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# Extention & Development Activities for Enhancing Adoption of Integrated Pest Management (IPM) Technologies among Chilli Farmers of Karnataka-India

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**Abstract**

*The study was conducted in Chickmagalore and Kadur taluks of Chickmagalore District of Karnataka state. Integrated Pest Management Practices in Chilli during 2013 and 2014. Study reveals that use of drip irrigation, fertigation technology, and management of pests & Diseases, Drying & grading for marketing and use of foliar nutrition in Chilli brought the benefit cost ratio for Chilli IPM farmers compared to farmers' of traditional practice, from 1.47 to 1.83. Whereas increasing yield in farmers who were under Extention & Development Activities Team was 810 Kg of Red Chilli per acre compared to 750 Kg of red Chilli in non-IPM farmers. Adoption of IPM technologies was increased to 65.42 percent among the farmers who were under Extention & Development Activities.*

Key Words; IPM, Drip Irrigation, Chilli, Extention, Pest Management.

## Introduction

Vegetables constitute about 55 per cent of horticultural crop production in the country with a total production of 85 million tonnes which is estimated to cross 100 million tonnes in near future. Successful cultivation of vegetables is hampered due to the incidence of several insect pests. Cultivation of hybrids, improved varieties, intensive agronomic practices, off season cultivation and indiscriminate use of insecticides has changed the pest complex in these crops.

*Chilli is considered as one of the commercial spice crops. It is the most widely used universal spice, named as wonder spice. Different varieties are cultivated for varied uses like vegetable, pickles, spice and condiments. In daily life, chilies are integral and the most important ingredient in many different cuisines around the world as it adds pungency, taste, flavor and color to the dishes. Indian chilli is considered to be the world famous for two important commercial qualities its colour and pungency level.*

The largest producer of chillies in the world is India accounting for 11 lakh tons of production annually followed by China with a production of around 4 lakh tons. Mexico and Pakistan produces 3 lakhs tonnes each of chili every year.In India, Chilli was grown on an area of 8.82 Lakh ha and annual production of 11.0 lakh tones and with an average productivity of 1200 kg/ha (Anon., 2002). Among Chilli producing states in the country Andhra Pradesh stands first in the list of leading chilli-producing states in India and also constitutes the maximum acreage for chilli cultivation in the country. It occupies 49% share in the Indian total production and produces around 2.7 lakh tons of chillies followed by Orissa (18%), Karnataka (15%), Maharashtra (6%), West Bengal (5%), Rajasthan (4%) and Tamil Nadu (3%) (www.ikisan.com).

Karnataka state stands 3rd in contribution of Chilli production to country. We have different chilli varieties such as Byadagikaddi, Byadagidabbi, Guntur(G-4) , Pusa jwala, KDSC-1, etc. are cultivated by farmers, however Byadagi & Guntur varieties has been recommended for cultivation. These varieties gaining the popularity among the farmers of the state also, because of chillies are famous for red colour because of the pigment 'capsanthin,' others are known for biting pungency attributed to 'capsaicin.

Among them occurrence of viral diseases as well as ravages caused by insect pests are significant ones (Gundannavaret al2007). The pest spectrum in chilli is complex with more than 293 insects and mite species debilitating the crop in the field as well as in storage (Anon, 1987). Amongst these, aphids, Myzus persicae Suler.,Aphis gossypii Glover., thrips, Scirtothrips

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doraslis Hood., yellow mite, Polyphagotarsonemus latus Banks and fruit borer, Helicoverpa armigera Hubner are the most vital production constraints. A total of 39 and 57 insect pests were recorded in chillies in Karnataka on nursery and field crops, respectively (Reddy and Puttaswamy, 1983 and 1984). During the last two decades insecticidal control of chilli pests in general and especially in irrigated crop characterised by high pesticides usage, has posed problems of residues in the fruits (Nandihalli 1979 and Joiaet al 2001). Besides pest resurgence, insecticide resistance and destruction of natural enemies (Mallikarjuna Rao and Ahmed, 1986), both domestic consumption and export of chilli necessitate production of quality chillies devoid of contamination of pesticides, industrial chemicals and aflatoxins. The pesticide consumption is in down trend in cotton with the introduction of Bt cotton but not the case of chilli. Many instances the dry chilli exports from Indian market were rejected because of pesticide residue problem. Hence, the need of the popularization of IPM technology in Chilli is felt. The project was started with the special objective of educating chilli farmers of nine selected villages in Chickmagalore & Kadur Taluks of Chickmagalore district of Karnataka on rational use of crop protection chemicals in an integrated pest management approach and thereby reduces the problem of pesticide residues in the harvested produce.

## Research Methodology

A study on enhancing IPM technology in Chilli was conducted in two predominantly Byadagikaddi,variety of Chilli growing Taluks Chickmagalore and Kadur taluks of chickmagalore District in Karnataka from from June 2013. The Training programmes and field advisory visits on IPM in Chilli was conducted in 9 villages of the two Taluks with 50 Chilli farmers. The selected farmers were briefed about, the IPM technology and its importance in initial group meetings with the selected farmers. Continuous field visits was done by the Extention team. Regular feedback on progress of the crop, pest and disease incidence was collected from the field. Regular interaction meetings were conducted with farmers to integrate appropriate IPM technologies into their existing cultivation practices.

IPM technology for Chili: The schedule for Integrated Pest Management in Chilli has been standardized at International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Hyderabad. By following the IPM, the disease and insect pest incidence were reduced to negligible. The number of sprays of pesticides was reduced to about 4 (botanical+ chemical) as compared to 6 chemical sprays in non-IPM plots. Among various insect pests, thrips, aphids, mites and fruit borers in chilli, are of prime importance.

Thrips;These minute and soft bodied insects are polyphagous, cosmopolitan, and occur throughout the year. Both nymphs and adults lacerate the leaf tissues and feed on the oozing sap. Usually young leaves are preferred, but buds and flowers also get infested. The infested leaves become shortened, curl upwards, and crinkle. Under severe infested conditions the leaves shed and hence plant growth is affected. Buds, when infested, become brittle, petals of the flowers become brown and drop off. Infested fruit have light brown scars.

Management: Seed treatment with imidacloprid (Gaucho) @ 5 grams per kg seed. In the field, spray with imidacloprid @ 1 ml in 3-4 liters of water or fipronil @ 2 ml per liter

Mites; These are tiny insects that live on tender foliage, buds and fruits by sucking the plant sap. These are found mostly on the lower surface of leaves in a protective web. Under severe infestation of chillies the leaves curve downwards and fruit turns brownish with hardened skin.

Management: Spray with miticides such as dicofol @ 5 ml per liter or wettable sulphur 3 grams per liter or Pegasis @ 1 gm per liter or Vertemic @ 0.5 ml per liter. Use overhead irrigation with sprinklers for effective management of mites wherever possible.

Aphids; These tiny insects can infest the crops at any time during the growing season. They look like minute dark specks and tend to gather around the shoot tips, flower buds and all over young foliage. Aphids also leave sticky excreta on leaves that they have been feeding on, which could help in the development of fungal molds. Aphid infestation results in stunted or deformed growth.

Management: An easy solution is to spray a very weak soap solution. This works well, although frequent application may affect crop growth. Ladybird beetles and hover flies are natural predators of aphids. Trying to attract them into these fields is the best way to naturally control the pests. Planting bright flowers such as marigolds around the chilli plots is a novel way to attract these natural enemies. In case of severe infestation, application of dimethoate @ 2 ml or acephate @ 1 gram per liter or imidacloprid @ 1 ml in 3-4 liters can effectively manage aphids.

Fruit borers; Fruit borers are highly polyphagous and cosmopolitan in distribution. These normally start infesting chilli crop around flowering time. Young larvae feed on leaves by scraping chlorophyll, while grown-up larvae feed on leaves and fruits resulting in holes. Well grown Spodoptera larvae are nocturnal in habit and hide in the soil during the day time.

Management:Installation of pheromone traps for Spodoptera litura and Helicoverpa armigera are of

ICRISAT Hyderabad IPM module

| Activity | Stage of crop | Management option |
|---|---|---|
| Seed treatment | Sowing time | Imidacloprid (Gaucho) @ 5 grams per kg seed |
| Management of sucking pests | Nursery | Imidacloprid @ 1 ml in 3-4 liters of water or fipronil @2 ml per liter. |
| Sowing trap crops | At the time of transplanting | Sunflower and marigold as border crop . |
| Installation of pheromone traps and bird perches | At the time of transplanting | Two traps per location for each species About 25 perches/ha |
| Management of thrips in main crop | Transplanting to one month before harvest | Overhead irrigation with sprinklers wherever possible .Imidacloprid @ 1 ml in 3-4 liters of water or fipronil @ per Ltr of Water |
| Management of mites | In the nursery and main crop | Overhead irrigation with sprinklers wherever possible. Spray one of these chemicals once in the nursery and second time in the main crop – dicofol @ 5 ml per liter or wettable sulphur 3 grams per liter or Pegasis @ 1 gm per liter or Vertemic @ 0.5 ml per liter |
| Management of fruit borers | Flowering stage | Application of neem fruit powder extract @ 25 kg ha-1 NPV @ 500 LE/ha, Bt 4 ml per liter. |
| Management of pod borers | Fruiting stage | Setting poison baits for Spodoptera Spray indoxacarb @ 1 ml per liter or spinosad @ 0.3 ml per liter |
| Arresting immigrating Spodoptera | Crop maturity stage | Erecting polythene fence around the field (4 inches above ground) |
| Management of pod borers | During crop maturity | NPV @ 500 LE/ha, Bt (dipel @ 4 ml per liter) or spinosad @ 0.3 ml per liter |
| Anthracnose | Green fruit stage | Thiophonate methyl 1 g per liter /Mancozeb 2.5 g per liter / Tilt 1ml per liter / Antrcol 2g per liter |
| Powdery mildew | Flowering and fruiting Stage | Dinocap 1 ml per liter/ wettable sulfur 3g per liter |

immense value in monitoring this pest. Planting sunflower along the borders can attract ovipositing moths, thereby saving the main crop from infestation. Use of poison baits (8:1:1 bran, jaggery and chloripyriphos) and placing them close to the plants proved effective in controlling immigrating Spodoptera caterpillars (25 kg bait is sufficient for one ha). Foliar spray with Bacillus thuringiensis (Bt) at recommended. application of indoxacarb @ 1 ml per liter or spinosad @ 0.3 ml per liter will be effective. Also, for Spodoptera and Helicoverpa, application of nuclear polyhedrosis virus (NPV) @ 500 LE per ha at the early stage of the pest infestation proved to be an effective control.

*A. Sampling area*

Total Nine villages (Five Villages from Chickmagalore Taluk & Four Villages from Kadur Taluk) in Chickmagalore district where the project activities carried were purposively selected.

*B. Selection of the Respondents;*

50 farmers from nine villages having 175.74 Acre cultivable land & growing Byadagikaddi variety of Chilli

| S. No | Village / Taluk | Taluk | Number of Farmers | Total Cultivable Are (Acre) | Chilli Area |
|---|---|---|---|---|---|
| 1 | Kunnalu | Chickmahalore | 10 | 20.50 | 17 |
| 2 | Sirabidagi | Chickmahalore | 5 | 22.98 | 14 |
| 3 | Uddeboranahally | Chickmahalore | 5 | 15.35 | 9.20 |
| 4 | Karisiddanahally | Chickmahalore | 5 | 13.71 | 9.33 |
| 5 | Kenganahally | Chickmahalore | 5 | 11.36 | 7.30 |
| 6 | Govindapura | Kadur | 5 | 14.20 | 10 |
| 7 | Chikkangla | Kadur | 5 | 28.34 | 16 |
| 8 | Shakunipura | Kadur | 5 | 22 | 11 |
| 9 | Yammedhoddi | Kadur | 5 | 27.30 | 17.20 |
| | Total | 9 | 50 | 175.74 | 111.03 |

in 111.03 Acre were selected.

*C. Data collection tools and procedures;*

A questionnaire was developed for the purpose was used for the survey. The questions were asked in Kannada and were used for collecting responses from the project farmers. The data were collected from the respondents through personal interview with the help of interview schedule. Necessary precautions were taken to ensure that the questions in the schedule were unambiguous, clear, concise, complete, and comprehensive. The respondents were contacted in person mostly at the common place in the village.

*D. Statistical Analysis;*

The data collected for the study was tabulated, processed and analysed using simple statistical tools like frequency and percentage.

## Results and Discussion

Table 1 indicates that a majority of farmers (78 %) started using drip irrigation for the improvement of crop when compared to only 24 % before the implementation of the project. Also a considerable improvement in parameters like fertilization technology, management of pests & Diseases at various stages, drying & grading of Red Chilli for marketing were improved over the 'before implementation' of the project. The use of NPV for control of fruit borer showed 38 per cent adoption compare to 12 % before the project. Technology like mulching in Chilli was adopted by 14 % of the farmers before the implementation of the project. But a drastic improvement (48 %) has been achieved in adoption of mulching technology through IPM technology project once the farmers realized its importance in water, weed, and labor and pest management. This achievement could be possible because of the Extention & Development Activities of Extention Team.

It is implied from Table 2 that the 78 % of the farmers attended more than two training programmes conducted by the Extention Team on IPM in Chilli with extension agents and scientists was good. This is because extension agents and scientists showed the importance of the technologies, and its timely application in the field to achieve more economic returns. It has been realized by the farmers that regular contact with scientists will definitely paves the way for gaining a lot from them.

It is evident from the table 3 the components of IPM technologies like reduction in chemical sprays, considerably reduction in the environmental pollution, health hazards and improves the marketability of the Red chilli achieving higher economic returns. Reduction in usage of chemicals, frequency of sprays and unnecessary usages of chemicals has been thoroughly communicated to the farmers to achieve more economic returns. Accordingly project area farmers could get Rs 1.83 for every rupee invested compared

Table 1**:** Enhance in adoption of IPM technologies. (N= 50)

| *Sl. No.* | *Technology components* | *enhance in Adoption of technology* | | | |
|---|---|---|---|---|---|
| | | Before project implementation | | After one year of project implementation | |
| | | Freq (n) | Percent adoption | Freq (n) | Percent adoption |
| 1. | Mulching in Chilli | 14 | 28 | 24 | 48 |
| 2 | Use of drip for irrigation | 24 | 48 | 39 | 78 |
| 3 | Fertigation technology | 26 | 52 | 37 | 74 |
| 4 | Use of NPV for control of fruit borer | 6 | 12 | 19 | 38 |
| 5 | Management of pests & diseases at various stages | 28 | 56 | 38 | 76 |
| 6 | Preparation on enriched FYM | 23 | 46 | 33 | 66 |
| 7 | Drying & Grading of fruits for marketing | 27 | 54 | 39 | 78 |

Table 2: Farmers Participation in Trainings of IPM on Chilli (N=50)

| Sl. | 1-2 times | | More Than 2 times | |
|---|---|---|---|---|
| No. | Freq (n) | % | Freq (n) | % |
| 1. | 12 | 24 | 39 | 78 |

Table 3: Economic improvement in Chilli cultivation through IPM

| Sl. No | Particulars | Non IPM farmer | IPM farmer |
|---|---|---|---|
| 1 | No. of plant protection chemical sprays | 06 | 4 |
| 2 | Reduction in no. of chemical sprays | - | 2 |
| 3 | No. of biological sprays | 0 | 1 |
| 4 | No. of micronutrient sprays | 0 | 1 |
| 5 | Yield Kg per acre | 750 | 810 |
| 6 | Cost of plant protection chemicals/acre | Rs 2544 | Rs 1696 |
| 7 | Rate obtained per kg of Red Chilli | Rs 80 | Rs 90 |
| 8 | Total Revenue per acre | Rs 60000 | Rs 72900 |
| 9 | Total cost per acre | Rs 40541 | Rs 39693 |
| 10 | Net profit | Rs 13459 | Rs 24709 |
| 11 | Benefit cost ratio | 1.47 | 1.83 |

· Specific for the Red Chilli Kaddi variety grown during August 13 to April 2014,
· Economics have been worked out for the district of Chickmagalore.

to only Rs 1.47 in case of farmers earlier practices. A considerable improvement in economic returns as well as awareness regarding hazardous chemicals among the farmers has been achieved in this project. This in turn a lesson for fellow farmers of same villages as well as neighboring district Chilli farmers. chilli are without chemical residues(Analysis report from Spices Board, Ministry of commerce Govt of India Kochi India enclosed) and preferred by the consumers in the market.

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