles was more effective than the coverage + cover page and language. So this magazine was popular among the women for its subject matter.

Table 4 reveals that majority of respondents (53.33per cent) gave response 'Good' about the getup of magazine ,while 30 per cent women gave the response 'ordinary' and 16.67per cent women liked the getup of magazine very much.

The data presented in table 5 reveal that the majority of respondents (56.67per cent) gave the response 'Good' about the form of articles. Thirty per cent women gave the response ordinary' and 13.33per cent women gave the response 'Very Good' about the form of articles exist in the magazine.

Table 4: Showing distribution of respondents according to getup of magazine. (N=30)

S.No.	Comment	Respondents Number	%age
1	Very good	5	16.67
2	Good	16	53.33
3	Ordinary	9	30.00
	Total	30	100.00

The data presented in table 6 clearly indicate that 46.66per cent women used to correspondence with the

magazine sometime while 36.67per cent women never used to correspondence the magazine and 16.67 per cent women used to correspondence regular with the magazine.

Table 5: Showing distribution of respondents according to form of articles. (N=30)

S.No.	Comment	Respondents Number	%age
1	Very good	4	13.33
2	Good	17	56.67
3	Ordinary	9	30.00
	Total	30	100.00

Table 6: Showing distribution of respondents on the basis of correspondence with the magazine (N=30)

S.No.	Answer	Respondents Number	%age
1	Regular	5	16.67
2	Sometimes	14	46.67
3	Never	11	36.67
	Total	30	100.00

Table 7: Showing distribution of respondents according to sending their articles for the magazines (N=30)

S.No.	Answer	Respondents Number	%age
1	Regularly	2	6.67
2	Sometimes	7	23.33
3	Never	21	70.00
	Total	30	100.00

Table 7 reveals that the majority of sampled women (70 per cent) were never sending their articles for the magazine and 23.33% women were sending their articles for the magazine sometimes but only 6.67% women were sending their articles regularly for the magazine.

Table 8: Showing distribution of respondents according to attracting women towards photograph on the front page of magazine. (N=30)

S.No.	Answer	Respondents Number	%age
1	Yes	6	20.00
2	Sometimes	11	36.67
3	No	13	43.33
	Total	30	100.00

Table 8 reveals that maximum percentage of respondents (43.33%) did not satisfy with photograph given on the front page of magazine for attracting women but 36.67% women were fifty-fifty satisfied with this compliment because they gave the response 'sometimes'. Twenty per cent women were fully satisfied with this compliment.

Table 9: Showing distribution of respondents according to reading editorial letter or related articles. (N=30)

S.No.	Answer	Respondents Number	%age
1	Regularly	12	40.00
2	Sometimes	13	43.33
3	Never	5	16.67
	Total	30	100.00

Table 9 reveals that maximum percentage of women (43.33%) was reading the editorial part sometimes. Forty per cent women were reading the editorial part regularly. The minimum percentages of women (16.67%) were never reading the editorial part of magazine.

Table 10: Showing distribution of respondents according to purchase the over cost magazine. (N=30)

S.No.	Answer	Respondents Number	%age
1	Regularly	6	20.00
2	Sometimes	12	40.00
3	Never	12	40.00
	Total	30	100.00

The data presented in table 10 clearly indicate that 40% sampled women in selected area purchased over cost magazine sometime same as 40 per cent women never purchased over cost magazine but 20 per cent women purchased over cost magazine regularly. It might be due to pocket allowed them to purchase or they may have high level of I.Q. towards new system.

Table 11: Showing distribution of respondents according to usefulness of reading magazine. (N=30)

S.No.	Answer	Respondents Number	%age
1	Very Useful	20	66.67
2	Useful	10	33.33
3	Less useful	0	0.00
	Total	30	100.00

Table 11 reveals that the majority of women (66.67%) said that the magazine is 'very useful' for women and 33.33%t women said that the magazine is only 'useful' for women but none of them say that the magazine is 'not useful' for women.

Table 12 reveals that the maximum percentage of sampled women (50 per cent) brought in practice

'regularly' to the information gathered from magazine. Forty six per cent women brought in practice' sometime' to the information gathered from magazine. The minimum percentage of sampled women (3.33per cent) 'Never' brought in practice the information gathered from magazine. The study inferred that magazine is playing an effective role in adopting the Home Science practices by the educated mass.

Table 12: Showing distribution of respondents according to bring in practice the information gathered from magazine. (N=30)

S.No.	Answer	Respondents Number	%age
1	Regularly	15	50.00
2	Sometimes	14	46.67
3	Never	1	3.33
	Total	30	100.00

Table 13: Showing distribution of respondents according to change in their attitude after reading the magazine.(N=30)

S.No.	Answer	Respondents Number	%age
1	Favourable	15	50.00
2	More Favourable	14	46.67
3	Not much Favourable	1	3.33
	Total	30	100.00

The data presented in table 13 clearly indicate that 50 per cent sampled women in selected area observed favourable changes in their attitude after reading the magazine. Forty-six per cent women observed more favourable changes in attitude after reading magazine. The minimum percentage of women (3.33%) observed nominal changes in their attitude after reading magazine

Table 14 reveals that maximum percentage of sampled women (53.33per cent) had observed a change in their behaviour related to the subjects F.N.+'H:D.+H.M. and C.T. and 23.33per cent women found change in their behaviour related to the subject 'Home Management'. Thirteen per cent and 6.67per cent women found change in their behaviour related to the subject 'Clothing & Textile' and 'Food & Nutrition' respectively. The minimum percentage of sampled women (3.33per cent) found change in their behaviour related the subject 'Human Development'.

Table 14: Showing distribution of respondents according to different subjects of change in behaviour.(N=30

S.No.	Subject	Respondents Number	%age
1	Food & Nutrition	2	6.67
2	Human Development	1	3.33
3	Home Management	7	23.33
4	Clothing & Textile	4	13.33
5	F.N.+H.D.+H.M.+C.T.	16	53.34
	Total	30	100.00

Table 15 reveals that 36.67 per cent women in selected area gave the first rank to the subject 'Food & Nutrition' and. Thirty per cent women gave the first rank to the subject 'Clothing & Textile' and 23.33per cent women gave the first rank to the subject 'Home Management' and 10 per cent women gave the first rank to the subject 'Human Development'.

Approximately 26% women gave IInd rank to 'Clothing & Textile' and 'Home Management' respectively. About 23 per women gave IInd rank to 'Human Development' and 'Food & Nutrition' respectively.

Thirty per cent women gave IIIrd rank to the subject 'Human Development' and 'Food & Nutrition' respectively. Twenty per cent women gave IIIrd rank to the subject 'Clothing & Textile' and 'Home Management'.

About 36 per cent women gave IVth rank to the subject 'Human Development'; while 30 per cent gave IVth rank to the subject 'Home Management' and 23 per cent women gave IVth rank to the subject 'Clothing & Textile'. Only 10 per cent women gave IVth rank to the subject 'Food & Nutrition'.

Table 15: Showing distribution of respondents according to giving rank to different subject related to Home Science (on the basis of change in behaviour) (N=30)

Rank	Food& Nutrition		Human Development		Home Management		Clothing & Textile	
	No.	%	No.	%	No.	%	No.	%
I	11	36.67	3	10.00	7	23.33	9	30.00
II	7	23.33	7	23.33	8	26.67	8	26.67
III	9	30.00	9	30.00	6	20.00	6	20.00
IV	3	10.00	11	36.67	9	30.00	7	23.33
	30	100.00	30	100.00	30	100.00	30	100.00

When we compared the rank of different subject of Horne Science we found that the maximum percentage of women (33.33per cent) gave the first rank to the subject 'Food & Nutrition'. So in this study we observed that the area of 'Food & Nutrition' is more useful to adopt the recommendations given in the subjects in public use in comparison to other subjects.

Table 16: Showing distribution of respondents according to suggestion related to different aspects for improving the magazine. (N=30)

S.No.	Aspect	Respondents Number	%age
1	Cover page and coverage	12	40.00
2	Subject matter	10	33.33
3	Language	7	23.33
4	Cover page & coverage + Subject matter + Language	1	2.34
	Total	30	100.00

Table 16 clearly indicates that the maximum percentage of sampled women (40 per cent) gave their suggestions related to 'coverage' for improving the magazine' and 33.33per cent women gave the suggestion related to the 'language' for improving the magazine, and 23.33per cent women gave their suggestions related to 'subject matter' for improving the magazine. The minimum percentage of women (3.34per cent) gave the suggestions related to 'coverage + language and subject matter' for improving the magazine. In opinion of respondents, publisher, editor and writers should give more emphasis to make magazine more effective by adding experiences and keep the language simple and make cover page more attractive. Cost of magazine should be low, so that magazine may come in reach of average families also.

Conclusions

In case of high level of effectiveness of articles, the maximum percentage of women (30 per cent) gave the first rank to "Foods & Nutrition". Articles effectiveness to different aspects, 43.33 per cent were in the favour of subject matter and gave first rank to the subject matter. In case of get up of magazine, 53.33 per cent gave response "Good". Fifty-six per cent women liked the form of articles. In case of finding changes in themselves, 50 per cent found change in themselves after reading magazine. Maximum percentage of women found change in their behaviour related to all subjects of Home Science and maximum percentage of women (36.67 per cent) gave first rank to "Food & Nutrition". Forty per cent women were giving suggestions to editor related to improve the coverage of magazine.

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Variability Patterns of Morphological and Physico-chemical characters in Potato (Solanum Tuberosum L.)

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Abstract

Experiment consisting of twenty five genotypes of potato was carried out at Hindu college Moradabad during Rabi season of 2003-04 and 2004-05 for variability studies. Highly significant differences among the genotypes were observed for all the characters studies. A good amount of variability (phenotypic as well as genotypic) was observed for all the characters, maximum total yield, leaf area, average tuber weight and vitamin A. High heritability values were recorded in case of protein content, T.S.S., dry matter content, leaf area and days to 50% emergence. Average tuber weight, leaf area, vitamin A and tuber yield exhibited high genetic advance. These results indicated that the characters showing high range of variability have more scope for their improvement.

Introduction

Potato (Solanum tuberosum L.) is one of the most important food crop after rice, wheat and maize. It is a new world crop of the antiquity, has historically contributed to securing the food and nutrition, and avoiding the poverty and hunger. In the emerging global economic order in which agricultural crop production is witnessing a rapid transition to agricultural commodity production, potato is appearing as an important crop, poised to sustain and diversity food production in this new millennium. The identification of genotypes with high variability and heritability for agro-morphological characters is the pre-requisites of breeding programme for selection of desirable trait. Partitioning of variance into various components provides information regarding breeding value and nature and magnitude of variability in the expression of a particular trait. The polygenic characters and its components are highly influenced by environment and become difficult to know weather the variability is heritable or environmental; therefore the present investigation is carried out together information on magnitude of variability in potato under two different environments.

Materials and Methods

In this investigation, twenty five genotypes of potato (Solanum tuberosum L.) were evaluated in Hindu college Moradabad during Rabi 2003-04 to estimate variability in general performance of genotypes for tuber yield and yield contributing characters (Table 1 and 2). The experiment was laid out in randomized block design with three replications. The crops of each genotype was raised by planting the tubers at 20 cm distance on ridges 60 cm apart by supplementing with 20 tonnes FYM and 160, 100 and 120 kg N, P and K per hectare, respectively. Data recorded on five tagged plants for different traits in each plot were analyzed individually as well as pooled using software SPAR 1 developed by IARI, New Delhi to study the variability in general performance of genotypes, variances, coefficients of variances, heritability and genetic advance.

Results and Discussion

Mean values of different genotype for various characters are presented in Table 1 and the range of the variation and estimates of genetic parameters in Table 2. The days to 50% emergence varied from 13.67 to 9.16 with a mean value of 12.02. The maximum days to 50% emergence was recorded for the variety Kufri Jyoti and minimum for genotype JX-90. Number of haulms per hill ranged from 5.95 to 2-31 with a mean value of 4.57. The maximum haulms per hill were found for the genotypes Ms/91-1326 and minimum for genotypes PS-1. the number of leaves per haulms was ranged from 18.94 to 12.34 with mean value of 14.38. The maximum number of leaves was observed for genotypes PS-1 and minimum for genotype J/93-77. Leaf area was a varied form 181.09 to 77.47 cm^2 with mean value of 117.26 cm^2. The maximum and minimum values recorded for J/92-3146 and K. Chipsona-2, respectively. The plant height varied form 68.43 to 40.68 cm and the lowest value was recorded for J/92-167. J/92-3146 had maximum plant height followed by J/92-159 (171.17 cm). Regarding number of tuber per hill, JW-160 produced the maximum tubers (8.54), whereas PS-1 produced minimum tubes per hill (4.64). The yield varied from 480.37 to 234.12 q/ha with a mean 357.82 q/ha. The maximum yield was recorded with K. Chipsona-2 and minimum for MS/92-1090. Average weight of tuber varied from 90.83 to 50.67 g with a mean value of 71.72 g. The maximum average weight of tuber was recorded for JX-90. The maximum specific gravity (1.078 g/cm^3) and T.S.S. (7.39^0B) was recorded for J/93-139 and J/92-159, respectively. While minimum specific gravity (1.029 g/cm3) and T.S.S. (5.29013) was recorded with genotype J/92-167. the dry matter content was varied from 23.54% to 13.84% with a mean value 16.38. The maximum was recorded with variety K. Chipsona-2 and minimum for genotype J.W.-160. Ascorbic acid, vitamin A and protein content were recorded highest 27.18 mg/

Table 1: Mean performance of potato genotypes for morphological and physico-chemical characters traits pooled over two years

Genotype	Days to 50% emergence	No. of haulms /hill	No. of leaves /haulm	Leaf area (cm2)	Plant height (cm)	No. of tubers /hill	Yield (q/ha)	Average tuber wt. (g)	Specific gravity (g/cm^3)	D.M. content (%)	T.S.S. (^0B)	Ascorbic acid (mg/100gm)	Vitamin A (I.U.)	Protein content (%)
MS/91-1326	13.50	5.95	12.97	100.26	53.02	5.77	265.33	62.83	1.046	14.43	6.07	22.70	36.80	1.91
MS/92-1090	12.17	4.09	13.67	112.76	55.10	5.25	234.12	62.00	1.048	15.67	6.51	18.06	31.66	1.25
J/92-159	11.17	3.89	14.40	171.17	49.23	6.99	321.75	61.33	1.033	16.21	7.39	24.32	39.73	1.32
J/92-164	13.17	4.07	14.84	125.39	47.47	6.72	416.25	82.83	1.050	15.15	6.30	25.98	48.47	1.16
J/92-167	12.50	4.37	15.80	141.14	40.68	6.60	257.75	53.00	1.029	14.17	5.29	16.42	43.41	1.21
J/92-3146	12.33	4.77	14.50	181.09	68.43	6.33	428.12	90.67	1.036	16.25	6.69	21.21	42.95	1.60
J/93-4	13.33	5.47	13.00	100.97	51.35	5.62	350.00	84.33	1.050	15.74	5.92	18.76	45.20	1.42
J/93-77	11.50	4.74	12.34	143.98	53.60	6.22	358.25	78.30	1.036	16.62	6.55	15.05	46.68	1.26
J/93-81	12.50	4.87	14.18	92.89	55.94	7.41	307.87	56.00	1.052	16.63	5.46	20.69	35.32	1.47
J/93-86	10.50	3.48	18.40	118.48	56.39	6.76	431.87	85.67	1.039	15.64	6.48	18.55	48.69	1.69
J/93-87	11.33	4.29	13.30	131.11	51.80	6.82	249.75	50.67	1.071	19.99	7.25	21.31	37.15	1.47
J/93-139	11.50	3.98	14.10	110.16	52.00	7.64	461.50	73.17	1.078	17.78	6.55	16.98	47.71	1.27
JX-90	9.16	4.46	14.00	155.21	54.52	6.07	406.37	90.83	1.039	15.00	6.30	22.79	42.77	1.39
JX-576	10.84	5.42	14.04	136.89	47.04	6.68	336.09	67.33	1.069	15.44	5.80	19.50	37.23	1.27
JW-160	12.17	5.67	15.17	127.76	59.69	8.54	383.00	61.00	1.045	13.84	6.76	24.36	29.89	1.25
PS-1	12.00	2.31	18.94	114.10	59.15	4.64	296.87	80.00	1.030	16.16	5.57	23.38	25.62	1.65
Kufri Anand	12.84	4.41	14.93	106.73	59.73	7.08	423.87	78.33	1.035	17.18	6.13	24.71	25.82	1.28
Kufri Ashoka	10.84	4.94	12.97	89.33	50.57	7.20	290.60	58.33	1.039	14.97	6.34	21.25	29.61	1.68
Kufri Bahar	12.17	3.95	15.00	103.58	63.27	6.08	323.12	67.17	1.052	16.51	6.30	27.18	34.99	1.72
K. Chipsona-1	11.33	4.52	13.34	81.46	49.06	8.38	480.37	78.67	1.044	23.22	7.27	21.39	21.95	1.45
K. Chipsona-2	12.17	5.77	14.50	77.47	64.69	7.73	437.37	77.50	1.067	23.54	6.97	21.88	27.98	1.81
Kufri Jawahar	13.17	4.95	13.70	110.88	45.72	6.58	415.75	81.83	1.046	17.80	6.83	22.09	44.59	1.86
Kufri Jyoti	13.67	4.62	13.34	92.99	44.27	6.67	300.41	72.33	1.041	16.51	6.62	26.48	21.87	1.17
Kufri Pukhraj	12.50	4.55	13.74	91.78	56.62	7.21	397.17	70.83	1.054	14.32	6.00	21.21	45.56	1.61
Kufri Sutlej	12.33	5.00	14.67	130.82	56.54	7.15	371.00	69.83	1.038	15.77	6.55	25.52	24.60	1.29
CD at 5%	0.84	0.82	1.52	16.24	7.78	1.08	66.91	15.08	0.031	1.28	0.23	3.08	3.29	0.04

100g, 48.69 I.U and 1.91% with Kurfri Bahar, J/93-86 and MS/91-1326, respectively. While, ascorbic acid, vitamin A and protein was found minimum 15.05 mg/ 100 g, 21.87 I.U. and 1.16 with J/93-77, J/93-86, J/93-86 and J/92-164, respectively. Mishra (2002) for number of leaves per plant, protein content and leaf area; Singh et al. (2003) for dry matter content and yield; and Dalakoti et al. (2003) for specific gravity and T.S.S. have been reported high genetic variability for the characters. The characters showing high range of variation have more scope for their improvement. Yield (q/ha) showed the maximum phenotypic and genotypic variances. The other characters showing high phenotypic and genotypic variances were leaf area, average tuber weight and vitamin A. The lowest phenotypic and genotypic variances were observed for T.S.S., number of haulms per hill and number of tubers per hill.

The calculated values of PCV and GCV ranged from 1.83 and 1.93 to 23.66 and 24.45 for days to 50% emergence and vitamin A, respectively. These results indicated that the material under study provide ample scope for improvement through selection in these characters. Broad sense heritability values ranged from 38.05 to 98.84 per cent for specific gravity and protein content, respectively. A broad look by pooling the whole information recorded on above said metric traits of haulm, demonstrated that J/92-3146 could be utilized to improve plant height, leaf area, tuber weight, phosphorus content and shoot girth, simultaneously. Likewise, Kufri Chipsona-2 can be used for high dry matter content, potassium content, total chlorophyll content, specific gravity and plant height. The information regarding the nature and magnitude of variability present in breeding material is a pre-requisite to carry out a successful breeding and crop improvement programme. In potato, precise assessment of variability present in population would provide more opportunity for selection of desirable traits which will perpetuate for a longer time. Genotypic and phenotypic variances in the present investigation were highest for tuber yield per plant followed by tuber weight and vitamin A suggesting ample variability for applying a selection programme for these traits. High magnitudes of genotypic and phenotypic coefficients of variation (GCV and PCV) were observed for vitamin A followed by tuber weight, number of haulms per hill, and protein content in tuber. In general, magnitude of closeness between GCV and respective PCV was observed for most of the traits, which indicated the absence of environmental influence on them. Similar finding have also been revealed by Luthra (2001) for number of tubers, Dixit et al. (1994) for number of shoots and Sandhu and Kang (1998) for plant height. Lower values of genotypic and phenotypic variation along with

Table 2: Analysis of variance for yield and yield contributing characters in Potato (Solanum tuberosum L.)

Characters	Range	General mean (SEm±)	Variance		Coefficient of variation (%)			Heritability (%)	Genetic advance(GA)
			Genotypic	Phenotypic	Genotypic	Phenotypic	Environment		
Days to 50% maturity	13.67-9.16	12.02+0.301	1.01	1.27	1.83	1.93	4.17	80.11	1.85
No. of haulms/hill	5.95-2.31	4.57+0.291	0.55	0.76	16.20	19.05	10.03	72.26	1.29
No. of leaves/haulm	18.94-12.34	14.38+0.543	1.96	3.02	9.72	12.07	7.16	64.81	2.32
Leaf area (cm3)	181.09-77.47	117.26+5.80	698.11	801.72	22.53	24.14	8.68	87.07	50.79
Plant height (cm)	68.43-40.68	53.12+3.456	34.00	60.95	10.83	14.50	9.64	55.78	8.97
No. of tubers/hill	8.54-4.64	6.68+0.387	0.71	1.10	12.64	15.66	9.24	65.17	1.40
Tuber yield (q/ha)	480.37-234.12	357.82+23.890	4529.20	6046.22	14.26	19.42	13.18	53.91	15.47
Average tuber weight (g)	90.83-50.67	71.72+5.387	104.63	194.07	18.80	21.73	10.88	74.90	79.13
Specific gravity (g/cm^3)	1.078-1.029	1.04+0.009	1.32	3.45	10.96	17.77	13.99	38.05	1.45
Dry matter content (%)	23.54-13.84	16.58+0.457	5.67	6.45	14.36	15.31	13.10	87.98	4.60
Total soluble solids (^{0}B)	7.39-5.29	6.39+0.082	0.29	0.32	8.67	8.81	2.77	91.10	1.04
Ascorbic acid (mg/100g)	27.18-15.05	21.67+1.10	7.97	14.91	13.02	17.81	12.14	53.49	4.25
Vitamin A (I.U.)	48.69-21.87	36.54+1.177	74.79	79.89	23.66	24.45	6.17	93.62	17.23
Protein content (%)	1.91-1.16	1.45+0.013	5.20	5.26	15.64	15.74	1.68	98.84	0.46

low GCV and PCV for total soluble solids, number of haulms per hill, number of tuber per hill, number of leaves per hill and specific gravity revealed very less opportunities for selection to improve the population for these traits directly. Analysis of data registered high heritability for protein content vitamin A, total soluble solids, dry matter content, leaf area and days of 50% emergence. For the characters showing high heritability, the selection of superior genotypes on the basis of phenotypic performance will be effective. Burton (1952) suggested that GCV along with heritability for plant height, number of stems, specific gravity of tuber, tuber number, tuber weight and tuber yield (Sharma, 1999). In pooled analysis also, the above characters showed superiority for genetic advance. Days to 50 per cent emergence, dry matter content, number of haulms per hill, number of leaves per haulm, plant height, number of tubers per hill, total soluble solids, ascorbic acid, vitamin A and protein content exhibited low genetic advance. Several workers have reported moderate to high genetic advance in potato for plant height, tuber weight, number of tubers per hill and tuber yield per plant (Luthra, 2001). Moderate to high estimates of heritability accompanied by low GCV and genetic gain were observed for days to 50 per cent emergence, number of haulms per hill, number of leaves per haulm, plant height, number of tubers per hill, total soluble solids, ascorbic acid, vitamin A, dry matter content, specific gravity of tuber and protein. It may be inferred that these characters were conditioned by non-additive gene action and simple selection would not be rewarding directly for improvement.

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Economics of paddy cultivation in Khushinagar district of Eastern U.P.

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Introduction

Rice is the staple food crop of the world. About 90% of total rice grown in the world is produced and consumed in the Asian region. All most all cultivated rice plants belong to Oryza sativa L. which originated in Asia.

Rice contain about 8% protein, 75 % carbohydrate and small amount of fat, fiber and ash. After milling the protein content of rice about 7% and the carbohydrate (mainly starch) content about 78%. The gross chemical composition of rice by products are, white rice 43%, broken 22%, husk 20%, bran 10% and immature parts less than 5%.

Rice is used for several purposes like human food in different form, bran and paddy straw for cattle, and poultry and other commercial and industrial purpose.

India ranks first in area and second in production in rice. The total rice production was 78.04 million tons in year 2005-06 and 80.78 million tons (advance estimates) during 2006-07 (source Indian Economy, Pratiyogita Darpan 2007) in India.

The area under paddy cultivation in Kushinagar district was highest, followed by wheat and sugarcane. The total production was 305651 metric tons during 2005-06 and product 25.40 quintals per hectare. Rice production has better scope for increasing income of the farmers and generating employment in the rural sector. Systematic economic study on paddy cultivation has not been conducted so far. Keeping in view, the above facts, present study entitled "Economics of paddy cultivation in Kushinagar district of Eastern U.P." has been under taken with the following specific objectives:

1. To work out the cost of production per quintal of paddy on different size of sample farms.
2. To work out the cost of cultivation and input-output relationship of sample farms.
3. To find out the constraints in the paddy production in study area.

Methodology

Three stage stratified random sampling design was used to select the block in first, village in second and cultivators in the ultimate stage of the study.

There are 14 blocks in Kushinagar district out of that one block namely, Sukrauli block was selected randomly as a sample block.

A list of all villages falling under selected block was prepared and five villages from this list were selected randomly for the study.

A separate list of paddy growers of five selected village was prepared along with their size of holding and were classified into four categories i.e. (i) Marginal (Below 1 ha), (ii) Small (1-2 ha), (iii) Medium (2-4 ha) and (iv) Large (4 ha and above).

The marginal, small, medium and large groups of the farms were selected in proportion to their population in the universe. Thus, the study was based on 100 sample farms (i.e. 55 marginal, 25 small, 13 medium and 7 large) from five villages of Sukrauli block of district Kushinagar of Eastern U.P..

Results and Discussion

Cost and returns

The cost and return on various categories of sample farms were worked out and given in Table 1.

Table 1 indicate the per hectare cost incurred on the various input factors in the paddy production. On an average gross income and net income were recorded Rs. 27236.00 and Rs. 8292.33. On an average cost of cultivation per hectare was estimated Rs. 18943.34. The highest cost of cultivation was found in case of large farms followed by medium, small and marginal i.e. Rs. 2372.21, 22236.36, 19626.80 and 17245.50, respectively.

The major component of the cost of cultivation were human labour (19.07%), rental value of land (18.47%), manure and fertilizer (16.67%), tractor and combined charges (15.66%) and seed cost (3.45%) respectively.

Per hectare cost and income from the production of paddy

Table 2 present that on an average cost A1/A2, cost B_1, cost B_2, cost C_1, cost C_2 and cost C_3 accounted to Rs. 11368.71, 12335.72, 15835.72, 13721.51, 17221.23 and 18943.34 respectively. On an average gross income and net income were recorded Rs. 27236.00 and Rs. 8292.33. Gross income was observed highest on large farms (Rs. 29758.33) followed by medium, small and marginal farms i.e. Rs. 28480.67, 28000.00 and 26773.00 but net income was observed highest marginal farms (because low investment on the fixed capital) i.e. Rs. 9027.44 followed by small, medium and large farms i.e. Rs. 8373.20, 6244.31 and 6031.20 respectively.

On an average family labour income and farm business income were observed Rs. 11400.28 and Rs. 15867.30 respectively. Family labour income was highest

Table 1: Per hectare cost of cultivation of paddy on different size group of sample farms (in Rs)

S. No	Items	Size group of farms (ha)									
		Marginal Farms	%age	Small Farms	%age	Medium Farms	%age	Large Farms	%age	Overall Farms	%age
1.	Family labour	1800.20	10.44	1045.66	5.33	760.53	3.43	505.78	2.14	1385.79	7.31
2.	Hired labour	1576.06	9.14	2800.00	14.27	3193.86	14.36	3500.25	14.76	2227.10	11.76
	Total human charges	3396.26	19.70	3845.66	19.70	3954.39	17.79	4006.03	17.00	3612.89	19.07
3.	Bullock labour	520.00	3.00	440.94	2.24	400.00	1.80	-	-	448.23	2.37
4.	Tractor and combine charges	2807.00	16.28	3200.00	16.30	3213.23	14.46	3333.35	14.04	2965.00	15.66
5.	Seed cost	630.00	3.65	671.35	3.42	691.93	3.11	700.00	3.00	653.28	3.45
6.	Manures and fertilizers	2800.72	16.24	3098.54	15.78	4050.25	18.21	4221.30	17.80	3157.10	16.67
7.	Irrigation charges	885.72	5.18	1301.83	6.63	1571.17	7.06	2050.60	8.64	1180.38	6.23
8.	Plant protection	320.22	1.86	376.20	1.91	453.75	2.04	512.23	2.15	365.75	1.93
9.	Interst on working capital	340.79	2.00	388.03	2.00	430.04	1.93	444.70	1.88	371.50	1.96
10.	Rental value of land	3500.00	20.30	3500.00	17.83	3500.00	15.74	3500.00	14.75	3500.00	18.47
11.	Interest on fixed capital	477.04	2.76	1020.00	5.20	1950.12	8.77	2802.00	11.80	967.10	53.10
12.	Sub Total	15677.73	90.91	17842.55	90.91	20214.88	90.91	21570.21	90.91	17221.23	90.91
13.	Marginal cost (10% of sub total)	1567.77	9.09	1784.25	9.09	2021.48	9.09	2157.00	9.09	1722.11	9.09
14.	Total	17245.50	100.00	19626.80	100.00	22236.36	100.00	23727.21	100.00	18943.34	100.00

Table 2: per hectare costs and income from the production of paddy on the basis of various cost concepts (value Rs.)

S. No	Items	Size group of farms				
		Marginal farms	Small farms	Medium farms	Large farms	Overall farms
1.	Cost A1/A2	9901.04	12276.89	14004.23	14762.43	11368.71
2.	Cost B1	10378.04	13296.89	15954.35	17564.43	12335.72
3.	Cost B2	13878.04	16796.89	19454.35	21064.43	15835.72
4.	Cost C1	12178.24	14342.55	16714.88	18070.21	13721.51
5.	Cost C2	15678.00	17842.55	20214.88	21570.21	17221.23
6.	Cost C3	17246.06	19626.80	22236.36	23727.23	18943.34
7.	Gross income	26273.50	28000.00	28480.67	29758.43	27236.00
8.	Net income	9027.44	8373.20	6244.31	6031.20	8292.33
9.	Family labour income	12395.46	11203.11	9026.32	8694.00	11400.28
10.	Farm investment income	14572.30	14677.45	13715.91	14490.22	14481.51
11.	Farm business income	16372.50	15723.11	14476.44	14996.00	15867.30
12.	Cost of production (Rs./q)	409.00	446.00	465.00	494.31	431.50
13.	Yield (q/ha)	42.24	44.00	47.82	48.00	43.80
14.	Input-output ratio					
i.	On the basis of C_3	1:1.50	1:1.40	1:1.20	1:1.20	1:1.40
ii.	On the basis of C_2	1:1.60	1:1.50	1:1.40	1:1.30	1:1.52
iii.	On the basis of C_1	1:2.10	1:1.90	1:1.70	1:1.60	1:1.90
iv.	On the basis of B_2	1:1.80	1:1.60	1:1.40	1:1.40	1:1.67
v.	On the basis of B_1	1:2.50	1:2.00	1:1.70	1:1.60	1:2.20
vi.	On the basis of A_1/A_2	1:2.60	1:2.20	1:2.00	1:2.00	1:2.38

on marginal farms followed by small, medium and large farms.

Cost of production per quintal of paddy

On an average cost of production of paddy per quintal was found Rs. 341.50. The cost of production was highest on large farms followed by medium, small, and marginal i.e. Rs. 494.31, 465.00, 446.00 and 409.00 respectively. The overall average per hectare paddy was estimated 43.80 q and average input-output ratio (on the basis of cost C_3 and C_2) was found 1:40 and 1:52 respectively.

Constraints

Problems encountered on different size of farms of block Sukrauli of district Kushinagar are given iun

Table 3: Constraints on different size group of farms

S. No.	Particulars	Marginal		Small		Medium		Large		Total		Rank
		Farms	%age	Farms	%age	Farms	%age	Farms	%age	Farms	%age	
1.	Technical problem	39.66	72.10	13.66	54.64	2.66	20.46	1.33	19.00	57.33	57.33	
i.	Seed (HYV)	33	60.00	14	56.00	2	15.00	-	-	49	49.00	
ii.	Transplanting/broadcasting	43	78.18	13	52.00	3	23.00	2	28.00	61	61.00	II
iii.	Harvesting through machine/combine	43	78.18	14	56.00	3	23.00	2	28.00	62	62.00	
2.	Management problem	25.66	46.65	6.33	25.32	2.66	40.46	1.33	19.00	35.33	35.33	
i.	Skilled person	28	50.90	6	24.00	2	15.00	1	14.28	37	37.00	
ii.	Trained person	13	23.63	6	24.00	2	15.00	1	14.28	22	22.00	IV
iii.	Decision problem	34	61.81	7	28.00	4	30.00	2	28.00	47	47.00	
3.	Financial problem	42.20	76.72	15.40	61.60	5.60	43.07	1	14.28	64.20	64.20	
i.	Adequacy of fund	47	85.45	16	64.00	4	30.76	1	14.28	68	68.00	
ii.	Timeliness	43	78.18	10	40.00	7	53.84	-	-	60	60.00	
iii.	Documents	44	80.00	16	64.00	7	53.84	1	14.28	68	68.00	I
iv.	Bribes	31	56.36	15	60.00	5	38.46	1	14.28	52	52.00	
v.	Subsidy	46	83.63	20	80.00	5	38.46	2	28.57	73	73.00	
4.	Miscellaneous problem	31	56.36	16	64.00	3	23.06	1	14.28	51	51.00	
i.	Risk	31	56.36	16	64.00	3	23.06	1	14.28	51	51.00	III

Table 3.

The response of the sample farms about the problemsfaced by them have been classified mainly under four heads:

1. Technical problem
2. Managerial problem
3. Financial problem
4. Miscellaneous problem

It was observed during investigation that, financial problems were most serious in cultivation of paddy, it was found highest in case of marginal farms i.e. 76.72% followed by small, medium and large farms i.e. 61.7%, 43.07% and 14.28% respectively.

On overall ranked, it was observed that the technical problem was next constraints in paddy production followed by miscellaneous and management problem respectively. The overall per cent of technical problems was found 57% after the financial problems. The category wise percentage of technical problems was found highest in case of marginal farms followed by small, medium and large i.e. 72.10%, 54.64%, 20.46% and 19.00% respectively. On over all ranked, financial, technical, miscellaneous and management problems have taken place Ist, IInd, IIIrd and IVth respectively.

Conclusion and Suggestion

On an average cost of cultivation per hectare of paddy came to Rs. 18943.34. The overall average gross income, net income, family labour income and farm business income were found Rs. 27236.00, 8292.33, 11400.00 and 15867.30 respectively. On an average cost of production and input-output relation on the basis of cost C_3 and C_2 was found Rs. 431.50 and 1:1.40, 1:1.52 respectively. Financial technical and miscellaneous problems were observed, major constraints in the paddy production i.e. 64.20, 57.33 and 51.00 per cent respectively.

1. Financial support should be provided to encourage interest rate by the financial agencies.
2. Subsidy should also be provided to encourage the paddy production and rural rice processing mills.
3. The state Department of Agriculture should ensure the timely and adequate supply of input and HYV seeds.
4. Adequate farmers training should be ensured on new technology on paddy production by the government.

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Repayment Capacity Performance of Commercial Banks' Financing Agriculture in Agra District of Western U.P.

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Abstract

The study was conducted in Bichpuri block of Agra district in western U.P. selected purposively on 75 borrowers through proportionate random sampling technique on the basis of holding size possessed by the borrowers. The results revealed that percentage of non-willful defaulters was more than willful defaulters. The major reasons for willful default were money spend for making property as well as uncertainty of further fresh loan. While in case of non-willful default were low price of output and higher price of input.

Introduction

Agriculture is the most important sector of Indian Economy. About two third of the Indian population depends directly or indirectly on agriculture. The agriculture provides the food for people, and fodder & concentrate to livestock, demand of food for growing population there is a need for raising production. The food grain production can be increased either by increasing area under cultivation or by intensification of agriculture, i.e. taking more number of crops in a piece of land with increased use of improved inputs for which credit is necessary and be made available in time and in adequate amount. In agriculture, credit is one of the accelerators for any development programmed and is particularly true for rural development, which aims at increasing standard of living of rural people. The rural credit system in India had significant contribution on promoting technological innovations, accelerating production and achieving self sufficiency in food through capital intensive green revolution, enhancing capital formation and employment generation in the rural areas.

The Commercial Banks have been providing loans to fulfill both production credit needs as well as investment credit needs of farmers. The Commercial Banks and RRBs supplied total credit to agriculture Rs. 5791 crores in 1992-93, Rs. 14467 crores in 1996-97 & Rs. 31595 crores in 2000-01.

The recovery of agricultural advances by Commercial Banks at end of June 1992 was Rs. 5056.56 crores (54.2 per cent), Rs. 6629.32 (59.9 per cent) in 1995 and Rs. 15540 crores (69.2 per cent) in 2001.

The over dues was Rs. 4281.75 crores (45.85 per cent) at the end of June 1992, Rs.4444.26 crores (40.17 per cent) at the end of June 1995 and Rs. 6889 crores (30.72 per cent) at the end of June 2001.

It is clear that there has been an appreciable expansion of agriculture credit from institutional agencies. But it is not only the quantum of institutional credit that is disbursed but also its timely repayment which will ensure the soundness of any institutional credit system. The inadequate recovery of loans only inhibits the ability of the banking system to re-cycle the funds as non-repayment of banks' dues by a section of agricultural borrowers of would only mean denying the benefits of the bank advances to other agricultural borrowers the lack of recovery also cripples the credit institutions capacity to draw refinance from the NABARD because banks eligibility criteria in this respect is now linked with their recovery performance. Thus it is essential to know what the reasons to be which affected the recovery of banks credit , and for framing the policy for advancing adequate and timely loan to the farmers through improving the recovery position of banks. The present study was, therefore, undertaken with the following main objectives in view:-

i) To know the repayment and over dues of the farmers.

ii) To estimate repayment capacity of the farmers.

iii) To find out the reasons for non-repayment of loans under different farm size groups.

Methodology

The study was conducted in Bichpuri block of Agra district of western U.P. which was selected purposively keeping in view the fact that a large number of branches of Commercial Banks are working in rural area. The Canara Bank of Midhakur was selected purposively. Since this bank is established in rural area and financing the farmers in bigarous way. The list of villages was prepared with the help of bank officer. Out of these villages five villages were selected randomly.

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After selection of villages the list of borrowers was prepared.75 borrowers were selected randomly through proportionate random sampling technique on the basis of holding size possessed by the borrower-farmers. Thus the numbers of cases were 42 in small (1-2 hect.), 28 in medium (2-4 hect.) and 5 in large (above 4 hect.) farm size groups. The present study was based on primary and secondary data. The primary data were related to year 2000-01, while secondary data were related to year 1995-2001. The data were collected through pre-prepared schedules and questionnaires through personal interview method with respondents. The Repayment Capacity was worked out as:

(a) Self-liquidating loans:

Repayment capacity = Gross income minus living expenses, working expenses (not including proposed loan taxes, other loan and repayments due.

(b) Non-liquidating or partially liquidating loans:

RC = FFI – (POC+LE+IP+OD+R)

Where, RC = Repayment Capacity;
FFI = Farm Family Income (The income earned from farm and off farm jobs);
POC = Paid Out Cost (which relates to cash ex penses including seasonal loans);
LE = Living Expenses;
IP = Installment to be paid;
OD = Old Debts to be paid;
R = Risk allowance @ 10 Per cent of net in come obtained from crops.

Results & Discussion

Repayment and overdues :

It can be seen from the table 1 that the overall position of overdues was 9.32 per cent. The extent of overdues in case of small and medium farm size groups came to Rs. 2749.43 (11.34 per cent) and Rs. 2290.14 (7.46 per cent) of loan taken respectively. The large farmers repaid the loan in time and there was no overdues on large farm size in case of crop loan.

Table 1: Repayment and overdues in case of crop loan on the farms under study (Amount in Rs.)

Farms size groups	Amount taken	Repayment made (paid)	Overdues	% overdues
Small	23095.25	20345.81	2749.43	11.94
Medium	30714.29	28424.15	2290.14	07.46
large	19482.00	19482.00	-	-
Overall	25698.80	23304.14	2394.66	09.32

As shown on Table 2 the overall average overdues in case of term loan was 22.98 per cent. In case of small, medium and large farms it was 40.26 per cent, 16.96 per cent and 23.19 per cent respectively. The overall average overdues in case of tractor, tubewell and allied activities was 24.39, 20.36 and 28.57 per cent respectively. The table 2 revealed that the overdues was highest in case of allied activities and next was in case of tractor loan.

Repayment capacity:

Table 3 indicates that the overall average farm family income per farm was Rs. 85926.77. In case of different farm size groups it was Rs. 63359.45, Rs. 101814.58, and Rs. 186520.46 on small, medium and large farms respectively. It can be seen from table 4 that the repayment capacity overall average was Rs. 11162.76. In case of small, medium and large farm size groups, it was Rs. 4959.18, Rs. 15068.34 and Rs. 41401.54 respectively. It can be concluded the repayment capacity of the small farmers is lowest as

Table 2: Repayment and overdues in case of term loan on the farms under study (Amount in Rs.)

Farms size group	Tractor instalment			Tubewell/Pumpset instalment			Allied activities instalment			Overall		
	Amount due for payment	Amount	Overdues (%)	Amount due for payment	Amount	Overdues (%)	Amount due for payment	Amount	Overdues (%)	Amount due for payment	Amount	Overdues (%)
8				3			5			8		
Small	-	-	-	4826.64	3110.31	1716.33 (35.56)	5999.94	3447.80	2552.14 (42.54)	5559.95	3321.24	2238.71 (40.26)
16	2			12			2			16		
Medium	15625.02	11750.14	3874.88 (24.80)	5399.67	4715.42	684.25 (12.67)	4999.89	3990.00	1009.89 (20.19)	6627.87	5504.08	14123.79 (16.96)
4	2			2						4		
Large	23437.50	17975.00	5462.5 (23.31)	7662.50	5910.00	1752.50 (22.87)	-	-	-	15550.00	11942.5	3607.50 (23.19)
28	4			17			7			28		
Overall	12276.79	9282.22	2994.57 (24.39)	5559.21	4427.47	1131.74 (20.36)	4571.35	3265.09	1306.26 (28.57)	6271.90	4830.41	1441.49 (22.98)

Note: Figures in parentheses indicate to percentage of overdues

Table 3: Farm family income per farm in different farm size groups. (In Rs.)

Farm size Group	Farm business income from crop	Income from milk	Income from wages	Income from service	Income from business	Income from hiringout serviceof machineand etc	Total
Small	42106.65	6715.15	4960.74	6680.76	2210.44	685.71	63359.45
	(66.46)	(10.60)	(7.83)	(10.54)	(3.49)	(1.08)	(100)
Medium	72990.73	9513.40	1189.82	7772.13	2440.90	7907.60	101814.58
	(71.69)	(9.34)	(1.17)	(7.63)	(2.40)	(7.77)	(100)
Large	145087.06	11751.80	310.00	11285.00	1696.60	16390.00	186520.46
	(77.79)	(6.30)	(0.17)	(6.05)	(0.91)	(8.79)	(100)
Overall	60502.07	8095.61	3242.88	7395.15	2262.22	4428.84	85926.77
	(70.41)	(9.42)	(3.77)	(8.61)	(2.63)	(5.15)	(100)

Note: Figures in parentheses indicate percentage to total

Table 4: Repayment capacity per farm in different farm size groups under study (In Rs.)

Farm size group	Family income	Total working expensesfor crops	Living expenses	Loan amount due for payment	Riskallowance @10% of net income obtained from crops	Total of col. no. (3 to 6)	RepaymentCapacity (col. 2 to 7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Small	63359.45	26926.66	20972.50	6987.76	3513.35	58400.27	4959.18
Medium	101814.58	39651.30	33230.27	7603.63	6261.04	86746.24	15068.34
Large	186520.46	65325.68	55422.50	11423.40	12947.34	145118.92	41401.54
Overall	85926.77	34237.13	27845.40	7513.39	5168.09	74764.01	11162.76

compared to medium and large farmers.

Wilful and non-wilful defaulters:

The defaulters having enough income (having a good repayment capacity but are not repaying the loan deliberately, they are treated as wilful defaulters. The non-wilful defaulters, on the other hand, are those, who have no surplus income to repay loan. Table 5 shows that out of 27 defaulters, 12 defaulters were in the category of wilful default while 15 defaulters were in the category of non-wilful default. The table also shows that in case of small, medium and large farm size, the no. of defaulters were 17 (7 wilful and 10 non-wilful default), 8 (3 wilful and 5 non-wilful default) and 2 only on the category of wilful defaulters, respectively. Thus it can be concluded that number of non-wilful defaulters was more than wilful defaulters. The number of non-wilful defaulters was more in case of small farms.

Reasons for non-repayment of loan;

The reasons for non-repayment of loan were asked from the defaulting farmers who were mentioned as;

Reasons of wilful default;

At the time of collecting information, 5 reasons were identified on the basis of response given by 12 wilful defaulters. Each wilful defaulter was asked to report more than one important reason, out of 5 reasons. Size-wise analysis shows on the table 6. Page (4.

As shown in the table 6 the defaulters reported more than one reason for wilful default. The maximum percentage of defaulters reported reason that money was used to form the property like purchase of land or construction of house building (28.57 per cent), the next percentage was in the reason-uncertainty about timely availability of fresh loan (25.00), the other reasons were lack of proper timely follow up of loan by the bank (21.43 per cent), money lending to others (14.29 per cent) and local influences (10.71 per cent). Thus it can be concluded that maximum wilful defaulters were under the diversion of income for making proper/construction of house and next were on account of not certainty of timely availability of fresh loan and not proper fallow up of loan by the bank.

Table 5: Extent of wilful and non-wilful defaulters in different farm size groups

Farm size groups	Total no. of defaulters	Wilful defaulters	Non-wilful defaulters
Small	17	7	10
	(100)	(41.18)	(58.82)
Medium	8	3	5
	(100)	(37.50)	(62.50)
Large	2	2	-
	(100)	(100)	
Overall	27	12	15
	(100)	(44.44)	(55.56)

Note: Figures in parentheses represent percentage

Table 6: Reasons of wilful default

S.No.	Reasons	Small	Medium	Large	Overall
1.	Slackness in timely recovery by loans (lack of proper Timely follow up)	5 (33.33)	1 (12.50)	-	6 (21.43)
2.	Diversion of income for purchasing land or other properties	3 (20.00)	3 (37.50)	2 (40.00)	8 (28.57)
3.	Uncertainty about timely availability of fresh loan	6 (40.00)	1 (12.50)	-	7 (25.00)
4.	Lending to others	-	2 (25.00)	2 (40.00)	4(14.29)
5.	Local influences (leadership)	1 (6.67)	1 (12.50)	1 (20.00)	3 (10.71)
	Total	15 (100)	8 (100)	5 (100)	28 (100)

Note: (i) Figures in parentheses indicate percentage
(ii) The number of defaulters exceeds than the actual number due to more than one reason reported by the defaulters

Reasons of non-wilful default:

Those defaulters who did not have repayment capacity to paid loan of the banks. As many as 9 reasons for the non-wilful default were identified on the basis of the responses given by 15 non-wilful defaulters. The table 7 shows the reasons of non-wilful default. The table shows that only small and medium farmers were found in non-wilful default. The major reasons for non-wilful default were low price of output (21.43 per cent), high price of inputs (21.43 per cent) and low yield (14.29 per cent). The other reasons of non-wilful default were delay in disbursement of loan (10.00 per cent), inadequate finance (5.71 per cent), regid terms of repayment (5.71 per cent), poor non-farm income (10.00 per cent) and more domestic expenditure (7.14 per cent). Thus the major reasons for non-wilful default were low price of output, high price of input, delay in disbursement of loan which leads to misutilization of loan and poor income from non-farm source (other than agriculture) almost the same price was observed in case of small and medium farmers.

Table 7: Reasons of non-wilful default

S.No.	Reasons	Small	Medium	Overall
1.	Crop failure due to natural calamities	2(3.92)	1(5.26)	3(4.29)
2.	Inadequate finance	3 (5.88)	1(5.26)	4(5.71)
3.	Low crop yield	7(13.73)	3(15.79)	10(14.29)
4.	Low price of output	10(19.61)	5(26.32)	15(21.43)
5.	High price of inputs	10(19.61)	5(26.32)	15(21.43)
6.	Delay in disbursal of loan	6(11.76)	1(5.26)	7(10.00)
7.	Rigid terms of repayment	3(5.88)	1(5.26)	4(5.71)
8.	More domestic expenditure than the income	4(7.84)	1(5.26)	5(7.14)
9.	Poor non-farm income	6(11.76)	1(5.26)	7(10.00)
	Total	51(100)	19(100)	70(100)

Note: Figures in parenthesis indicate percentage
F.N.: No farmers in case of large group found on non-wilful default

Conclusion

This paper concluded that the large farmers repaid the loan in time and there was no overdues on large farm size in case of crop loan. The repayment position was better in case of crop loan than term loan. However there was a overdues of crop loan and term loan. The repayment capacity of large farmers was highest as compared to medium and small farms. It can be further concluded that number of non-wilful defaulters was more than wilful defaulters. The number of non-wilful defaulters was more in case of small farms. The maximum wilful defaulters were under the diversion of income for making property/construction of house and next on account of not certainty of timely availability of fresh loan and not proper follow up of loan by the bank. The major reasons for non-wilful default were low price of output, high price of input, delay in disbursement of loan which lead to misutilization of loan and poor income from non-farm source (other than agriculture) almost the same price was observed in case of small and medium farmers.

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Response of pigeonpea [*Cajanus cajan* (L.) Millsp.] genotypes to varying phosphorus and sulphur levels on growth and yield

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Abstract

A field experiment was conducted on pigeonpea during 2004 and 2005 in kharif *season to study the effect of phosphorus and sulphur fertilization on growth, yield and quality of pigeonpea genotypes. Three genotypes (UPAS-120, Pusa-992 and Pusa-855) were tested with four levels of P (0, 30, 60 and 90 kg P_2O_5/ha) and three levels of S (0, 20 and 40 kg/ha). Pusa-855 was found significantly better in respect of growth and yield as compared to all other genotypes. Application of phosphorus and sulphur both increased the grain, straw/stalk yields as well as seed weight per plant significantly up to 60 kg P_2O_5/ha and 20 kg S/ha, respectively. Results revealved that the genotype Pusa-855 superior to the other genotype in respect to growth and yield.*

Introduction

India is the major pulse growing country of the world, accounting roughly for one third of the total world area under pulses and one fourth of the total world production. Pulse crops, also called grain legumes, have been valued as food, fodder and feed and have remained as a mainstay of Indian agriculture for centuries. In fact, a major factor responsible for sustaining soil productivity in this country has been the highly diversified nature of the cropping patterns which either include a pulse crop or a legume crop as one of the components. In India, pigeonpea is the second most important pulse crop next only to chickpea. However, among the *kharif* grain legumes, it occupies first place. Pigeonpea is an important *kharif* pulse and is extensively grown on all types of soils under different climatic conditions. The evolution of short duration and high yielding varieties of this crop has made it possible to grow them successfully in a short span of 5-6 months instead of long span of 9-10 months. However, this crop can be grown throughout the year. Pigeonpea being a leguminous crop shows special response of phosphatic fertilizer, because of the need of phosphorus in large quantity for multiplying *Rhizobia* in the nodules. Phosphorus also improves the crop quality and makes the crop resistance to diseases. Phosphate application to pulses not only benefit the particular crop in increases its yield but also favourably affects the soil nitrogen content for the succeeding non-legume crop which requires lower dose of nitrogen application. The adequate supply of phosphorus to legume is more important than that of nitrogen. Because it has beneficial effect on nodulation, growth and yield. It plays an important role in energy transfer reactions and in oxidation reduction processes. Phosphorus application increases cell division, as a result of which growth is increased in legumes. It also improves the crop quality and resistance against diseases. Sulphur is an important essential secondary plant nutrient. Importance of sulphur in Indian agriculture is being increasingly emphasized and has a great impact on production of legumes. Sulphur plays an important role in many physiological process in plant like synthesis of sulphur containing amino acids (Cysteine, Cystine and Methionine), synthesis of certain vitamins (Biotine and Thiomine), co-enzyme A and in the metabolism of carbohydrates, proteins and fats. Sulphur also promotes nodulation in legumes. Although not a constituent, sulphur is required for the synthesis of chlorophyll. Sulphur application increases drought and cold tolerance in plants due to the process of disulfide linkage. It also helps in the control of diseases and pest. Sulphur is essential to the formation of chlorophyll and plays an important role in the assimilation. The significance of sulphur deficiency as a factor in limiting the yield and quality of grain legumes has been recognized. Since at least 70% of the S is found in the chloroplast. Sulphur is known for its role in the formation of amino acids, i.e. methionine (21% S), cystine (27% S) and cyteine (26% S), synthesis of proteins in pulses and oil seeds (Aulakh and Pasricha, 1990). Sulphur application in pigeonpea crop plays an important role.

Material and Methods

The experiment was conducted during the *kharif* season of 2004 and 2005 at Agricultural Research Farm of R.B.S College, Bichpuri (Agra). The soil was sandy loam, having pH 7.90, electrical conductivity (EC) 1.86 dS/m, organic carbon 0.34% and available N, P_2O_5, K_2O and S 182.0, 29.50, 253.0 and 15.0 kg/ha, respectively. The treatments consisted of three genotypes (UPAS-120, Pusa-992 and Pusa-855), four levels of phosphorus (0, 30, 60 and 90 kg P_2O_5/ha) and three levels of sulphur (0, 20 and 40 kg S/ha).The

experiment was conducted in split plot design, where genotypes and levels of phosphorus kept in main plot and sulphur levels in sub plot, replicated three times. A uniform dose of nitrogen for pigeonpea @ 20 kg N/ha (urea) and potassium 40 kg K_2O/ha (MOP) were applied to all plots, at the time of sowing.

Results and Discussion

Genotypes

Genotype Pusa-855 produced significantly more number of branches/plant compared with UPAS-120 and Pusa-992. Pusa-855 recorded significantly higher straw/stalk yield over all other genotypes because of the more plant height and dry matter accumulation during both the years. The genotypes exhibited significant variation in respect of growth parameters. Pusa-855 produced taller plant over UPAS-120 and Pusa-992, which indicated their expression of genetic character under iso-nutritional and moisture conditions. This might be due to genetic nature of the genotype.

Dry matter accumulation varied significantly from genotype to genotype at all the stages. Dry matter accumulation was low in the beginning (30 DAS) and reached a peak at harvest. Genotype Pusa-855 recorded higher dry matter accumulation at all the successive stages. UPAS-120 and Pusa-992 being next in order. This might be due to more height of plant and higher number of primary and secondary branches per plant were observed in Pusa-855. The same observations have been reported by Govil *et al.* (2000).The crop duration plays an important role in its productivity. Genotype Pusa-855 scored significantly higher seed productivity over UPAS-120, Pusa-992 was short duration genotype over UPAS-120 and Pusa-855. General longer the duration, yielding ability would be higher. The same observations have been reflected by the different cultivers.

Effect of phosphorus

The beneficial effects of increasing rates of phosphorus on growth character have been clearly brought out in this investigation. Growth parameters, viz. plant height, dry matter accumulation and primary and secondary branches increased significantly with increasing levels of phosphorus up to 60 kg P_2O_5 ha^{-1}. Plant height was significantly affected by P supply at all the growth stages. Highest dose of phosphorus (90 kg P_2O_5 ha^{-1}) produced tallest plants but which was on par with 60 kg P_2O_5 ha^{-1}. The favourable effects of phosphorus application on plant height have also been reported by Maurya and Rathi (2000). Dry matter production is resultant effect of growth parameters viz. plant height and number of branches per plant. Dry matter increased with increasing doses of phosphorus up to 60 kg P_2O_5 ha^{-1} at all the growth stages except early stage. The slow growth and lesser dry matter accumulation during initial stage of crop growth might be due to the lower assimilating surface area leading to low photosynthetic rate. Every increase in level of

Table 1: Plant height, branches per plant, dry weight per plant, grain and straw/stalk yields as affected by different treatments

Treatments	Plant height (cm)		Primary branches/plant		Secondary branches/plant		Dry weight /plant		Grain yield (Kg/ha)		Straw/stalk yield (Kg/ha)	
	120 DAS		120DAS		120DAS		120DAS					
	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Genotypes												
UPAS-120	200.89	190.02	15.27	14.12	25.22	24.24	39.64	36.78	1426	1303	5439	4705
Pusa-992	196.64	185.84	14.66	13.54	24.21	22.93	36.53	34.00	1379	1273	4874	4110
Pusa-855	205.33	195.70	15.53	15.05	26.54	24.94	43.02	39.93	1646	1539	5750	5372
CD (P= 0.05)	5.25	7.04	0.64	0.62	1.06	0.89	1.82	1.81	52.4	50.8	181.3	176.8
Levels of phosphorus(k g P_2O_5 ha^{-1})												
0	193.71	183.19	13.27	12.65	23.35	22.03	35.56	32.91	1162	1043	4719	4216
30	199.88	189.68	14.95	13.88	24.49	23.31	39.08	36.22	1451	1354	5349	4739
60	204.59	193.96	16.07	15.15	26.47	25.26	41.85	38.81	1643	1523	5683	4952
90	205.63	195.26	16.32	15.25	26.84	25.54	42.42	39.66	1680	1558	5685	5065
CD (P= 0.05)	6.06	8.13	0.73	0.72	1.22	1.03	2.10	2.09	60.5	58.6	209.3	204.1
Levels of sulphur (kg S ha^{-1})												
0	197.47	185.53	14.40	13.67	24.20	23.41	38.17	35.26	1312	1217	5082	4504
20	202.17	192.58	15.45	14.38	25.70	24.25	40.32	37.46	1547	1428	5507	4832
40	203.22	193.45	15.62	14.66	25.96	24.46	40.68	37.99	1599	1470	5570	4839
CD (P= 0.05)	4.42	5.55	0.53	0.48	0.81	0.71	1.36	1.42	23.1	13.4	69.1	75.7

DAS=Days After Sowing

phosphorus brought about a significant increase in the number of primary and secondary branches per plant of pigeonpea crop. The maximum number of primary and secondary branches per plant was recorded with the application of 90 kg P_2O_5 ha^{-1} but this was found statistically at par with 60 kg P_2O_5 ha^{-1}.

The beneficial effect of phosphorus on per ha grain and straw/stalk yields were observed during both the years. However, the highest values, in general, were recorded with 90 kg P_2O_5 ha^{-1} but this was found statistically at par with 60 kg P_2O_5 ha^{-1}. The beneficial influence of phosphorus application on yields obtained in the present investigation, are in close conformity with the findings of Kushwaha (1990), Dubey and Namdeo (1994), Sekhon *et al.* (1994), Srinivas and Raju (1997), Mourya (2000) and Maurya and Rathi (2000).

Effect of sulphur

Application of sulphur bring about a valuable effect on dry matter production of pigeonpea. Sulphur is a constituent of a number of amino acids and helps in protein synthesis. The function that played by sulphur in the metabolic activities with the crop plants is very much similar to that of nitrogen. Besides sulphur also found to play a synergistic effect with nitrogen. Sulphur application also helps the availability of nitrogen in crop plants. It may be assured that increased chlorophyll content in leaves will bear a positive relationship with photosynthetic efficiency of plant. Higher dry matter accumulation in plant under increased level of sulphur over no application may be due to above mentioned facts. The dry matter accumulation per plant due to sulphur application in the cause of number of primary and secondary branches per plant and plant height improved to a great extent after addition of sulphur. High accumulation of dry matter also facilitated considerable improvement in the straw/ stalk yield due to application of sulphur over control. Similar increase in dry matter with sulphur application has been reported by Singh *et al.* (1994) and Dey and Basu (2005).

It was observed that growth parameters i.e. plant height, number of branches and dry matter production were recorded highest under the treatment of 40 kg S ha^{-1}. However, 40 kg S ha^{-1} did not exhibited any significant difference over 20 kg S ha^{-1} in all the growth parameters. Yield of seed and straw/stalk being the effect of sulphur fertilization brought about significant improvement in the production of both. The significant increase was noted in the seed yield (kg ha^{-1}) with every increase in level of sulphur up to 40 kg ha^{-1}. However, 40 kg ha^{-1} of applied sulphur did not attribute any significant change over 20 kg S ha^{-1} with regard to seed and straw/stalk yield in both the years. The beneficial effect of sulphur application on the yield of seed and straw/stalk obtained in the present investigation, is in close conformity with the findings of Ramasamy (1997), Trivedi *et al.* (1997), Pujari *et al.* (1998) and Meena *et al.* (2005).

On the basis of two years data, it was concluded that the pigeonpea genotype Pusa-855 showed the superiority over rest of genotypes in respect of plant growth and seed yield. Higher yield could be obtain with the application of phosphorus 60 kg/ha and sulphur 40 kg/ha.

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Effect of Frontline demonstration on Knowledge and productivity enhancement of potato in Agra district of U.P.

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Abstract

The potato productivity in India is persistently low due to technological gaps in adoption of improved technologies and other socio economic factors. Potato tuber yield can be increased by demonstrating improved agro techniques at the farmers' fields with active participation of farmers with technical experts. Keeping the importance of potato crop in Agra, the KVK, and Agra conducted Frontline Demonstrations on improved agricultural technologies of potato crops in scientific manner at farmers' fields during the year 2004-05 and 2005-06. Thus, it could be concluded that the front line demonstration would bridge the existing huge extension and technological gap by showing the scope of potato productivity enhancement at farmer's field and resulted in more knowledge to the farmers. More number of farmers can be benefited by conducting need based frontline demonstration.

Introduction

Potato is the world's fourth important staple food crop after wheat, rice and maize it is characterized as a crop of great yield potential and high nutritive value. It constitutes nearly half of the worlds annual output of all root and tuber crops. With an annual global production of about 300 million tones, potato is an economically important staple crop in both developed and developing countries. Since 50's the area, production and productivity of potato had increased 853,1748 and 173 percentage and 6.8, 18.5 and 2.7 times (Table-1). These are remarkable change in potato statistics in our country and also depict increasing importance in human diet. The top ten producers in the world are China, Russia, USA, Ukraine, Poland, Germany, Belarus, Netherlands and France. These together contribute about 70% of the total production. India ranks third contributing around 7.5% to the world's production.

In India, most of the farmers are of small and marginal category and have limited resources and surplus family labour. This makes technological up-gradation of agriculture-based enterprises imperative. Keeping the importance of potato crop in Agra, the KVK, Agra conducted Frontline Demonstrations on improved agricultural technologies of potato crops in scientific manner at farmers' fields during the year 2004-05 and 2005-06. The study clearly revealed that demonstration at farmer's field resulted in more knowledge of improved package of practices by the farmers. More number of farmers can be benefited by conducting need based frontline demonstration.

Methodology

Farmers of operational area of Krishi Vigyan Kendra (K.V.K), Agra were selected as per guideline of Front Line Demonstrations to KVK by Zonal Coordinator of Zone IV. Accordingly, the FLDs under potato crop were laid out in the villages; namely, Nagar, Nagala Gujra, Nagala Bhalra and Anguthi. The knowledge level of the farmers in these four villages was also estimated by taking random sample of 25 farmers from each village. Thereby sample included 100 numbers of farmers in the study. The farmers were asked to reply questions about the improved agro techniques including the high yielding varieties of potato. The scores so obtained under various questions were summed up. On the basis of the total score obtained, respondents were categorized into three classes i.e. low, medium and high level of knowledge.

The participating farmers were provided with all advance technical know how about sustainable cultivation of potato. Also KVK scientists visited regularly the demonstration fields and continuously guide the farmers. These visits were also utilized for collection of feedback information for more improvement in technology transfer programmes. Field days and group meetings were also organized at the demonstration sites to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. The data on potato productivity (q/ha) were collected from the demonstration and control plots (farmers practice) for further analysis. The critical inputs were duly supplied to the farmers by the KVK. Data were collected from the fields of FLDs farmers and analysed to compare the yields of farmers' fields and FLDs fields. The technology gap, extension gap and the technology index

were estimated by the formulae provided by Samui et al, 2000.

Technology gap = potential yield – demonstration yield

Extension gap = demonstration yield – farmers yield

$$\text{Technology index} = \frac{\text{Potential yield- Demonstration yield}}{\text{Potential yield}} \times 100$$

Frontline Demonstrations on improved agricultural technologies of nutrient management and improved varieties of potato was carried out in scientific manner at farmers' fields during the year 2004-05 and 2005-06 and the pooled data is presented in table.

Result and discussion

(A). Knowledge level of advanced agronomic practices of potato cultivation

To know the need of the technological intervention the knowledge level of the farmers in four villages were estimated from 100 farmers 25 from each village. Over all maximum number of farmers fall in the category of medium knowledge level, while very few were with high knowledge level (Table-2). Thus need was felt to introduce latest varieties and nutrient management in front line demonstration programme in the four villages. FLD is good extension tool to demonstrated impact of new agro techniques to the farmers.

Table 1: Area, production and productivity trend in potato production on long term basis.

Year	Area('000 ha)	Prod ('000 t)	Yield (q/ha)
1949-50	234	1543	65.9
2004-05	1600	28500	180.0
% increase	583.7	1748.0	173.0
Increase (time)	6.8	18.5	2.7

Based on Agricultural Statistics at a glance 2007-08

(B) Front Line Demonstration on potato:

Performance of recommended high yielding varieties of potato: the progress of front-line demonstration on potato during *rabi* 2004-05 and 2005-06.

Table 2: Overall knowledge level of farmers in respect of organic farming practices, N = 100

Category of knowledge level	Score range	Number of farmers	Percentage of respondants
Low	30-35	18	18
Medium	55-75	52	52
High	40-63	30	30

Front line Demonstration on improved nutrient management on potato productivity:

Front line demonstration on nutrient management were conducted with 100% nutrient supply through as recommended fertilizer dose through chemical fertilizer, 50% RDF + FYM (5t/ha), FYM (10t/ha) and no nutrient supply at all under control respectively during 2004-05 and 2005-06 at Nagala Gujara village. The maximum increase in productivity was recorded in integrated nutrient management component of 50% nutrient supply through FYM and 50% through chemical fertilizer, though it was comparable with the potato productivity under recommended dose of fertilizer only through chemical fertilizer (Table 3). Farmers' feed backs were also positive about effect of nutrient sources on quantity and quality of potato under integrated nutrient source.

Front Line Demonstration on improved varieties on potato productivity:

Kufri pukhraj and Kufri chipsona were found better in terms of potato productivity against local check 3797 at Nagala Bhalra and Anguthi villages. Increase in potato productivity was observed from 20-50% in both the villages. Kufri pukhraj performed exceptionally well over control and Kufri chipsona. In Nagal bhalra, potato productivity was increased up to 50% and in Anguthi village it was 41% and 21% over kufri chipsona and local (3797) respectively. Yadav et al, 2007 also highlighted the impact of FLD in convincing the farmers for adoption of improved techniques for enhancing the pulse productivity. The technology gap in RDF (100% NPK), 50% RDF + FYM (5t/ha), FYM (10t/ha) and

Table 3: Demonstration on improved nutrient management of potato cultivation at Nagala Guraja village during 2004-05 and 2005-06.

Components of FLD	Variety	No. of Demons-trations	Area (ha)	Productivity (ha) ±SE	Increase in productivity (%)	Technology gap	Extension gap	Technology index
RDF(100% NPK)	Kufri Pukhraj	4	2.0	328±15	29	27	73	8
50%RDF+FYM (5t/ha)	Kufri Pukhraj	4	2.0	335±11	31	20	80	6
FYM (10 t/ha)	Kufri Pukhraj	4	2.0	310±18	22	45	55	13
Control	Kufri Pukhraj	2	1.0	255±20	-	100	-	28
Potential yield with all inputs				355±12				

Table 4. Performance of high yielding varieties of Potato under FLD.

Crop Season/Year	Varieties	Village	No. of Demon-strations	Area (ha)	Productivity (q/ha)	Increase in productivity over Local (%)	Technology gap	Extension gap	Technology index
Rabi (2004-05)									
	Kufri Chipsona-1	Nagala Bhalra	5	2.5	280	33.0	75	70	21
	Kufri Pukhraj		5	2.5	335	60.0	20	125	6
	3797(local)		2	1.0	210	-	145	-	41
Rabi (2005-06)		Anguthi							
			5	2.5	289	31.0	66	69	19
			5	2.5	340	54.0	15	120	4
			1	0.5	220	-	135	-	38
Potential yield with all inputs					355				

was estimated as 27, 20, 45 and 100 q/ha, whereas average extension gap was observed 70 q/ha in RDF (100% NPK), 50% RDF + FYM (5t/ha), FYM (10t/ha). This explained the importance of extension techniques to convince the farmers about the improved agro techniques for enhancing the potato productivity. The technology index illustrates the achievability of the demonstrated technology at the farmer's field. More will be the scope of the technology demonstrated in yield enhancement with lower value of technology index, (Sager and Chandra, 2004). The technology index varied from 8-28 percentages under various improved nutrient management techniques (Table-3) and 4-41 percentages (Table-4) for varieties respectively. However, the average value of technology Indices were estimated 14 percentages under nutrient management and 22 percentages under improved varieties of potato in both the year. This is in conformity of Mishra et al, 2007.

Conclusion

Very few farmers had the knowledge of improved cultivation practices of potato. The farmers need to be made well aware about the improved package of practices including high yielding varieties, this will make easy in their large scale adoption. The maximum increase in productivity was recorded in integrated nutrient management component of 50% nutrient supply through FYM and 50% through chemical fertilizer, though it was comparable with the potato productivity under recommended dose of fertilizer only through chemical fertilizer. Kufri pukhraj and Kufri chipsona were found better in terms of potato productivity against local check 3797. The technology index illustrates the achievability of the demonstrated technology at the farmer's field. More will be the scope of the technology demonstrated in yield enhancement with lower value of technology index. The average value of technology Indices were estimated 14 percentages under nutrient management and 22 percentages under improved varieties of potato in both the year. Technology index displays the likelihood of the technology demonstrated which result in potato productivity enhancement through technological intervention made to lessen the yield gap in potato.

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Costs and returns of Maize Crop on different farm size groups in Rajouri distt. Of J&K.

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Abstract

The present study was confined to Rajouri district of J & K. the study covered 12 villages and 180 farmers belong to small, medium and large categories. The study revealed that maize in kharif season were the major crops grown on the farms. The cost of cultivation per hectare increases with increase in farm size due to more use of inputs on large farms. The returns per hectare increase with increase in farm size.

Introduction

In India, Agriculture is the largest sector of economic activity. Under the constitution, agriculture is the state subject. The agricultural sector, today provides lively hood to about 64 percent of the labour force contributes nearly 25 percent in 1950-51, 52 percent in 1960-61 and accounts for about 38 percent share of the total value of the country exports which includes about 20 percent from goods made of raw material of agricultural sector . Being the dominant sector, the improvement or change in the national output depend on the output in agricultural In the wake technological advancement in agricultural endeavor is to increase productivity profitability, adoptability stability and sustainability are necessary for the efficient utilization of farm resources which are highly variable according to farm size and levels of technological adoption. The difference in these parameters among different categories of farm is also inhibited because farmers differ in this ability to use technologycal efficiently. It is an essential to study systemically the cost return and profit per ha in relation to resources situation of time. The present study cost and return on different farm size group impels the behaviour of out put and returns. This investigation is particularly significant in view of Para mount importance of crop production in the future growth of rural economy the following are the main objective of the study:

1. To examine the resource structure on the farms under study.
2. To estimate cost and returns of Maize crops on different farm size groups.

Methodology

The study was conduct in Rajouri district of Jammu and Kashmir, out of the total number of three randomly selected Tehsil four village were selected from each Tehsil. Thus a total of 12 villages were selected for the present study. The sample respondents comprised of various categories of farmers belonging to small, medium and large ones a sample of 5 farmers in each categories from each village were selected randomly. Thus the total number of sample respondents from twelve villages came 180. The respondents were personally contacted to study the economic of crop enterprises on different farm size groups on specific areas viz. resource structure cropping pattern to estimate cost and returns.

Results and discussion:

Asset structure

The Table 1 shows that the overall per hectare value of fixed assets including farm building, implements and live stock was estimated to be Rs 72465.56 on small medium and large farm value of total fixed capital per hectare was about Rs 107273, Rs 75544 and 43818 respectively. The table further reveals that per hectare value of implement s inversely related to the farm size as the farm size increase the value of implements decrease which accounts for about 0.29 per cent live stock for about 17.10 percent and farm building for about 82.61 per cent in overall. Which in turn decides the use of inputs Labour is directly proportional to the intensity of cropping on different farm size groups.

Intensity of cropping

The intensity of land use is reflected by number of crops raised in a the year which in optional use . the intensity of cropping effects the demands of labour on the farm .

Table 2 show that the over all average intensity of cropping was 200 percent which clearly indicates that the farmers of the study area grow two crop in an agricultural year within all farm size group the intensity of cropping was found to be the same (200%) which can not be taken as satisfactory there is need

to double the cropping intensity percentage. And namely Maize and wheat in the said area.

Table 1: Per ha value of fixed assets excluding land on different farm size group.

Farm Size	Value in Rs			
	Live stock	Implements	Farm building	Total
Small	19926.2	282.9	87064.1	107273.2
	(18.58)	(0.26)	(81.61)	(100.00)
Medium	11766.9	202.2	63574.4	75543.5
	(15.58)	(0.27)	(84.16)	(100.00)
Large	7505.7	159.2	36153.4	43818.3
	(17.13)	(0.36)	(82.51)	(100.00)
Over all	12392.2	207.9	59865.4	72465.6
	(17.10)	(0.29)	(82.61)	(100.00)

(Figure in parenthesis indicate percentage)

Cropping pattern :Cropping pattern refers to the area of crops and crop combination which the farms follows within specifies period of time the type of crop grown on a particular farm play a very important role in it cost and income position.

Table 2: Intensity co cropping on different farms size groups.

Farm	Per farm cultivated area in (ha)	Per farm cropped area(ha)	Cropping intensity %
Small	1.47	2.94	200.00
Medium	3.06	6.12	200.00
Large	5.94	11.88	200.00
Overall	2.75	4.49	200.00

Table 3: The per farm area (ha) under different crop grown in different farm size groups

Name of crops	Farm Size Groups			
	Small	Medium	Large	Overall
Maize	1.27(43.08)	2.82(46.09)	5.63(47.40)	2.51(45.76)
Paddy	0.20(6.92)	0.24(3.91)	0.312.60	0.434.24
Total Kharief	1.47(50.00)	3.06(50.00)	5.0650.00	2.7550.00
Wheat	1.30(44.19)	2.86(46.69)	5.6747.73	2.5546.39
Barseem	0.17(5.81)	0.20(3.31)	0.272.27	0.203.60
Total Rabi	1.47(50.00)	3.06(50.00)	5.9450.00	2.7550.00
Total	2.94(100.0)	6.12(100.0)	11.88100.00	5.49100.00

(The figure in parenthesis indicates the percentages)

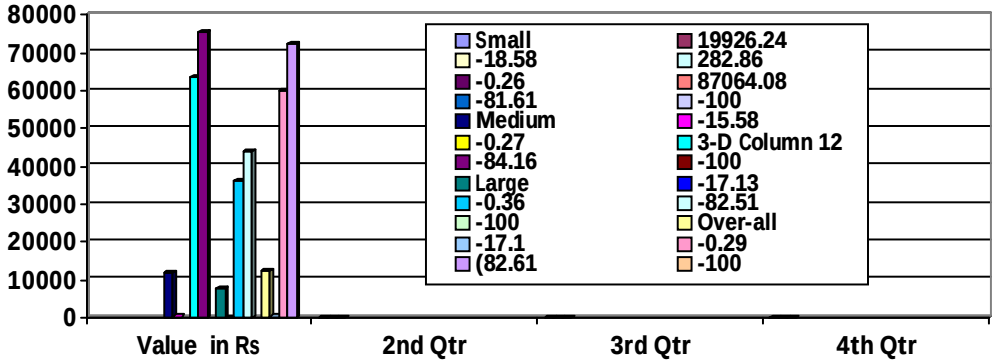
Maize and wheat are the main crops of their respective seasons and occupied 45.76 and 46.39% of the total cropped area respectively. Besides these crop paddy and Berseem were the other crop grown by the sample farmers occupied 4.24 and 3.60% of the cropped area respectively (Table 3).

Further it can also be seen from the table that area under Maize and wheat increase as the farm size increase . On the contrary the share of the paddy and Barseem to the cropped are reduces invariable with the size of farms.

Per hectare cost

The item wise cost incurred in the cultivation of Maize per hectare indifferent farm size groups the value of inputs per hectare item wise and their percentage distribution are given in the Table 4.

The table reveals that per hectare over-all total cost of maize cultivation was Rs 23469.87 which was about Rs 21272 on small farms Rs 23900 or medium and Rs 24451 on large farm value of



human labour value of material used and bullock labour charge were the items occupied about 27,14 9 percent share in total cost respectively total variable cost was estimated to be about 91 percent while 9 percent

Table 4: Break up of inputs per ha item wise on different farm size groups (In Rs).

Items of cost	Small	Medium	Large	Over-all
Area (ha)	1.27	2.82	5.6	2.51
Family Labour	2937.6	2574.9	1429.7	2242.0
Casual labour	1142.42	1578.145	3038.25	2015.85
Human Labour	4080.06	4153.00	4468.00	4257.82
Bullock labour	2781.81	2992.98	2954.04	2928.99
Material cost	5785.94	6164.89	6813.76	6319.78
Interest on working capital	379.44	399.33	427.07	405.20
Total variable cost	13027.31	13710.208	14662.87	13911.79
Land revenue	9.05	10.10	10.75	0.09
Depreciation on fixed capital	131.78	79.15	53.32	82.91
Interest on fixed	102.02	65.50	40.04	65.31
Rental value of land	2000.00	2000.00	2000.00	2000.00
Total Fixed cost	2242.84	2154.75	2104.11	2160.97
Total cost (c_2)	15270.15 (100.00)	15864.95	16766.98	16072.76

(The figure in parenthesis indicates the percentages)

The total fixed cost. It is obvious from above table it can be concluded that the total cost of cultivation of maize varies directly with the farm size.

Table 5: Income per hectare inputs, outputs, Net income and input output ratio

Farm Size group	Total inputRs/ha	Total output Rs/ha	Net income Rs/ha	Input output Ratio.
Small	15270.15	17241.04	1970.89	1:1.38
Medium	15864.95	19044.44	3179.49	1:1.41
Large	16766.98	20115.26	3349.26	1:1.42
Over-all	16072.76	18969.13	2896.37	1:1.41

The above table shows that overall net income per hectare worked out too about Rs 2896 and it is being about Rs 1970, Rs 3179 and Rs 3349 on small medium and large farms respectively .

Thus net income was the highest on large farms. The return per rupee of investment nets also highest on large farm size groups.

Relationship between selected independent variable with productivity of Maize crop.

The multiple regression coefficients as well as coefficient of correction between the selected independent variable with the productivity of maize crop are given in Table 6 and 7.

Table 6: Regression coefficient of maize crop

Particular	Small	Medium	Large	Overall
Constant	1.792	9.252	3.252	2.511
Human Labour	0.953	0.9923	0.03806	0.299**
Bullock	0.06097	0.02563	0.706	0.14
Material used	0.101	0.8827	0.108	0.430*
R^2	64.00	28.00	43.00	9.10

* *Significant at 1% level * Significant at 5% level

Multiple regression analysis shows I the above table that human labour and material use were significantly contributing to the productivity of maize crop , machine labour was not used in this crop out of these human labour was contributing at 1 percent level of significant and material used was contributing at 5 percent level of significance. All these independent variable together were found to be contributing about 64, 28 and 43 per cent to the productivity of maize crop on small medium and large farm size groups sample farms respectively, which was not a satisfactory contribution with in the different farm size groups any individual independent variable was not contributing significantly to the productivity of maize

Table7: Correction Bi- variate of Maize crop.

Particular	Small	Medium	Large	Overall
Human Labour	1.000	1.000	1.000	1.000
Bullock Labour	0.786**	0.146	0.754**	0.683**
Material used	0.918**	0.170	0.830**	0.696**
No. of observation	90	60	30.00	180

**Significant at 1% level *Significant at 5% level

The finding revealed that human labour and bullock labour were showing significant correlation with the productivity on over all farms . There were found significant at 1 per cent level of probability within the farm size groups these two variable were also found significantly associated at 1 percent

level of significant on small medium and large farm farm . on medium farm size group all the independent variable were found not significant .

Thus, it may conclude that in Maize cultivation all independent factors do not have much impact in team of association and contribution on the productivity of crop . These may be the effect of some other residual factors.

Conclusion

It can be concluded from the study that maize during kharif season and wheat crop in rabi season were the major crops grown on the farms. The overall cost of cultivation per hectare came to about Rs. 2896.00. The cost per hectare increase with increase in farm size. It may be due to more use of better inputs on large farms which resulted in more returns per hectare on large farms. Since the net returns per hectare came to about Rs. 1970.00, 3179.00 and Rs. 3349.00 on small, medium and large farms, respectively.

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Ground Water Quality Appraisal around Sewage Treatment Plant Command Area

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There is a growing need worldwide to conserve and protect ground water resources as it is most important sustainer of human life after atmospheric air. Reuse of waste water for crop production is being recognized due to scarcity of ground water in arid and semi arid areas, but it needs to be used cautiously since direct use of sewage/waste water for irrigation may increase salinity and sodicity and thereby affect the ground water quality (Sial *et al* 2005). Growing interests in sewage and effluent recycling for irrigation have resulted in establishment of many sewage treatment plants (Cowan and Johnson 1984; FAO 1985). Although treated sewage water (TSW) can serve as source of irrigation but, it differs from tube well water which in general used for irrigation. In India though irrigation water is becoming a scare commodity and a huge amount of domestic waste water is let in surface water bodies. To reduce pollution load in river Ganges, the sewage treatment plants (STP_S) have been established under Ganga Action Plan (GAP-1985). The whole TSW is being disposed off in river but around the sewage treatment plant it is partially used for irrigation. In order to assess water quality of ground water in areas receiving TSW, the present investigation was carried out around Dinapur sewage treatment plant of Varanasi city.

Varanasi city generates about 240 MLD (million liters per day) sewage and has a sewage treatment plant (STP) at Dinapur village 10 km. down the city with a capacity of about 80 - 100 MLD. The villages viz. Dinapur, Kamauli, Kotava, Khalispur, Shiwar and Raghunathpur are in the range of 3 – 5 km. around the sewage treatment plant and have been using the treated sewage water for irrigation for the last ten years. The open wells, hand pumps and tube wells are the common sources of drinking water in the locality. In the present investigation, water samples form each source (i.e. OW having a depth 30-40 feet, HP 50-60 feet & TW 80-100 feet) and each villages were collected in winter, summer and monsoon season and analyzed for various parameters such as pH, EC, NO_3^-, PO_4^{3-}, K^+, SO_4^{2-}, Cl^-, Ca^{2+}, Mg^{2+}, Na^+, TDS, BOD, DO, as per procedures given by Tondon (1993) and heavy metals i.e. Fe, Cu, Mn and Zn were analyzed on atomic absorption spectrophotometer (AAS) after digesting the water samples in di-acid (HNO_3 : $HClO_4$ 4:1; Black 1965) mixture.

Water sample drawn from open well were neutral to alkaline in reaction (Table 1). The pH of open well ranged from 7.4 to 8.0, 7.5 to 7.9 and 7.5 to 7.9 with mean values of 7.64, 7.62 and 7.56 during in winter, summer and monsoon season respectively (WHO standard). The electrical conductivity of open well water in all the three seasons varied from 1.01 to 1.28, 1.01 to 1.25 and 1.02 to 1.29 dSm^{-1} with mean value of 1.20, 1.19 and 1.20 dS m^{-1} in winter, summer and monsoons respectively. The pH of tube well water varied form 7.4 to 7.7, 7.3 to 7.6 and 7.4 to 7.8 with a mean value of 7.5, 7.46 and 7.5 irrespective of season and area under study (Table 1). Overall, water was neutral to alkaline in reaction. The electrical conductivity of TW varied from 0.18 to 1.20, 0.82 to 1.20 and 0.82 to 1.21 dS m^{-1} with a mean of 0.99, 1.1 and 1.1 dS m^{-1} in winter, summer and monsoon seasons, respectively. No marked variation in pH and EC of TW were recorded with respect to season and sites under study. Adhikari *et al* (1997) also reported higher pH, EC and BOD in ground water of sewage irrigated area, but within safe limit of tolerance.

Hand pump water also showed neutral to alkaline reaction in all the seasons. The electrical conductivity of hand pump water in monsoon was somewhat higher then winter and summer season but was well within safe limit (Table 1). The NO_3^- content of hand pump water of Shiwar in winter and summer and that of Khalispur and Kotava in monsoon season were higher than the standard limits (ie 10 mg L^{-1}). This may be due to addition of NO_3^- form run off water and which are in ground water.

Biochemical oxygen demand of hand pump water in monsoon season was somewhat higher in comparison to winter and summer. This fluctuation in DO and BOD values might be due to ambient temperature moisture at which the rate of microbial activities increases in monsson season consumes dissolved oxygen and increases biochemical oxygen demand and ultimately result in higher BOD. This fluctuation in DO and BOD values may be due to some organic impurities reaching to ground water in rainy season. Iron, Zn and Mn contents in hand pump water samples of winter, summer and rainy season were within the safe limits whereas Cu was not detectable.

The NO_3^- content of open well water showed a range of 3.92 to 15.68, 3.96 to 12.6 and 3.4 to 14.6 mg L^{-1} with a mean value of 9.94, 8.8 and 9.12 mgL^{-1} in

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winter, summer and monsoon seasons respectively. However, the open well water of Khalispur and Shiwar in winter and summer season and open well water of Khalispur, Shiwar, Kotava and Raghunathpur in monsoon season crossed the safe limit of NO_3^- content (i.e. 10 mgL^{-1}) (Table. 2). NO_3^- content of ground water of hand pump, tube wells and open wells in winter, summer and monsoon season given in table-2. Irrespective of season the NO_3^- content was higher in open wells of shiwar village and lowest in tube wells of Kamauli of study area. Frequent irrigation with treated sewage water and to some extent application of nitrogenous fertilizer in winter season and accumulation of run off water in rainy season might have increased the nitrated levels in these sources. The NO_3^- contents of tube well water samples varied from 2.1 to 8.1, 2.4 to 9.1 and 3.9 to 8.6 mg L^{-1} with a mean value of 4.84, 5.26 and 5.7 mg L^{-1} in winter, summer and monsoon season respectively. It is further clear that unlike open wells and hand pump water, tube well water show NO_3^- well within the safe limits of drinking water quality.

Phosphate and potassium contents of hand pump water in all the three seasons were within safe limits. Water samples of hand pump collected in monsoon season showed somewhat higher concentration of sulphate in comparison to winter and summer seasons. The chloride content in hand pump water did not show much variation in all the three seasons. Total dissolved solids (TDS) of hand pump water varied form 550 to 580, 560 to 585 and 600-690 mg L^{-1} with mean value of 565, 573 and 665 mg L^{-1} in winter, summer and monsoon season respectively, but water samples collected in monsoon season had higher TDS contents, and as per rating given by Sharma *et al* (1994) the water of study area may be classified as of marginal quality. Hand pump water of winter and summer season showed a higher range of dissolved oxygen but in monsoon season DO was lower which may be due to contamination of water due to organic impurities in monsoon season. Phosphate and potassium content in tube well water did not show any marked variation in all the three seasons and the values were within the safe limits. Anion and Cation concentrations in open well water in all the three seasons were within the permissible limits (WHO standards). Sulphate content in open wells varied form 3.5 to 4.2, 2.6 to 3.5 and 4.4 to 5.7 me L^{-1} with a mean of 3.8, 2.96 and 4.86 me L^{-1} in winter, summer and monsoon seasons respectively. Chloride content was also within the limits in winter, summer and monsoon irrespective of area under study. Open well water samples of monsoon season

Table 1: Ground water characteristics of Treated sewage water and tube well irrigated command area.

Season	Location	pH	EC dSm^{-1}	PO_4^{3-} mg L^{-1}	K^+ mg L^{-1}	SO_4^{2-} me L^{-1}	Cl^- me L^{-1}	Ca^{2+} me L^{-1}	Mg^{2+} meL^{1}	Na^+ me L^{-1}	TDS mg L^{-1}	DO mg L^{-1}	BOD mg L^{-1}	Fe mg L^{-1}	Cu mg L^{-1}	Zn mg L^{-1}	Mn mg L^{-1}
Winter	Open well	7.7-8.0	1.01-1.28	.02-0.11	1.06-1.3	3.5-4.2	12.6-14.4	5.2-8.4	4.0-6.0	4.8-6.3	559-565	5.9-6.5	<1	00.1-0.2	ND	0.1-0.2	0.1-0.2
		(7.6)	(1.20)	(0.06)	(1.17)	(3.8)	(13.2)	(6.32)	(5.6)	(5.86)	(562)	(6.25)		(0.12)		(0.15)	(0.15)
	Hand pump	7.5-7.8	0.80-1.34	0.11-0.12	1.0-1.8	2.2-4.67	11.8-13.8	4.4-8. 4	2.4-8.0	2.5-5.2	550-580	6.5-7.0	<1	0.1-0.2	ND	0.1-0.3	0.1-0.2
		(7.6)	(0.94)	(0.11)	(1.26)	(3.1)	(12.54)	(6.1)	(4.72)	(4.0)	(565)	(6.78)		(0.14)		(0.18)	(0.14)
	Tube Well	7.4-7.7	0.81-1.20	0.1-0.220	1.2-1.5	2.2-2.9	11.0-11.9	4.0-8.0	1.6-8.0	3.0-5.0	565-580	6.5-7.0	<1	0.1-0.2	ND	0.1-0.3	0.1-0.2
		(7.5)	(0.99)	(0.12)	(1.36)	(2.5)	(11.6)	(5.76)	(4.64)	(4.1)	(575)	(6.88)		(0.14)		(0.18)	(0.14)
Summer	Open well	7.5-7.9	1.01-1.25	0.2-0.5	1.3-1.9	2.6-3.5	10.8-12.5	5.4-8.4	3.6-6.8	5.6-6.5	555-570	5.9-6.8	<1	0.1-0.3	ND	0.1-0	0.1-0.2
		(7.6)	(1.19)	(0.312)	(1.5)	(2.96)	(11.64)	(6.4)	(5.46)	(6.24)	(562)	(6.36)		(0.18)		(0.169)	(0.14)
	Hand pump	7.5-7.7	0.81-1.33	0.10-0.30	1.0-2.0	2.1-3.0	11.6-13.8	4.5-8.2	2.5-5.2	2.6-5.3	560-585	5.9-6.8	<1	0.1-0.2	ND	0.1-0.2	0.1-0.2
		(7.6)	(0.95)	(0.20)	(1.34)	(2.54)	(12.7)	(6.12)	(4.14)	(4.12)	(573)	(6.34)		(0.14)		(0.14)	(0.12)
	Tube Well	7.3-7.6	0.82-1.20	0.2-0.3	1.3-1.6	2.5-3.6	10.5-13.1	5.1-8.1	3.9-8.0	3.0-5.1	565-585	5.8-6.5	<1	0.1-0.4	ND	0.1-0.2	0.1-0.2
		(7.5)	(1.10)	(0.22)	(1.44)	(2.94)	(12.24)	(6.1)	(5.1)	(4.26)	(575)	(6.2)		(0.24)		(0.14)	(0.12)
Rainy	Open well	7.5-7.9	1.02-1.29	0.11-0.3	1.2-1.5	4.4-5.7	10.5-12.	5.7-7.9	3.7-6.9	5.6-6.5	670-690	5.2-6.0	1-2	0.1-0.2	ND	0.1-0.3	0.1-0.2
		(7.6)	(1.20)	(0.21)	(1.34)	(4.86)	(11.84)	(6.4)	(5.62)	(6.16)	(666)	(5.76)	(1.2)	(0.14)		(0.18)	(0.14)
	Hand pump	7.5-7.6	1.03-1.27	0.11-0.40	1.0-1.0	2.7-4.0	10.9-13.8	4.5-8.1	2.5-8.4	2.5-5.4	600-690	4.8-5.8	1.0-1.8	0.1-0.2	ND	0.1-0.3	0.1-0.2
		(7.6)	(1.20)	(0.25)	(1.32)	(3.78)	(12.1)	(6.22)	(4.8)	(4.1)	(665)	(5.3)	(1.4)	(0.14)		(0.18)	(0.14)
	Tube Well	7.4-7.8	0.82-1.21	0.2-0.4	1.3-1.5	4.2-5.0	11.8-13.0	4.7-8.3	1.7-8.2	3.4-5.4	660-685	5.2-5.8	1.0-1.8	0.1-0.2	ND	0.1-0.3	0.1-0.2
		(7.5)	(1.10)	(0.28)	(1.42)	(4.74)	(12.66)	(6.18)	(4.7)	(4.4)	(675)	(5.7)	(1.6)	(0.14)		(0.18)	(0.14)
WHO standard		6.5 to 8.5	2.25	5	12	250	250	100	50	50	1000	7.0	<1	1.0	0.1	5.0	0.1

ND= Not Detectable, TDS= Total dissolved solids, DO= Dissolved oxygen, BOD= Biochemical oxygen deman

Table 2: NO_3^- content of ground water sources of STP command area in winter, summer and monsoon season (mg L^{-1}).

Villages	Winter			Summer			Monsoon		
	HP	TW	OW	HP	TW	OW	HP	TW	OW
Dinapur	8.4	5.7	6.7	8.5	5.9	6.8	6.8	5.6	6.8
Kamauli	5.1	2.1	3.9	5.4	2.4	3.7	5.4	3.9	3.4
Khalishpur	5.6	4.2	13.4	5.6	4.7	10.4	10.0	5.9	10.7
Shiwar	10.1	8.1	15.7	10.2	9.1	12.6	8.2	8.6	14.6
Kotava	5.6	4.1	10.0	5.6	4.2	10.0	10.0	4.4	10.1
Raghunathpur *	7.2	5.9	10.0	7.3	5.1	10.1	10.0	5.9	10.1
WHO standards	10	10	10.0	10.0	10.0	10.0	10.0	10.0	10.0

* Area receiving tube well irrigation

had higher sulphate content than other sources. The TDS content and biochemical oxygen demand of open well water were higher in monsoon season in comparison to winter and summer seasons (Table 1). The heavy metals i.e. Fe, Cu, Zn and Mn were also with in the limits of tolerance (Tab 1).

The cation and anion concentrations were within the permissible limits of WHO standards. Sulphate content varied from 2.6 to 2.9, 2.5 to 3.6 and 4.2 to 5.0 me L^{-1} in winter, summer and monsoon seasons respectively, while chloride had a variation from 11.0 to 11.9, 10.5 to 13.1 and 11.8 to 13.0 me L^{-1} with a mean value of 11.6, 12.24 and 12.7 me L^{-1} in winter, summer and monsoon seasons, respectively. Further it is noticeable, that tube well water in monsoon season had higher sulphate content in comparison to winter and summer seasons which may be due to addition of sulpher through runoff water and rainfall. But SO_4^{--} and Cl^- were below the toxic limits. The total dissolved solids content of tube well water varied from 565 to 580, 565 to585 and 660 to 685 mg L^{-1} with a mean value of 575 in winter and summer and 675 mg L^{-1} in monsoon season, respectively. Based on the TDS rating, tube well water of winter and summer seasons is classed as good quality water and that of monsoon season marginal quality water (TDS >600 mg L^{-1}). The tube well water of winter season had somewhat higher values of dissolved oxygen in comparison to summer and monsoon seasons while BOD values of tube well water were higher in monsoon season. This may be due to presence of organic impurities. Like the water samples of open wells and hand pumps, the tube well water also had the heavy metals like Fe, Zn and Mn within the prescribed limits of WHO standards and other heavy metal like Cu was not detectable. Mittra and Gupta (1999) have also reported that all the parameters higher in raw sewage effluents compared to tube well water.

Treated Sewage water irrigation may be hazards with respect to NO_3^- pollution of ground water because the soils of the area are sandy in texture being more prone to fast ground water recharge. As far as heavy metal pollution of ground water due to TSW irrigation is concerned, concentrations of Fe, Cu, Zn and Mn in ground water were within the safe limits of drinking water with no danger of heavy metal pollution of ground water. Other heavy metals like Cd, Cr, Ni and Pb were non detectable in TSW as well in the ground water of the TSW command area.

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Adoption-cum-Technological gap of Paddy Crop on small holdings in District Mainpuri (U.P)

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Abstract

The present study was conducted in Mainpuri (U.P.) covering one block and six villages. The total sample of respondents was 120.The study aims to generalize socio-economic profile of the farmers and their perception and adoption of paddy technology in the area under study. The study highlights that majority (85.00%) of the small farmers was literate, having their own means of transport and conveyance, and majority respondent were member of at least one organization. While major conclusions regarding adoption indicate that highest technological gap exist in plant protection followed by soil technology and fertilizer. A moderate level of gap exists in seed and irrigation technology.

Introduction

Besides all efforts our population is still increasing very rapidly. We are unable even to feed them, land is always limited. The only way to become independent in food production is to increase the productivity of land available for cultivation, but how? The answer to this big question is continuous improvement in agricultural technology and proper application of that technology in the farmer's field. The development of agriculture is primarily the application of science and technology and making the best use of available resources. Several attempts have been made in this direction since independence. But only after 1966 a new era has begun in India's agriculture with their significant advances in technology such as the high yielding varieties of crops, the provision of package of services to farmers matching with new technology. In India rice is the most important and extensively grown food crop, occupying 44.24 million hectare and nearly 39% of the total area under cereal. Among the rice growing countries, India has the largest area under rice accounting for about 30% of the total area under rice cultivation. In respect of production India ranks second with 88.62 million tonnes of paddy which is about 25% of the total world production. The data shows that our per unit area production is low. The researches show that we have sufficient agricultural technology to raise the production but there is huge technological gap in adoption of improved practices by the farmers. There may be some problems with the farmers either of socio-cultural background or technological availability to them. If we could know these reasons and extent of technological gap with the farmers we can be able to raise the productivity and finally the economic condition of the farmers. In India, after about half number of marginal holdings, significant numbers of operational holdings (about19%) are small. In our country most of the studies conducted so far concerning with small farmers were attempted to characterize the small farmers with reference to their socio- economic behavior.

The present study entitled "Adoption-cum-technological Gap of Paddy Crop on Small Holdings in District Mainpuri (U.P)" was conducted to study the important socio-economic characteristics of the small farmers and the gap between recommended and existing level of improved agricultural technogies. Keeping in view all the above facts the following objectives were framed for the investigation.

1. To generalize the socio-economic profile of the small farmers
2. To know the extent of adoption-cum-technological gap of paddy technology on small holdings.

Methodology

The study was conducted in Mainpuri district of Uttar Pradesh. From the selected block karhal, out of 86 villages, six villages were selected randomly. Based upon past studies, the farmers having 2.5 to 5 acres of land has been considered to be small farmers. For each selected village a list of small farmers was prepared and from the list 20 farmers were selected using random number method. Thus, In all 120 respondents were selected for the investigation. The data were collected using self constructed and pre-tested schedules. The study was conducted during the session 2008-2009 and data were analyzed through frequency and percentage.

Results and Discussion

The major findings of the study have been presented hereunder with the help of analyzed data tables 1.

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Table 1: Showing the socio-economic background of the small farmers.

S.No.	Particulars	No. of respondents	Percentage
1.	Level of education		
	A. Illiterate	18	15.00
	B. Can read and write only	10	8.33
	C. Primary	14	11.67
	D. Jr. High School	15	12.50
	E. High School	24	20.00
	F. Intermediate	20	16.67
	G. Above Intermediate	19	15.83
2.	Caste background		
	A. Upper	55	45.83
	B. Middle	49	40.84
	C. Lower	16	13.13
3.	Type of family		
	A. Neuclear	73	60.83
	B. Joint	47	39.17
4.	Occupational background		
	A. Agriculture	86	71.67
	B. Service	8	6.67
	C. Business	12	10.00
	D. Caste occupation	14	11.66
5.	Annual income		
	A. Up to Rs.20000	12	10.00
	B. Rs.20001-40000	18	15.00
	C. Rs.40001-60000	43	35.83
	D. Rs.60001-80000	35	29.17
	E. Above to Rs.80000	12	10.00
6.	Social participation		
	A. No participation	20	16.67
	B. Member of one organization	65	54.17
	C.Member of 2 or more organization	25	20.83
	D. Office bearer	10	8.33
	Total	120	100.00

It is evident from the above table 1 that the huge (85.00%) majority of respondents were literate, be that 'can read and write only' or 'graduate and above', more than 85 per cent respondents belong to upper and middle caste, majority belongs to neuclear family system, 71.67% respondents were totally dependent on agriculture, majority earns Rs. 40000 to 80000 per year and above 80 per cent small farmers participate in at least one social organization.

Here, we can see that education and social participation among small farmers is very high but they are losing very important characteristic of agrarian social structure i.e. joint family system.

Table 2 reveals that regarding soil technology the existing gap in ploughing and leveling is not the matter of much more concern, more than half of population is following the recommended technology. Whereas, two most important components of soil technology viz. soil testing and soil treatment are being very much ignored by the small farmers. There is huge gap existing (66 to 100%) between recommended and adopted levels of soil testing among the majority (72.50%) of small farmers and more or less same condition is about soil treatment where majority (52.50%) falls into 33-66% category of gap followed by 27.50 per cent in 66-100% category. Only 20.00 per cent small farmers are taking satisfactory soil treatment.

Table 3 showing technological gap in seed technology of paddy crop presents that majority of respondents is aware of seed rate (76.67%) followed by time of sowing (55.83%). Whereas, medium to high level of gap still exists among near to half number of respondents regarding name of variety, method of sowing, depth of sowing and spacing from row to row and plant to plant. It means, they are still in need of proper information and training about sowing/transplanting of paddy crop.

Table 4 reveals that regarding nitrogenous fertilizers in method of application majority (51.17%) lies in the category of 33 to 66% gap followed by 45.83 per cent in dose of nitrogen under same level of gap. Regarding time of application of phosphatic fertilizers majority (56.67%) falls in the lowest level of gap (up to 33%) while about dose and method of application of phosphatic fertilizers majority lies under medium level of gap (33 to 66%).Technological gap in the use of

Table 2: Showing technological gap in adoption of different components of soil technology (N= 120)

S.No.	Existing gap in %	Ploughing		Levelling		Soil testing		Soil treatment	
		No.	%	No.	%	No.	%	No.	%
1.	Up to 33%	60	50.00	69	57.50	-	-	24	20.00
2.	33% to 66%	40	33.33	51	42.50	33	27.50	63	52.50
3.	66% to 100%	20	16.67	-	-	87	72.50	33	27.50

Total number of respondents is 120

Table 3: Showing technological gap in adoption of different components of seed technology of paddy crop. (N = 120)

S.No. Existing gap	Variety name		Seed rate		Sowing time		Method of sowing		Depth of sowing		Spacing from Row to row		Spacing from Plant to plant	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1. Up to 33%	58	48.33	92	76.67	67	55.83	58	48.33	57	47.50	53	44.47	62	51.67
2. 33 to 66%	40	33.33	28	23.33	48	4.00	52	43.33	41	34.17	45	37.50	42	35.00
3. 66 to 100%	22	18.34	-	-	5	4.17	10	8.34	22	18.33	22	18.33	16	13.33

Total no. of respondents: 120

Table 4: Showing technological gap in adoption of different components of fertilizer technology of paddy crop.

S.No. Existing gap	Nitrogenous fertilizers						Phosphatic fertilizers						Potassic fertilizers					
	Dose		Time		Method		Dose		Time		Method		Dose		Time		Method	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1. Up to 33%	30	25.00	59	49.17	42	35.00	37	30.83	68	56.67	42	35.00	11	9.17	44	36.67	42	35.00
2. 33 to 66%	55	45.83	46	28.33	62	51.67	65	54.17	52	43.33	65	44.17	36	30.00	53	44.17	61	50.53
3. 66 to 100%	35	29.17	15	12.50	16	13.33	18	15.00	-	-	13	10.83	73	60.83	23	19.16	17	14.17

Total no. of respondents: 120

Table 5: Showing technological gap in adoption of plant protection technology of paddy crop (N = 120)

S.No.	Existing gap in %	Components of insecticide and fungicide				Components of weed technology					
		Name		Dose		Method		Weedicide		Dose	
		No.	%	No.	%	No.	%	No.	%	No.	%
1.	Up to 33	-	-	-	-	55	45.83	-	-	-	-
2.	33 to 66	39	32.50	37	30.83	40	33.33	42	35.00	38	31.67
3.	66 to 100	81	67.50	83	69.17	25	20.84	78	65.00	82	68.33

Total no. of respondents: 120

potassic fertilizers shows that maximum gap exists about dose followed by method and time of application respectively. Data also indicate that method of application has same level of gap (33 to 66%) with almost same number of respondents for all fertilizers. The highest level of gap (66 to 100%) with majority (60.83%) of sample population was observed in dose of potassic fertilizers.

Above given table 5 indicate that regarding name and dose of insecticide and fungicide majority of respondents is not concerned with chemical control of diseases and pests in paddy crop. While regarding weed control technology they know something about manual control methods but again in case of chemical control of weeds also the majority (65.00% and 68.33%) comes under category of high level gap (66 to 100%). From the above results we may conclude that in spite of big efforts made by Government and other institutions and agencies, the plant protection technology still needs greater attention on part of the extension machinery.

Conclusion:

The major findings of present investigation indicate that majority likes to live in nuclear family system, education of respondents is quite satisfactory and social participation is of good level even then soil testing and soil treatment are very much ignored by the respondents and there is a wide gap in plant protection technology, while in case of seed, fertilizer and irrigation technology a moderate level of gap was found with more than half number of the population.

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Fertilizer Requirement of Sunflower (*Helianthus annus L.)* for Pre-set Yield Targets in a *Mollisol* of Uttarkhand

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Abstract

Under All India Coordinated Research Project on Soil Test Crop Response Correlation (STCR) studies, a field experiment was conducted on a Mollisol of Pantnagar Tarai during rabi (2003-04) season to study the response of sunflower (Helianthus annus L.) variety GK 2002 to the selected treatment combinations of 4 levels of fertilizer N, 5 levels of fertilizer P and three levels of fertilizer K with a simultaneous variations in initial soil test values of these nutrients. The nutrient uptake data based on analysis and soil test values were used to develop nutrient adjustment equations for tailoring of fertilizer prescriptions for pre-set yield of sunflower. Nutrients required to produce one quintal of grain were 4.64 kg of N, 1.30 kg of P_2O_5 and 5.66 kg of K_2O. The per cent utilization of soil nutrients was found to be 7.91, 5.56 and 4.56 and that of fertilizer nutrient was 86.92, 17.47 and 121.91 for nitrogen, phosphorus and potassium, respectively.

Introduction

To avoid unjust use of fertilizer nutrients, soil testing became a most acceptable tool for fertilizer recommendation all over the world. Approach of fertilizer recommendation for pre-set or targeted yield is a refined technique particularly applicable in the condition of constraints of fertilizer resource for most efficient use of fertilizer and inherent soil nutrients (Ramamurthy and Velayutham, 1971). In this technique, the fertilizers are recommended separately for different fields separately on the basis of soil test values and are pre-set uniform yield targets depending upon the availability of fertilizer inputs. The efficiency of applied fertilizer nutrients and nutrients already present in the soil is a location specific character and it needs calibrations for every set of soil-crop-climate complex with optimum agronomic practices. Sunflower having a potential of increasing percentage in the overall edible oil production of the country and lack of scientific approach and information for this crop for Tarai region prompted this investigation.

Material and Methods

To calibrate the fertilizer recommendation equations for pre-set yield targets of sunflower, experiment was conducted at Crop Research centre, Pantnagar in two phases. In first phase, whole experimental plot was divided in 4 strips of equal size and fertility stabilizing experiment was conducted to create a wide range of fertility gradients were created by applying graded level of fertilizer (N, P and K) and growing maize as nutrient exhaustive crop for minimizing the effect of other soil management factors affecting the yield of the crop. A wide range of soil test values in respect of available nitrogen, phosphorus and potassium was created.

In the second phase, each of the four strips were divided in to 28 equal sized plots of 5m X 3m and composite soil samples (0-15 cm depth) were collected, processed and analysed for Organic carbon (Walkely and Black, 1954), available phosphorus (Olsen *et al*, 1954) and available potassium (Hanway and Kiedal, 1952). The yield and nitrogen, phosphorus and potassium uptake responses of sunflower variety 2002 to selected combinations of 4 levels of fertilizer N (0, 40, 80 and 120 kg N ha^{-1}), 5 levels of fertilizer P (0, 40, 80, 120 and 160 kg P_2O_5 ha^{-1}) and three levels of fertilizer K (0, 40 and 80 kg K_2O ha^{-1}) with simultaneous variations in initial available soil nitrogen, phosphorus and potassium were studied. At harvest, plot-wise grain and stover yields were recorded. Samples of grain and stover yield were collected on the basis of maximum yield of treated and control plots and analysed following standard procedures of plant sample analysis.

Results and Discussion

The strip-wise soil test values for organic carbon ranged from 0.96 to 1.75 in experimental area, alkaline $KMnO_4$ extractable available nitrogen varied from 284.64 to 489.15 kg N ha^{-1} whereas Olsen's extractable phosphorus ranged from 15.02 to 83.00 kg P_2O_5 ha^{-1} and ammonium acetate extractable potassium ranged from 184.90 to 385.40 kg K_2O ha^{-1}. Of the four strips, strip I was the richest in fertility level followed by strip II, III and IV. (Table 1)

Strip-wise maximum grain yield was recorded in strip II (11.29 Qha^{-1}) followed by strip III (11.08 Qha^{-1}),

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Table 1: Basic data for calculating fertilizer doses for pre-set yield targets of sunflower

S. No	Particulars	N	P_2O_5	K_2O
1	Nutrient requirement (Kg) for producing 1 Q grain (NR)	4.64	1.30	5.66
2	Contribution from soil as percentage of its available nutrient (CS)	7.91	5.56	4.55
3	Contribution from applied nutrient as percentage of its nutrient content (CF)	86.92	17.47	121.91

strip I (10.10Q ha^{-1}) and strip IV (8.99 Q ha^{-1}). The trend of grain yield was due to medium to higher level of nutrient status of soil and also by applying higher doses of nitrogen and phosphorus. Strip-wise average stover yield were 31.99, 34.26, 33.21 and 27.28 Qha^{-1} in strips I, II, III and IV, respectively. (Table: 2) Stover yield also showed the same trend between strips as well as between treatments within the strips. This concludes that nitrogen along with phosphorus gave better increase in grain and stover yield than nitrogen or potassium alone or in combination. (Table 3)

The fertilizer prescription equation were worked out in conjugation with the yield level, soil test values and fertilizer doses in the following manner

$$F\ (nutrient) = [(YT \times A) - (STV \times B)]\ 100/C$$

Where; F (nutrient) denoted fertilizer requirement (kg/ha), YT denotes grain yield target (Tonnes/ha), A is total nutrient uptake (grain + straw) to produce 100 kg grain, STV is soil test value (organic carbon, kg P_2O_5 $ha^{-1}$and kg K_2O ha^{-1}), B is factor for contribution of nutrient from soil (%) and C is fertilizer use efficiency.

B and C can be calculated as

$$B = \frac{\text{Total uptake of nutrient in control plots}}{\text{STV of that nutrient in Control Plot}} \times 100$$

$$C = \frac{\text{Total uptake of nutrient in treated plots} - (\text{STV} \times B/100)}{\text{Fertilizer dose}} \times 100$$

With the help of soil and plant analysis and yield data, the basic data for targeted yield of sunflower are given below in table 4.

The basic data shows that for production of one quintal of grain 4.64 kg N ha^{-1}, 130 kg P_2O_5 $ha^{-1}$and 5.66 kg K_2O ha^{-1}were required. The contributions of N, P2O5 and K_2O from the soil were 7.91, 5.56 and 4.55 per cent, respectively.

Using the data of table 1, the following simple fertilizer requirement equations for the pre-set yield targets of sunflower were worked out as:

Fertilizer nitrogen (kg N ha^{-1}) = 5.34 x pre-set yield target (Qha^{-1}) – 0.091 x soil test value (Organic carbon %)

Fertilizer phosphorus (kg P_2O_5 ha^{-1}) = 7.44 x pre-set yield target (Qha^{-1}) – 0.32 x Soil test value (Olsen's P kg P_2O_5 ha^{-1})

Fertilizer potassium (kg K_2O ha^{-1}) = 4.64 x pre-set yield target (Qha^{-1}) – 0.037 x Soil test value (Amm. Acet-K kg K_2O ha^{-1})

It was clearly indicated that as the soil test values for the nutrient increased, the nutrient requirement for the given yield target decreased. However, at a given soil test value, nutrient requirement increases with increasing level of yield targets. It was also found that nutrient application based on soil test values for targeted yield by following the recommended package of practices for sunflower, it is possible to achieve the pre-set yield targets within a known variation (±10 %) provided the targets are not unduly high (Randhawa and Velayutham, 1982).

Range of soil test values utilized for the fertilizer requirement was 0.96-1.75% organic carbon, 284.64-489.15 kg N ha^{-1} available nitrogen, 15.02-83.00 kg P_2O_5 ha^{-1}available phosphorus and 184.90-385.40 kg K_2O ha^{-1}available potassium. These equations therefore will be applicable normally within these limits of soil test values and pre-set yield targets of sunflower variety GK 2002 in Tarai region of Uttarakhand only.

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Effect of INM treatments on growth, yield and nutrient content of wheat under sodic environment

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Abstract

The integrated use of inorganic fertilizer along with organic sources positively affected the growth, yield and nutrient contents (N, P, K, S and Zn) of wheat crop. The soil application of inorganic fertilizer with organic sources as 120 kg ha-1 nitrogen, 26 kg ha^{-1} phosphorus and 60 kg ha-1 potassium + either 10 t ha^{-1} press-mund or in combination with green manuring may be suggested to the cultivators for obtaining higher production of wheat crop under sodic environment.

Introduction

The soil is not an in exhaustive source to supply nutrients regularly to the ever-growing crops. The farm production at the present level depleted every year about 20-30 million tones of nutrients in addition to 8.4 million tones of nutrients lost through soil erosion alone. Soil fertility surveys indicate that nitrogen deficiency of is universal in most of the Indian soils. Deficiency of phosphorus is next in order. Application of potassium has been avoided for a long period in many soils of the indo-Gangetic plains because of micaceous nature of soil clay. It now appears that K is also becoming limiting in this highly productive region. Sulphur deficiency is also emerging in many areas particularly in the pulses and oil seed crops. Deficiency of Iron and Zinc has also emerged in intensively cropped areas of Northern India which causes shriveled rice and wheat grain and reduces yields. This at every harvest of the wheat crop, deficiency of N, P, K, S and micro-nutrients is incurred in the soil. This needs to be augmented continuously efficient nutrient management stratigies. Hence keeping the above aspects in view, the present investigation entitled "Effect of INM treatments on growth, yield and nutrient content of wheat under sodic environment" was conducted in Etah district during the rabi season of 2003-04.

Materials and Methods

A field experiment was conducted in alkali soil of Etah district (U.P.) during the Rabi season of 2003-04. The field experiment was carried out with eleven treatments of organic sources and inorganic fertilizer as T_0- Control, T_1- $N_{90}P_{19.5}$ K_{45} (75% NPK), T_2- $N_{120}P_{26}$ K_{60} (100% NPK), T_3- $N_{90}P_{19.5}$ K_{45} (75% NPK) + 10 ton/ha FYM, T_4- $N_{90}P_{19.5}$ K_{45} (75% NPK) + 10 ton/ha press-mund, T_5- $N_{90}P_{19.5}$ K_{45} (75% NPK) + green manuring, T_6- $N_{90}P_{19.5}$ K_{45} (75% NPK) + wheat residue, T_7- $N_{120}P_{26}$ K_{60} (100% NPK) + 10 ton/ha FYM, T_8- $N_{120}P_{26}$ K_{60} (100% NPK) + 10 ton/ha press-mund, T_9- $N_{120}P_{26}$ K_{60} (100% NPK) + green manuring and T_{10}- $N_{120}P_{26}$ K_{60} (100% NPK) + wheat residue. The treatments were replicated three times of following randomized block design. The soil having pH 9.0, EC 0.23 dS/m, organic carbon 0.25% available N, P, K and S is140.5, 20.65, 194.0, and 12.8 kg/ha, respectively and Zn 2.50 mg/kg. the recommended seed rate of 120 kg/ha in wheat was used sowing on 26Nov., 2003 and equal amount of water was supplied to every plot at the time of irrigation. Seed and straw sample were collected at harvest and separately analyzed for N, P, K, S and Zn content as per standard procedures.

Results and Discussion

Table 1: Effect of different treatments on growth and yield of wheat crop

Treatments	Tillers/meter row length (No.)	Plant Height (cm)	Grain yield (t/ha)	Straw yield (t/ha)
T_0	75.5	80.7	0.98	2.05
T_1	86.3	88.1	2.78	3.64
T_2	88.2	88.2	3.88	4.15
T_3	89.3	88.5	3.19	4.05
T_4	93.2	89.3	3.23	4.35
T_5	94.7	89.7	3.25	4.33
T_6	89.1	88.4	3.45	4.78
T_7	98.5	90.2	4.26	4.65
T_8	98.7	90.4	4.28	4.81
T_9	98.8	90.8	4.32	4.95
T_{10}	98.3	90.1	4.12	4.47
SEm±	1.89	2.08	0.29	0.28
C.D. at 5%	3.87	4.26	0.61	0.58

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Table 2: Effect of different treatments on N, P, K, S and Zn content in wheat grain and straw

Treatments	Nutrient content in grain					Nutrient conntet in straw				
	N (%)	P (%)	K (%)	S (%)	Zn (mg/kg)	N (%)	P (%)	K (%)	S (%)	Zn (mg/kg)
T_0	2.27	0.597	0.480	0.131	14.0	0.296	0.028	1.54	0.117	11.5
T_1	2.47	0.610	0.492	0.139	16.5	0.363	0.043	1.94	0.119	13.5
T_2	2.63	0.622	0.504	0.156	18.5	0.406	0.046	2.20	0.122	14.0
T_3	2.78	0.646	0.534	0.169	21.5	0.448	0.051	2.42	0.127	16.0
T_4	2.89	0.651	0.542	0.172	23.0	0.455	0.056	2.37	0.129	16.5
T_5	2.93	0.648	0.545	0.171	23.5	0.468	0.053	2.43	0.128	17.0
T_6	2.66	0.640	0.515	0.168	21.0	0.427	0.045	2.13	0.125	15.5
T_7	2.96	0.664	0.558	0.189	25.0	0.522	0.059	2.74	0.136	18.5
T_8	3.01	0.692	0.573	0.192	26.5	0.528	0.063	2.75	0.138	19.0
T_9	3.03	0.680	0.582	0.190	27.5	0.538	0.060	2.89	0.137	19.5
T_{10}	2.94	0.652	0.554	0.183	24.0	0.471	0.056	2.72	0.130	17.5
SEm±	0.049	0.006	0.004	0.027	1.23	0.038	0.015	0.04	0.003	1.25
C.D. at 5%	0.100	0.012	0.009	0.054	2.61	0.079	0.030	0.08	0.007	2.55

The integrated use of organic sources with inorganic fertilizer significantly increased the number of tillers (per meter row length) and plant height of wheat crop. The maximum numbers of tillers (per meter row length) and plant height was recorded with T9 treatments (Table 1). The data supported by Bacon and cooper (1985).

The application of NPK fertilizer alone or in combination with organic sources significantly affected the grain and straw yield of wheat crop (Table 1). The highest grain yield received from T8 and T9, whereas the treatmentT9 precede superior in case of straw yield of wheat crop. The findings are supported by Singh and Yadav (2001).

The integrated use of organic sources with inorganic fertilizer significantly increased the nitrogen content in grain and straw of wheat crop as compared to control (Table 2). Over all, the maximum nitrogen content was observed (3.53%) with T9 treatments. The results were confined with Yaduvanshi (2001) and Chand et al. (2004).

Application of inorganic fertilizer with or without organic sources significantly enhanced the phosphorus content in grain and straw of wheat crop in comparison to control. In case of phosphorus content in treatment T8 proved more effective in enhancing the P content in grain (0.68%) and straw (0.062%) of wheat in Table 2.integrated use of organicsources with inorganic fertilizer levels exhibited significantly on potassium content of wheat crop. The maximum potassium ulilization was observed with T9 treatments with respect to grain and straw of wheat crop (Table 2).

Application of organic sources with inorganic fertilizer significantly influenced the concentration of sulphur of wheat crop (Table 2). The T8 treatment gave better performance regarding sulphure content in grain and straw of wheat crop. The data supported by Akbari (2002).

The different rates and combination of inorganic fertilizer with organic sources enhanced the zinc content in grain and straw of wheat crop in Table 2.

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Effect of fertility levels & moisture conservation practices on performance of barley under rain fed condition in central U.P.

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Abstract

A field experiment was conducted on sandy loam soil at Kanpur to study the performance of rain fed barley in relation to moisture conservation practices& fertility level under rain fed condition. Water use efficiency and economic of barley, revealed best results both with respect to yield and water use efficiency with application of 60 kg N + 30 kg P_2O_5 + 30 kg K_2O and paddy straw mulch @ 3 tone/ha.

Introduction

Barley (Hordium vulgare L.) is an important crop of rabi season. In up barley occupied an area about 3.31 lacks ha and average yield is 21.26 q/ha. it has also estimate that about 47 million ha of land is timely problematic with respect to moisture scarcity and has been classified as dry land area. Barley crop is largly grown on marginally and sub marginally land with frequent irrigation. Fertility being a costly input in agriculture, effort should be concentrated to make their used efficacious through suitable method aimed at maximizing fertilizer use efficiency. High fertilizer efficiency warrants that fertilizers application should be synchronized with physiological stages of plant growth. Mulches are answer to the mulch waxes problem of moisture conservation in soil. They serve as insulating material against heat or cold and serve as physical barriers at surface against soil moisture losses (Kanitkar et al., 1960). Keeping in the view the present investigation was carried out under rain fed condition with fertility levels and moisture conservation practices on barley crop.

Materials and Methods

The field experiment was conducted during rabi season in same condition in first year 1999-2000 and second year 2000-2001 at soil conservation and water management farm, C.S.A. Univ. & Tech., Kanpur. The treatments consisted of nine combinations with three moisture conservation practices and three fertility levels viz. (i) Control (farmer practices) M0 (ii) Inter culture (M1) (iii) Paddy straw mulch @ 3 tone/ha (M2) and three fertilitylevels viz. (i) Control, 0 kg N + 0 kg P_2O_5 + 0 kg K_2O (F_0) (ii) 30 kg N + 15 kg P_2O_5 + 15 kg K_2O (F_1) (iii) 60 kg N + 30 kg P_2O_5 + 30 kg K_2O (F_2). The treatment were replicated thrice in randomize block design. The soil was deep well drained sandy loam with organic carbon 0.27%, total available nitrogen 0.027%, available P_2O_5, 16.8 kg/ha available K_2O 195.0 kg/ha and pH 7.7. The values of field capacity, permanent wilting point and bulk density were 18.52%, 7.6% and 1.46%, respectively. The plot size was (5.0m x 3.6m). barley variety Lakhan was sown in rows 22.5 cm apart with recommended seed rate of 100 kg/ha. the total rainfall during crop period was 146.8 in 1999-2000 and nil in 2000-2001. The soil moisture content determined by the thermo gravimetrically using the samples collected from 0-25, 25-50, 50-75 and 75-100 cm depth at different stages of crop growth. The moisture used by the crop under different treatment was computed by formula WUE = Y/ET

Results and Discussion

Effect of fertilizer application

Application of 60 kg N + 30 kg P_2O_5 + 30 kg K_2O (F_2) significantly improved growth character of barley viz. plant height, no. of tillers/plant (Table 1) and yield attributing characters viz. no. of spike/plant, no. of grains/spike, weight of grain/spike, test weight (Table 2), yield contributing characters viz. grain and straw yield over control (Table 3). This may be attributed to better growth and yield attributes characters due to supply of balance fertilizer dose. A similar observation has been reported by Thakur and Shekhar (1982). F_2 treatment also recorded highest water use followed by F_1 and it was lowest under F_0 treatment. Similar observation reported by Bhan et al. (1995).

Effect of moisture conservation

The effect was more pronounced in paddy straw mulch @ 3 tonnes/ha. M_2 treatment followed by inter culture (M_1 treatment) and lowest under control (Mo treatment). This may be due to more availability of moisture and better was water use efficiency by barley crop when grown with proper moisture conservation practice (Table 3). This finding is confirmed by Prasad et al. (1995), Sachan (1987) and Prasad and Singh (1998).

Water use was found highest under M_0 followed by M_1 lowest under M_2 treatment in contrast the water

Table 1: Effect of fertility levels and moisture conservation practices growth on barley

Treatment	Plant height								No. of tillersat maturity	
	1999-2000				2000-2001				1999-2000	2000-2001
	30 days	60 days	90 days	Maturity	30 days	60 days	90 days	Maturity		
Fertility levels										
Control(0kgN+0kgP_2O_5+okgK_2O)	3.75	26.6	56.30	56.16	3.15	25.75	58.62	58.39	3.72	5.85
0kgN+0kgP_2O_5+okgK_2O	3.98	27.00	64.40	64.22	3.82	27.37	61.08	61.08	5.21	7.51
0kgN+0kgP_2O_5+okgK_2O	4.36	28.70	70.80	70.52	4.23	28.64	64.44	63.48	5.99	8.64
SEm±	0.94	0.93	3.55	3.65	0.14	0.55	1.21	1.22	0.63	0.45
C.D. at 5%	2.0	1.96	7.54	7.74	0.30	1.71	2.56	2.56	1.33	0.95
Moisture conservation practice										
Control	3.84	25.85	59.50	59.30	3.84	26.34	59.97	58.80	4.30	6.38
Interculture	4.05	27.42	65.60	65.30	3.84	27.15	61.42	60.80	4.82	7.32
Paddy straw mulch @ 30 ton ha^{-1}	4.22	28.37	66.50	66.36	4.02	28.30	61.59	62.40	5.79	8.30
SEm±	0.94	0.93	3.55	3.65	0.14	0.55	1.21	1.22	0.63	0.45
C.D. at 5%	2.0	1.96	7.54	7.74	0.30	1.71	2.56	2.56	1.33	0.95

Table 2: Effect of fertility levels and moisture conservation practices yield attributing on barley

Treatment	No. spiklet/ spike		No. of spike/ plant		Weight of spike (g)		No. of grain/ spike(g)		Weight of grain/ spike(g)		1000 seed weight (g)	
	1999-2000	2000-2001	1999-2000	2000-2001	1999-2000	2000-2001	1999-2000	2000-2001	1999-2000	2000-2001	1999-2000	2000-2001
Fertility levels												
Control(0kgN+0kgP_2O_5+okgK_2O)	14.06	14.94	3.60	4.48	2.10	2.32	38.33	39.54	1.76	2.65	46.48	46.73
0kgN+0kgP_2O_5+okgK_2O	15.57	16.59	4.41	5.33	2.51	2.86	44.10	47.21	2.09	3.25	48.45	48.43
0kgN+0kgP_2O_5+okgK_2O	16.85	17.31	5.26	6.12	2.80	3.13	50.18	50.38	2.50	3.31	49.50	49.58
SEm±	0.27	0.39	0.41	0.21	0.12	0.11	2.53	0.95	0.07	0.15	0.41	0.83
C.D. at 5%	0.56	0.84	0.86	0.44	0.24	0.23	5.34	2.02	0.14	0.32	0.87	1.76
Moisture conservation practice												
Control	14.06	16.54	3.76	4.88	2.35	2.51	40.14	42.01	1.99	2.79	47.62	47.49
Interculture	16.67	16.62	4.67	5.35	2.37	2.84	46.03	46.28	2.13	3.05	48.08	48.29
Paddy straw mulch @ 30 ton ha^{-1}	15.94	16.68	4.84	5.92	2.69	2.96	46.33	48.81	2.24	3.17	48.72	48.96
SEm±	0.27	0.39	0.41	0.21	0.12	0.11	2.53	0.95	0.07	0.15	0.41	0.83
C.D. at 5%	0.56	0.84	0.86	0.44	0.24	0.23	5.34	2.02	0.14	0.32	0.87	1.76

use efficiency use found highest under M_2 treatment followed by M_1 and lowest under M_0. This may be due to more moisture conservation in treated plot where moisture conservation practices was adopted (Table 3). These findings are supported by Chaudhary (1996) and Singh (1998).

Interaction effect

Application of fertilizer (F_2) treatment along with moisture conservation practices treatment (M_2) have positive effect on growth characters and yield attributes of barley crop. The water use efficiency also increased with application of fertilizers (F_2) and moisture conservation practice (M_2) under different fertility levels. The highest water use efficiency (13.50 kg seed/ ha/mm and 17.58 kg seed/ha/mm) was recorded under F_2 followed by F_1 (10.82 kg seed/ha/mm and 15.69 kg seed/ha/mm) and lowest under F_0 (8.38 kg seed/ha/mm and 12.07 kg seed/ha/mm) in first year and second year respectively. In case of moisture conservation practices M_2 shows maximum water use efficiency (13.42 kg seed/ha/mm and 17.51 kg seed/ha/mm) followed by 11.64 kg seed/ha/mm and 15.37 kg seed/ha/mm) lowest in M_0 (9.68 kg seed/ha/mm and 12.6 kg seed/ha/mm) in first and second year respectively (Table 3).

Economics

The cost of cultivation was highest in F_2 fertility treatment followed by F_0 and F_1 among moisture conservation treatment highest cost of cultivation was recorded in order of $M_2>M_1>M_0$. The application of highest dose of fertilizer in M_2 conclusion increased cost

Table 3: Effect of fertility levels and moisture conservation practices on yield contributing water use efficiency and economics on barley

Treatment	Grain yield 1999-2000	Grain yield 2000-2001	Straw yield 1999-2000	Straw yield 2000-2001	Consumptive water 1999-2000	Consumptive water 2000-2001	Water use efficiency 1999-2000	Water use efficiency 2000-2001	Total cost of 1999-2000	Total cost of 2000-2001	Gross return 1999-2000	Gross return 2000-2001	Net return 1999-2000	Net return 2000-2001
Fertility levels														
Control(0kgN+0kgP_2O_5+okgK_2O)	15.98	18.24	31.38	31.25	190.63	151.00	8.38	12.07	8510.7	8510.7	11485.4	12969.9	2974.7	4459.2
0kgN+0kgP_2O_5+okgK_2O	21.41	24.61	41.03	43.11	167.87	156.80	10.82	15.69	8980.7	8980.7	15296.9	19017.6	6316.3	10036.9
0kgN+0kgP_2O_5+okgK_2O	18.49	28.01	53.98	48.80	210.98	159.30	13.50	17.58	9092.7	9092.7	20299.8	21605.1	11207.7	12512.4
SEm±	1.03	0.75	1.56	1.50										
C.D. at 5%	2.18	1.59	3.31	3.18										
Moisture conservation practice														
Control	19.25	20.45	37.08	35.37	198.86	162.00	9.68	12.62	8085.7	8085.7	13770.7	14235.0	5685.0	6149.3
Interculture	22.48	23.91	42.96	39.30	193.00	155.60	11.64	15.37	8892.7	8892.7	16050.6	19409.1	7157.9	10516.4
Paddy straw mulch @ 30 ton ha^{-1}	25.14	26.50	46.34	46.48	187.34	151.30	13.42	17.51	9605.7	9605.7	17796.5	20487.0	8191.8	10881.3
SEm±	1.03	0.75	1.56	1.50										
C.D. at 5%	2.18	1.59	3.31	3.18										

of cultivation. However, net return was highest in F_2 and M2 treatment and the increase in grain and straw production increase the net return in F_2 and M_2 treatment.

Conclusion

After straitening and analysis of the data of investigation, it was found that to achieve the maximum yield and return from barley crop under rain fed condition in central U.P., the application of fertilizer @ 60 kg N + 30 kg P_2O_5 + 30 kg K_2O/ha along with application of mulch @ 3 tones/ha was found suitable practices for growing barley crop as comparison to other practices of fertility levels and moisture conservation. The above treatments also increased the water use efficiency of barley crop.

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Suggestions of rural women for making "Total sanitation campaign" effective

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Abstract

Largest population of our country lives in the villages, their main problem is not only to get "Roti, Kapra and Makan" but also to enjoy them and this is not possible without good health, which is the result of sanitation practices. No other modality of routine life is more important than health and sanitation, which is affecting the largest population of India. In the present efforts were also made to get the suggestions from the rural women, in order to explore the possible solutions of various constraints faced by them. Total 400 rural women, 200 women from group A and 200 women from group B, categories were randomly selected from Bikaner and Nagore district from Rajasthan. Due to constraints, suggestions were given by the respondents according to them more number of women should be in administration reasons of this was women help them wherever required and women easily meet them and women also suggested that toilet pit size should be large because it was not useful for long time and large sized family. Trainer's language was not understood by the women, so they suggested that process of any technical information should be in simple method and language should be in simple and local.

Introduction

"Total Sanitation Campaign" is basically the branch of Public health, which is concerned with keeping the rural environment healthful. The broad aim of the programme is to improve proper sanitation in rural package of services of the programme includes rural sanitation like, sanitary complex, school toilet, Anganbari toilet, and individual toilet. The National Sample Survey (1988-89) puts the sanitation coverage in terms of household latrines at only 11 per cent in rural India.

Health hazards associated with sanitation are one of the major causes of child Related diseases in India. As per WHO, diarrhea, which spreads easily in poor Sanitary conditions is one of the three top fatal diseases claiming about 2.5 lakh Children annually. Rajasthan is also grappling with the problem of unsanitary Conditions in schools, ignorance of correct hygiene related practices such as hand Washing, appropriate storage, handling of water and eatables. Poor health of Child is also a major impediment in enrolment in schools especially girl child. SHE programme in India aims to promote sanitation and hygiene in and through schools to bring about behavioral change to enable children to live in a safe and healthy environment. SSHE is one of the important components of TSC, which require provision of toilet facilities with water supply and hand washing in all government schools. This will ensure that children will learn good hygiene behavior and through then the message of sanitation and hygiene shall reach the community and the family, which will trigger the demand for other components of TSC.

To achieve this objective a lot of intersectoral co-ordination in various state government departments such as PHED, Rural Development, PRIs, Education department, Health department, Women & Child department is required. As part of TSC, comprehensive projects to provide hardware facilities in all schools and to take up the necessary software activities by pooling all resources of the line departments are required to be prepared. In this context, the Education Department of Rajasthan has prepared an action plan for implementation of SSHE.

Methodology

The present study was conducted in eight villages of Bikaner and Nagore districts from Rajasthan. Total 400 rural women were selected from two groups, group A and group B. Group A was consisted of district where T.S.C. was fully operational and group B was having district where the T.S.C. was yet to gain the proper working.

The data was collected through personal interview technique with a structured schedule prepared and pre-tested for the present study.

Results and Discussion

To get an overview of constraints, many suggestions were given by the respondents from both groups.

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Table 1: Suggestions to overcome the constraints related to administration.

S. No.	Item	Group 'A' N=200 F	%	Group 'B' N=200 F	%
1.	T.S.C. programme should be done by the women groups at village level	120	60	100	50
2.	Anganwadi worker should join and motivate the rural women	50	25	60	30
3.	Youth club should joined TSC and work	50	25	60	30
4.	More number of women should be in administration	140	70	180	90
5.	Sapranch should not join T.S.C.	180	90	160	80
6.	Sanction of toilet should be done by the block coordinator	60	30	50	25
7.	Gramsevak participation should be minimum	80	40	90	45

Table 2: Suggestions to overcome the problems related to training

S. No.	Item	Group 'A' N=200 F	%	Group 'B' N=200 F	%
1.	Training should be done timely in village	80	40	90	45
2.	Information of training should be timely	90	45	60	30
3.	Training periods should be increased	120	60	80	40
4.	Training of vermin-culture should be separated for the women	180	90	160	80
5.	Trainers language should be simple	200	100	200	100
6.	Technical information's should be simple method	180	90	160	80

Table 1 reveals that 90 and 80 percent respondents from both the groups suggested that their sarpach should not joined T.S.C. because sarpanch dose work according to their profit and in group B most of the respondents like 90 percent suggested that number of women should be in administrations reason of this was, women help them wherever required and respondents easily meet them, they know about the village and also understand the family conditions and women requirements. Around 25 percent and 30 percent from both group suggested that anganwadi workers and youth club should join T.S.C, which can work more effectively as compared to gramsevak and sarpanch. 40 percent and 45 percent respondents from groups A & B said that gramsevak participations should be minimum because gramsevak did not work properly.

Table 2 shows that 100 percent respondents from group A and also 100 percent from group B suggested that trainers language should be in simple way and local, this may be understood that women do not properly understand all method and process of any technical information, so it should be in simple method and training of vermin-culture should be separated, the cause this of problem were due to several reasons, foremost amongst them was that absence of any help from man and they generally suffer from insecurity and loneliness. 40 percent and 45 percent told that training should be timely in the village and information of training should be timely

Table 3: Suggestions to over come the constraints related to implementation

S. No.	Item	Group 'A' N=200 F	%	Group 'B' N=200 F	%
1.	Raw material of sanitations should be available at village level	160	80	90	45
2.	Contact should be door to door	60	30	40	20
3.	Teacher should give attention on children sanitation	90	45	80	40
4.	Prize should be fixed in sanitary mart	180	90	160	80
5.	Mason should be trained	60	30	80	40

it was felt from 45 percent and 30 percent of the respondents from both groups.

Table 3 shows that about 90 percent and 80 percent of respondents from both groups recommended that prize should be fixed in sanitary mart and 80 percent and 45 percent suggested that raw material of sanitation should be available at village level, the suggestion given to problem had several reasons that if raw material of sanitation should be available at village level then it will facilitate them to get material easily and it will save their money and time. Few of respondents suggested that contact should be door to door, its reasons that to it will provide time to time information regarding sanitation, 45 percent and 40 percent suggested that teacher should give the attention on children sanitation because this will motivate children for their sanitation.

Conclusion

On the basis of findings it could be concluded that large number of women reported that women groups' participation should be at village level because they know about the village and also understand the family conditions and women requirement, which can work more effective as compared to gramsevak and sarpanch. Women were not proper understand all method and process of any technical information regarding vermin-culture so it should be in simple method and training should be separated for them, because of problems were due to several reasons, foremost amongst there was that absence of any help from man and they generally suffer from insecurity and loneliness .Raw material of sanitation should be available at village level, the suggestion given to problem had several reasons that if raw material of sanitation should be available at village level then it will facilitate them to get material easily and it will save their money, and time. Few of respondents suggested that contact should be door to door, its reasons to that it will provide time to time to information regarding sanitation.

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Studies on the effect of Nitrogen source and Sulphur levels on growth and yield of Isabgol (*Plantago ovata* Forsk)

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Introduction

Bond Psyllium *(Plantago ovata* Forsk) commonly known as Isabgol, is short stemmed annual herb belonging to the family plantaginaceae which attains height of 10-45 cm and an important cash crop cultivated for its export value. The white skin of the seed (20-25% aprox.) is used for producing medicines, the grain of Isabgol contains approximate 30 per cent mucilage and hemicelluloses, which is mainly composed of xylose, arabinose, galacturinic acid, raminose, and gallactose. It also has a high water absorbing capacity and therefore, used as an anti-diarrhoea drug, the seeds having cooling and demulcent effect used in ayaurvedic, unani and allopathic medicine. The seed stabilizer husk is used as cattle feed and contain about 17-19 per cent protein. India dominates the world market in production and export of Psyllium.

About 200 species of Isabgol have been identified in the world, out of which ten species are commonly cultivated in the India. Among ten species *Plantago ovata* is the most common species cultivated in our country. Approximately 35000 tonnes of Isabgol produced in India annually and about 25-80% produce is exported to various countries like – USA, UK, Spain, Belgium and France. The low fertility and decline in soil fertility are the main reason of low productivity of most of the cultivated lands (Pillai *et al.*, 1985). Application of nitrogen along with FYM plays an important role in crop production as it is an essential plant nutrient.

Material and Methods

An experiment was conducted at the research farm of Shri F.H. (PG) College, Nidhauli Kalan, Etah during rabi season of 2007-08. The experiment was laid out in Randomized Block Design with 4 replications. The experiment consisted of sixteen treatment combinations involving four nitrogen source (100% through urea, 75% through urea + 25% through FYM, 50% through urea + 50% through FYM and 25% through urea + 75% through FYM) and four sulphur levels (0, 20, 40 and 60 kg ha^{-1}). A recommended dose of 30 kg N ha^{-1} nitrogen was applied through urea and FYM as per treatments. Urea was applied at the time of sowing and FYM incorporated in soil and sulphur was applied as per treatments through gypsum three weeks before sowing.

Results and Discussion

Effect of integrated use of nitrogen:

The result showed that different treatments, nitrogen through urea + FYM had a almost good effect on number of tillers per plant, plant height and dry matter accumulation. The values of these parameters were observed significantly higher under 25% N through urea + 75% N through FYM as compared to all other treatments. These findings are in agreement with Bhutia and Singh (1990).

Effect of sulphur:

Applications of sulphur enhance the number of tillers per plant, plant height and dry matter accumulation

Table 1 : Effect of integrated use of nitrogen and sulphur levels on plant stand and number of tillers/plant

Treatments	Plant stand/m row length		Number of tillers/plant		
	25 DAS	At harvest	60 DAS	90 DAS	At harvest
Nitrogen levels (30 kg N ha^{-1})					
100% through urea	12.05	11.85	5.32	5.35	4.96
75% through urea + 25% through FYM	12.31	12.20	6.13	6.20	5.98
50% through urea + 50% through FYM	12.26	12.13	6.69	6.80	6.56
25% through urea + 75% through FYM	12.27	12.01	6.98	7.17	6.92
CD at 5%	NS	NS	0.31	0.36	0.35
Sulphur (kg ha^{-1})					
0	11.90	11.80	5.71	5.91	5.60
20	12.52	12.25	6.25	6.29	6.05
40	12.32	12.21	6.57	6.64	6.36
60	12.14	11.93	6.59	6.68	6.41
CD at 5%	NS	NS	0.31	0.36	0.35

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Table 2: Effect of integrated use of nitrogen and sulphur levels on plant height and dry matter accumulation at different stages of crop growth

Treatments	Plant height (cm)			Dry matter/m row length (g)		
	60 DAS	90 DAS	At harvest	60 DAS	90 DAS	At harvest
Nitrogen levels (30 kg N ha^{-1})						
100% through urea	18.01	27.69	29.86	8.61	25.11	37.33
75% through urea + 25% through FYM	20.34	30.67	32.86	9.89	28.87	42.92
50% through urea + 50% through FYM	22.30	32.59	34.77	11.00	32.06	42.67
25% through urea + 75% through FYM	23.61	34.23	36.56	11.59	33.83	50.31
CD at 5%	1.14	1.71	1.69	0.52	1.65	2.29
Sulphur (kg ha^{-1})						
0	17.86	28.34	29.98	8.50	26.39	39.53
20	20.80	31.10	32.96	10.16	29.36	44.25
40	22.64	32.78	35.46	11.19	31.80	46.94
60	22.96	32.97	35.65	11.25	32.31	47.51
CD at 5%	1.14	1.71	1.69	0.52	1.65	2.29

Table 3: Effect of integrated use of nitrogen and sulphur levels on yield attributes, yield and harvest index

Treatments	Spikes /plant	Grains /plant	Test weight (g)	Yield (qha^{-1})			Harvest Index (%)
				Grain	Straw	Boomass	
Nitrogen levels (30 kg N ha^{-1})							
100% through urea	27.16	50.03	2.22	5.9	46.9	52.80	11.12
75% through urea + 25% through FYM	34.18	57.99	2.11	7.2	55.1	62.40	11.58
50% through urea + 50% through FYM	38.67	64.31	2.26	7.1	59.3	67.2	11.60
25% through urea + 75% through FYM	41.57	68.52	2.24	8.2	61.8	70.03	11.77
CD at 5%	0.34	0.96	NS	0.56	1.34	0.98	0.58
Sulphur (kg ha^{-1})							
0	31.98	46.32	2.18	6.0	46.0	51.7	11.60
20	34.98	59.66	2.09	7.1	53.8	60.9	11.44
40	36.88	67.22	2.29	7.3	56.4	63.8	11.50
60	37.74	67.64	2.26	7.8	57.1	64.6	11.56
CD at 5%	0.34	0.96	NS	0.49	1.18	0.90	0.52

at all the growth stages. Similar result were observed by Singh *et al.* (1987).When increasing levels of Sulphur applied up to 40 kg ha^{-1} recorded better improvement in different parameters number of spikes per plant, number of grains per spike and grain, straw and biological yield per hectare. These results were found with close conformity by Arora, Singh 1987.

Conclusion

On the basis of above results and discussion it maybe concluded that 25% N through urea + 75% N through FYM and 40 kg ha^{-1} Sulphur may applied to get maximum production of *Plantago ovata.*

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Effect of Varieties and Fertility levels on Growth and Green pod yield of OKRA (Abelmoschus esculertus(2) Mochch)

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Abstract

An experiment was conducted to study the effect of varieties and fertility levels. The yield attributing parameters such as weight of pods plant, average weight of pod and diameter of pod were found to be higher with variety VRO-6 whereas no. of pods plant^{-1} and length of pod were found to be more in variety varsha uphar during summer season. Among the fertility levels more plant height, weight of pod plant^{-1} average weight of pod, length of pod were found with high fertility levels i.e. 120:80:80 Kg NPK ha^{-1} with the variety VRO-6 during summer season.

Introduction:

Okra (Abelmoschus esculentus L.) commonly known as Bhindi is one of the most widely Spread malvaceaus vegetable crop and grown in tropical and subtropical parts of the world and round the year indifferent regions of India. Northern part of India, including Eastern part of U.P., Okra is predominantly raised in summer and rainy seasons to maintain the continuous supply of Okra. Generally yield of Okra in rainy season drop is quite high as compared to summer season crop. Total area under Okra cultivation in India is 4.3 lakh bec : with production of 40.31 lakh tones and productivity is 9.37 tonnes ha^{-1} by Singh and Verma (1998). Okra green pods contains 1.19 gm protein 0.2 g fat, 1.5 Mg, Iron, 56 Mg phosphorus 66 mg Calcium, 103 Mg Potassium, 88 IU. Vitamin-A and 13 Mg Vitamin-C on the basis of 100 g of edible portion of pods (Aykroyd, 1963). During the period of growth and development of a plant nutrients have vital role for operating the normal physiological functions. For higher economic yield, balanced nutrient supply is one of the key factor. Nitrogen and phosphorus along with potassium are the primary and Major nutrients which are required large quantities for healthy growth of the plant. Some workers have also been reported about the response of these nutrient. On the different varieties of Okra at different places Rani et al 1999, but information regarding the major nutrients i.e. N.P.K are meager for agroelimatic conditions of Western U.P., on improved varieties like Parbhani Kranti Varsh Uphar, VRO-6, and NDO-10 particularly under Agra condition.

Materials and Method

The present investigation was carried out during the year 2005 at Agricultural Research farm Shri F.H.(P.G.) College Nidhauli, Kalan Etah (U.P.) with the main objectives to find out the suitable variety and fertility better growth and green pod production during summer seasons. The experiment was conducted in randomized block design with factorial concept and replicated thrice. The treatments consisting of four varieties (Parbhani Kranti, Varsh Uphar, VRO 6 and NDO 10) and four fertility levels of NPK (60:40:40, 80:50:50, 100:60:60, and 120:80:80 Kg ha^{-1}). Okra seed were sown in month of 7th March in summer season and 28th June in rainy season, 2005. Recommended cultural practices were adopted time to time and the coarse of investigation and observations pertaining to vegetative growth, yield attributing parameters and green pod yield/g/ha) were recorded.

Economics of the Okra cultivation was also calculated.

Results and Discussion

It is evident from Table 1 the variety and fertility level influenced the growth characters markedly. Maximum height of plant was measure in varieties NDO-10 and Varsa Uphar during summer season as 60 and 90 days after sowing, respectively. Number of leaves was significantly influenced due to variety. The maximum values was recorded under variety Varsa uphar in summer season. More number of branches was found in variety Varsa Uphar.

The height of plant increased with increasing fertility levels during summer season at 60 and 90 days after sowing. The maximum height of plant was measured with higher fertility level (120 :80 :80 Kg ha^{-1}) in comparison to lower fertility levels. Number of leaves plant^{-1} was significantly influenced due to fertility. The higher values were counted with application of NPK @ 120 :80 : 80 Kg ha^{-1} at 60 and 90 days after sowing. Application of NPK @ 100 : 60 : 60 Kg ha^{-1} gave maximum number of branches plant^{-1} recorded under F_3 and F_4 was found at par. Singh et al. (1997) observed the increasing nitrogen and phosphorus rate upto 150 Kg + 60 Kg. K produced maximum plant height, number of leaves and No. of branches plant^{-1}.

It is evident from Table (1 & 2) that the yield distributing parameters were significantly enhanced by varieties and fertility levels. Among the varieties, most of yield attributing parameters were higher under VRO-6 followed by Varsa Uphar and NDO-10 in summer

Table 1: Effect of Varieties and fertility levels on plant height, no. of leaves plant^{-1}, No. of branches plant^{-1}, and No. of pods plant^{-1}.

Treatments	Plant height (cm) 60	90	No. of Leaves Plant^{-1} 60	90	No. of branches Plant^{-1}	No. of pods Plant^{-1}
Fertility Levels:						
60:40P:40K	28.23	65.25	9.72	14.95	4.08	10.12
80:50P:50K	32.69	25.57	10.28	16.55	4.45	11.01
100N:60P:60K	40.69	86.25	10.81	17.92	4.83	11.81
120:80P:80K	42.22	92.57	11.12	17.72	4.78	11.62
SEM±	0.29	0.56	0.08	0.27	0.17	0.31
CD at %	0.84	1.62	0.24	0.78	0.49	0.88
Varieties:						
Prabhani Kranti	34.80	81.16	10.17	16.59	4.35	10.68
Varsh Uphar	36.75	81.37	10.82	17.37	4.94	12.01
VRO 6	32.84	76.24	10.28	15.98	4.34	10.80
NDO 10	39.44	80.87	10.67	17.20	4.52	11.15
SEM±	0.29	0.56	0.08	0.27	0.17	0.31
CD at 5%	0.84	1.62	0.24	0.78	0.49	0.88

Table 2: Effect of Varieties and fertility levels on length of pods (cm), diameter of pod(cm), wt. Of pod plant^{-1}, Av. Wt. of pod (cm) and green pod yield (q ha^{-1}).

Treatments	Length of pods (cm)	Diameter of pod (cm)	Wt. of pods Plant^{-1}	Av. Wt. of pod (gm)	Green pod yield (q/ha)
Fertility Levels:					
60:40P:40K	13.15	1.45	102.48	10.19	103.76
80:50P:50K	13.54	1.48	115.32	10.40	116.76
100N:60P:60K	13.73	1.50	125.74	10.67	127.33
120:80P:80K	13.77	1.47	127.44	10.94	129.05
SEM±	0.16	0.02	3.80	0.22	3.85
CD at 5%	0.48	1.45	10.98	0.63	11.11
Varieties:					
Prabhani Kranti	13.60	1.47	107.95	10.14	109.34
Varsh Uphar	13.75	1.45	119.69	10.02	121.18
VRO 6	13.58	1.50	123.37	11.38	124.91
NDO 10	13.25	1.47	119.96	10.67	121.46
SEM±	0.16	0.02	3.80	0.22	3.85
CD at %	NS	NS	10.98	0.63	11.11

season. Increasing fertility levels increased the number of pod plant^{-1}, weight of pods plant^{-1} average weight of pods, length of pod and diameter of pod. Maximum no. of pods plant and diameter of pod were found under 100 : 60 : 60 Kg NPK ha^{-1} followed by higher fertility level (120 : 80 : 80 Kg ha^{-1}) NPK was produced more no. of pods plant^{-1}, length of pod, diameter of pod, average weight of pod and weight of pod plant^{-1} and these yield attributing parameters were slightly reduced under 100 : 60 : 60 Kg ha^{-1} NPK, Paliwal et al. (1999).

Greem pod yield (q ha^{-1}) was significantly influenced due to variety and fertility level during summer season. The maximum green pod yield (q ha^{-1}) of Okra was recorded under variety VRO-6. Fertility level had significant response on the total green pod yield (q ha^{-1}). The maximum green pod yield (q ha-1) was found with the application of NPK @ 120 : 80 : 80 Kg ha^{-1} followed by 100 : 60 : 60 Kg ha^{-1}.

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Major problems experienced by the farmer in availing and utilizing the fertilizers

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Abstract

The present study was conducted in Sikandra Rao and Akrabad blocks of Aligarh district of Uttar Pradesh with the total sample size was of 240 respondents i.e. small, medium and large farmers. To identify the problems of farmers in the study area. Seven major problems of the farmers were observed i.e. high cost of fertilizers in all categories farmers, it was ranked in Ist availability of credit facilities and agricultural inputs at proper time, it was ranked in IInd in case of medium farmers, ranked Vth in large farmers and VIth ranked in small farmers, lack of proper storage facilities, it was ranked in IIIrd, in case of large farmers, ranked in Vth, small farmers and ranked in Ivth medium farmers, non availability of irrigation facilities at proper time, it was ranked in IInd in case of small and marginal farmers and IIIrd ranked in medium farmers. Risk orientation, it was ranked in IIIrd in case of small farmers, ranked in Vth medium farmers and ranked in IVth large farmers. Non availability of pure variety seed, it was ranked in IVth in case of small farmers and ranked in VIth medium and large farmers. Economic problems, it was ranked in VIth in case of small farmers, while ranked in Viith in medium and large farmers.

Introduction

Agriculture is the most crucial and pivotal sector of Indian economy during the current phase of its development after more than four decades of planning the picture today with respect to food production is not very encouraging as regards keeping pace with population expansion. There is a considerable gap between the present knowledge of the farmers and that which is being so rapidly developed by agricultural scientist. So research on methods of accelerating the fertilizer use of agricultural innovations is urgently needed to raise the agricultural production. Keeping the above into consideration this study was undertaken with the specific objective as below

1. To study the training faced by different categories of farmers.

Research Methodology

This study was conducted in Sikandra Rao and Akrabad block of Aligarh district. Two villages were randomly selected from each block. A total of 240 respondents have been selected amongst three categories viz. small, medium and large size of the farmers. The data were collected with the help of pre-tested schedule and questionnaire by personal interview method. The data collected were analyzed with the help of parametric and non- parametric statistical tests.

Results and Discussion

The results pertaining to various aspects of constraints/problems faced by different categories of farmers at the time of fertilizer use are presented in Table 1.

Table 1 indicates that in case of small farmers, the most important constraints being experienced by 70 per cent is low production. This was closely followed by another important constraints namely 'high cost of fertilizer' (65 per cent), sudden need (58.75 per cent), non-availability of irrigation (57.50 per cent), risk orientation (53.75 per cent), luck of resources (47.50 per cent), non-availability of credit and input and price of grain at harvest are generally much lower than at later period (46.25 per cent) respectively.

In case of medium famers the most important constraints being experienced is high cost of fertilizer (81.25 per cent).the another important but understandable constraints are price of grain at harvest generally much lower that at later period (62.50 per cent) followed by lack of managerial resources (60.00 per cent), low production and absence of facility for procurement of grain by government agency (58.75 per cent), high cost of fertilizer (56.25 per cent), small size of the farm (55.00 per cent), non-availability of credit and input factor (53.25 per cent), respectively.

Among the large farmers the most important constraints in price of grain at harvest are generally much lower than at later period (87.50 per cent). This is closely followed by another important but understandable constraints namely lack of managerial resources (81.25 per cent). The other constraints namely shortage of labour (77.50 per cent), high cost of fertilizer (75.00 per cent), absence of facility for procurement of grain by government agency (68.75 per cent), non-availability of irrigation (67.50 per cent), lower production (65.00 per

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Table 1: Constraints problems faced by the respondents at the time of fertilizer use in different crops

S.No. Constraints Perceived	Category of holdings Small N = 80	Medium N = 80	Large N = 80
1. Non-availability of pure variety	35 (43.75)	28 (35.00)	21 (26.25)
2. Rist Orientation	43 (53.75	32 (40.00)	38 (47.50)
3. Laziness	25 (31.25)	26 (32.50)	24 (30.00)
4. Lack of profitable marketing system	18 (22.50)	22 (27.50)	45 (56.25)
5. Non-availability of credit and input	37 ((37.50)	43 (53.75)	30 (37.50)
6. Economic problem	30 (37.50)	24 930.000	18 (20.50)
7. High cost of fertilizer	52 (65.00)	65 (81.25)	60 (75.00)
8. Lack of resources	38 (47.50)	34 (42.50)	29 (36.25)
9. Shortage of labour	15 (18.75)	42 (52.50)	62 (77.50)
10. Lack of managerial resources	32 (40.00)	48 (60.00)	65 (81.25)
11. Sudden need	47 (58.75)	36 (45.00)	30 (37.50)
12. Bad weather effect	20 (25.00)	31 (55.00)	26 (40.00)
13. Small area under the crop	55 (68.75)	44 (55.00)	32 (40.00)
14. long distance of the farm	14 (17.50)	20 (25.00)	27 (33.75)
15. Due to low production	56 (70.00)	47 (58.75)	52 (65.00)
16. Non-availability of irrigation	46 (59.50)	41 (51.25)	59 (67.50)
17. Price of grain at harvest are generally much lower than at later period	37 (46.25)	50 (62.50)	70 (87.50)
18. Absence of facility for procurement of grain by Government agency	29 (36.25)	47 (58.75)	43 (53.75)
19. Lack of proper storage facilities	31 (38.75)	38 (47.50)	43 (53.75)

Note: More than one problems/constraints have been experienced by the respondents, hence total percentage exceeds to 100.

cent), lack of profitable marketing system (56.25 per cent) and lack of proper storage facilities (53.75 per cent), respectively.

Conclusion

The study revealed that most important constraints were low production, high cost of fertilizer and low price of grain at harvest. The prices were found generally much lower than the off season price as revealed by small, medium and large farms.

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