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Influence of organic manure on growth attributes of CIM Saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based Agroforestry system

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Abstract

A field experiment was conducted at the Herbal Garden of Indira Gandhi Krishi Vishwavidyalya Raipur, Chhattisgarh, India, from 2019– 2020. It was laid out in a randomized block design with nine organic nutrient management treatments were T1 FYM 100% (5t/ha), T2 Vermicompost 100% (2.5 t/ha), T3 Neem cake 100% (2t/ha), T4 FYM 75% (3.75t/ha) + Vermicompost 25% (0.625t/ha), T5 FYM75% (3.75t/ha) +Neem cake 25%(0.5t/ha),T6 Vermicompost 50%(1.25t/ha) + Neem cake 50%(1t/ha) , T7 FYM 50%(2.5t/ha) + Neem cake 25%(0.5t/ha) + Vermicompost 25%(0.625t/ha), T8 FYM 25% (1.25 t/ha) +Neem cake 50% (1t/ha) +Vermicompost 25% (0.625 t/ha) T9 control (No manures). In case of different organic manure it was in order of plant height $T_1>T_2>T_4>T_7>T_5>T_8>T_6>T_3>T_9$ at 30, 60, 90 days after transplanting and 30, 60, 90 days after 1st harvesting. It was in order of number of branches $T_1>T_2>T_4>T_7>T_5>T_8>T_6>T_3>T_9$ at 30, 60, 90 days after transplanting and 30, 60, 90 days after 1st harvesting. The results indicated that the collar diameterper plants of Tulsi were significantly affected by the application of organic manures FYM under Eucalyptus. In 1st harvesting collar diameter per plant in T_1 showed maximum diameter in mm at 30,60, 90 days after transplanting. Similar the 2nd harvesting collar diameter per plant in T_1 showed maximum diameter in mm at 30, 60, 90 days after1st harvesting.

Keywords: Organic manure, crop growth parameters, and agroforestry system

Introduction

In agroforestry systems there are both ecological and economical interactions between the different components. Agroforestry dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. In particular, agroforestry is crucial to smallholder farmers and other rural people because it can enhance their food supply, income and health. Agroforestry systems are multifunctional systems that can provide a wide range of economic, socio cultural, and environmental benefits.

Sim saumya (*Ocimum basilicum*) is belongs to the family of Lamiaceae. Its scientific name is (*Ocimum basilicum)* Sim saumya Tulsi is native to tropical and subtropical Asia. It is the short, annual, heavily flowered plant that was originally introduced to the US as "Holy Basil" and it is the most common type found in cultivation in the US. It is a perennial plant and can grow between 12 to 24 inches tall as well. The leaves turn purple in color in case of Krishna Tulsi variant. It requires regular watering. Sim saumya (sometimes spelled Tulsi) or Tulsi, is an aromatic perennial plant Tulsi is cultivated for religious and traditional medicine purposes, and for its essential oil. It is widely used as an herbal tea, commonly used in Ayurveda, and has a place within the Vaishnava tradition of Hinduism, in which devotees perform worship involving holy basil plants or leaves.

Eucalyptus tereticornis tree belongs to Myrtaceae family native to Australia, and adapted too many different habitats. It is the most popular choice

to be planted along the edges, or bunds of agricultural field and appears to be well incorporated and accepted in agroforestry in India (Tejwani, 1994**)** for the paper and pulp. The tree grows to a height of 20 to 50 metres with a girth of up to 2 meters dbh. The trunk is straight and is usually un-branched for more than half of the total height of the tree. Thereafter, limbs are unusually steeply inclined for a *Eucalyptus* species. The bark is shed in irregular sheets, resulting in a smooth trunk surface coloured in patches of white, grey and blue, corresponding to areas that shed their bark at different times.

Materials and Methods

A field experiment was carried out during season 2019– 2020 in Herbal Garden of Indira Gandhi Krishi Vishwavidyalya Raipur, Chhattisgarh to study the effect of different organic manure on CIM Saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based Agroforestry system. It was laid out in a randomized block design with nine organic nutrient management treatments were T1 FYM 100% (5t/ha), T2 Vermicompost 100% (2.5 t/ ha), T3 Neem cake 100%(2t/ha), T4 FYM 75% (3.75t/ ha) + Vermicompost 25% (0.625t/ha), T5 FYM75% (3.75t/ha) +Neem cake 25%(0.5t/ha),T6 Vermicompost 50%(1.25t/ha) + Neem cake 50%(1t/ ha),T7 FYM 50%(2.5t/ha) + Neem cake 25%(0.5t/ ha) + Vermicompost 25%(0.625t/ha), T8 FYM 25% (1.25 t/ha) +Neem cake 50% (1t/ha) +Vermicompost 25% (0.625 t/ha) T9 control (No manures). The observations were made in Tulsi crop and Eucalyptus (*Eucalyptus tereticornis*) based Agroforestry system. Data was collected randomly selected plants per plots to represent the crop of each plot.

Results and Discussions

Growth Parameters of Tulsi crop

Plant height (cm)

Plant height of Tulsi crop was measures at 30, 60 and 90 days after transplanting .The data on the effect of different organic manure on the plant height of Tulsi (Var. CIM saumya) are presented in Fig.1 and 2. The plant height of CIM saumya was statistically significantly difference were observed among the different treatments in 1st harvesting and 2nd harvesting. The maximum plant height per plant was observed in T_1 100% FYM (66.33, 62.57 cm) followed by T_2 100% vermicompost (54.23, 48.83cm), T_4 75% FYM + 25 % Vermicompost (48.77, 45.37 cm) and minimum plant height was obtained in T_9 control no organic manure (40.70, 38.73cm) at both the cutting under 30 DAP

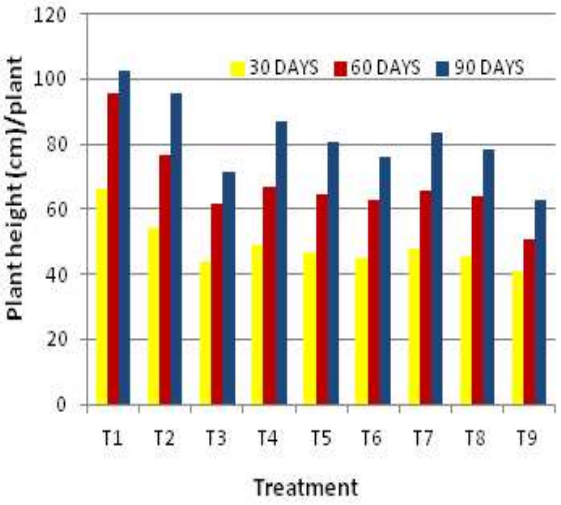

Fig. 1: Effect of different organic manure on plant height (cm)/plant of CIM saumya [*Ocimum basilicum*(L.)] of 1st harvesting under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

and 30 days after 1st harvesting. The maximum plant height per plant was observed in T_1 100% FYM (95.73, 76.73 cm) followed by T_2 100% vermicompost (76.30, 68.83cm), T_4 75% FYM+25% Vermicompost (66.73, 50.17cm) and minimum plant height was obtained in T_9 control no organic manure (50.70, 42.47cm) at the both the cutting under at 60 DAP and 60 days after 1st harvesting. The maximum plant height per plant was observed in T_1 100% FYM (102.53, 97.77 cm) and followed by T_2 100% vermicompost (95.70, 78.33 cm) , T_4 75% FYM + 25 % Vermicompost (86.93, 61576 cm) and minimum plant height was obtained in

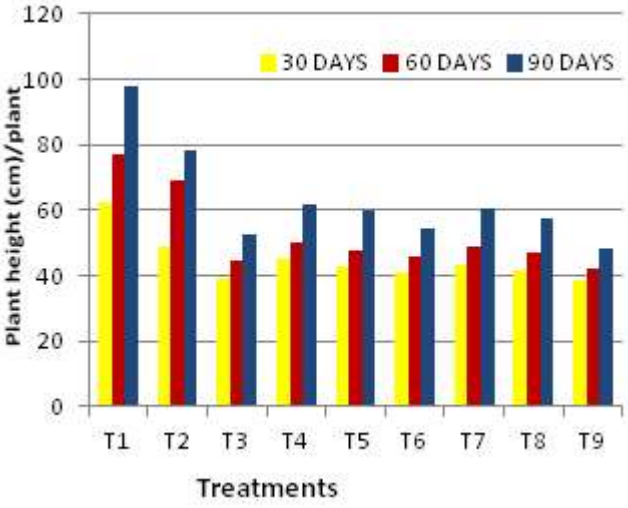

Fig. 2: Effect of different organic manure on plant height (cm)/plant of CIM saumya [*Ocimum basilicum*(L.)] of 2nd harvesting under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

T_9 control no organic manure (62.93 48.57cm) at both the cutting under 90 DAP and 90 days after 1st harvesting. Similar finding results were cited by Pramanik et al. (2007). The plant height was higher where cow dung was applied as manure and lowest in control. In another study carried out by Vijaya Rachel and Sirisha (2016). Increasing in plant height might be attributed due to the effect of organic fertilizer that improves physical, chemical, and biological properties of soil; that is, increasing soil organic matter, cation exchange capacity, and water holding capacity and availability of mineral nutrients and, this in turn, increases plant height.

No. of branches plant-1

Number of branches of Tulsi crop was measures at 30, 60 and 90 days. The data presented in Fig. 3 and 4 clearly showed the number of branches per plant indicated that significant variation observed due to application of different organics manure treatments. In the both harvest all the treatment exhibited significant influence over the number of branches produced per plant. At 30 DAP maximum No. of branches per plant was observed in T_1 100% FYM (9.87) and followed by T_2 100% vermicompost (8.46), T_4 75% FYM + 25 % Vermicompost (7.66) and minimum no. of branches was obtained in T_9 control no organic manure (1.97). At 60 DAP maximum No. of branches per plant was observed in T_1 100% FYM (14.87) followed by T_2 100% vermicompost (13.76), T_4 75% FYM + 25 % Vermicompost (12.43) and minimum No. of branches was obtained in T_9 control no organic manure (5.83). At 90 DAP maximum No. of branches per plant was observed in T_1 100% FYM (18.06) and followed by T_2 100% vermicompost (16.60) , T_4 75% FYM + 25 % Vermicompost (15.36) and minimum No. of branches was obtained in T_9 control no organic manure (8.70). At 30 days after 1st harvesting maximum No. of branches per plant was observed in T_1 100% FYM (8.66) followed by T_2 100% vermicompost (7.86) , T_4 75% FYM + 25 % Vermicompost (6.83) and minimum No. of branches was obtained in T_9 control no organic manure (1.87). At 60 days after 1st harvesting maximum No. of branches per plant was observed in T_1 100% FYM (14.13) and followed by T_2 100% vermicompost (11.57) , T_4 75% FYM + 25% Vermicompost (10.53) and minimum No. of branches was obtained in T_9 control no organic manure (4.50). At 90 days after 1st harvesting maximum No. of branches per plant was observed in T_1 100% FYM (16.87) and followed by T_2 100% vermicompost (15.56), T_4 75% FYM + 25% Vermicompost (14.73) and minimum No. of branches was obtained in T_9 control no organic manure (6.86). Similar findings were cited by Khatik *et al.* (2001). The FYM doses were significantly superior over to control. Similar results were observed by Thakur and Kumar (2006).

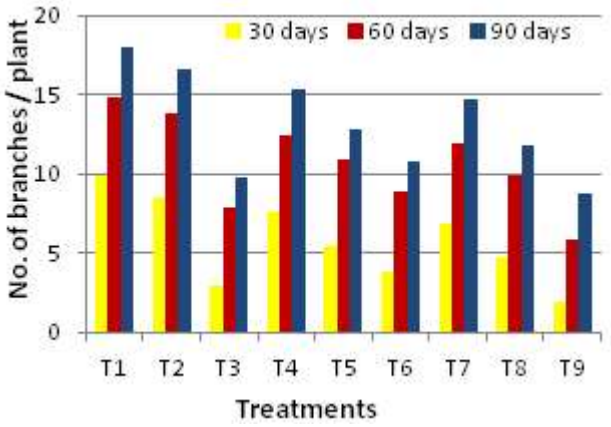

Fig 3: Effect of different organic manure on number of branches /plant in 1st harvesting of CIM saumya [*Ocimum basilicum*(L.)] under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

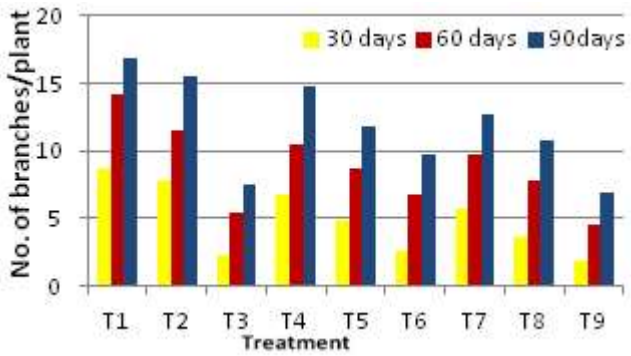

Fig 4: Effect of different organic manure on number number of branches / plant in 2nd harvesting of CIM saumya [*Ocimum basilicum*(L.)] under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

Collar diameter (mm)

Collar diameter of Tulsi crop was measured at 30, 60 and 90 DAP**.** The data presented in Fig. 5 and 6 showed the collar diameter (mm) per plant indicated the significantly influenced in different organic manure. In both harvesting all the treatments significantly influence the collar diameter.

1st harvesting

At 30 DAP maximum Collar diameter per plant was observed in T_1 100% FYM (11.93 mm) followed

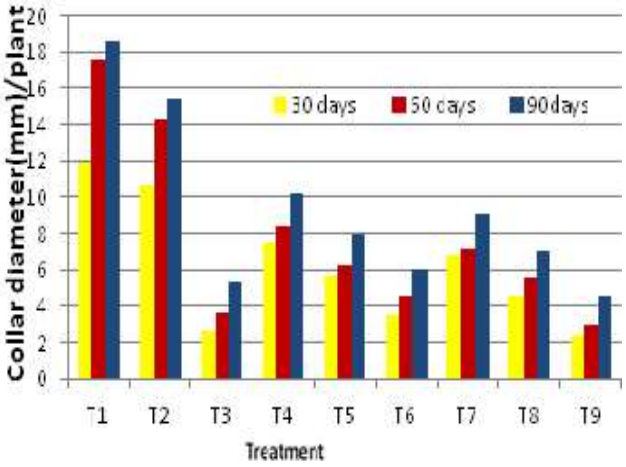

Fig 5: Effect of different organic manure on collar diameter (mm) / plant in 1st harvesting of CIM saumya [*Ocimum basilicum*(L.)] under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

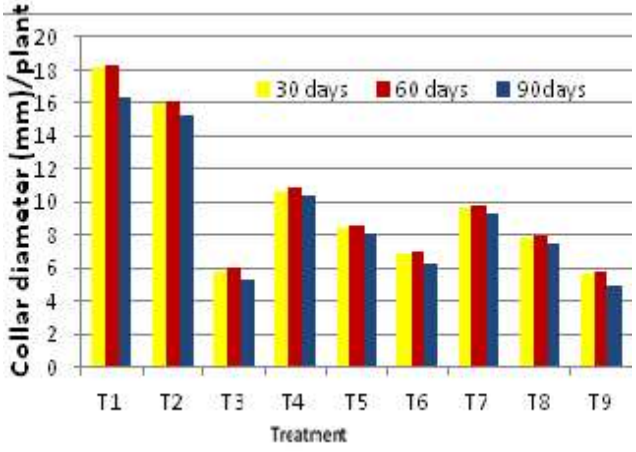

Fig. 6: Effect of different organic manure on collar diameter (mm) / plant in 2nd harvesting of CIM saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*)based agroforestry system

by T_2 100% vermicompost (10.63 mm), T_4 75% FYM + 25 % Vermicompost (7.47 mm) and minimum Collar diameter was obtained in T_9 control no organic manure (2.37mm). At 60 DAP maximum Collar diameter per plant was observed in T_1 100% FYM (17.6 mm) followed by T_2 100% vermicompost (14.27 mm), T_4 75% FYM + 25 % Vermicompost (8.43 mm) and minimum Collar diameter was obtained in T_9 control no organic manure (2.93 mm). At 90 DAP maximum Collar diameter per plant was observed in T_1 100% FYM (18.57 mm) and followed by T_2 100% vermicompost (15.97mm), T_4 75% FYM + 25 % Vermicompost (10.20 mm) and minimum Collar

Table 1: Growth characteristic of Eucalyptus (*Eucalyptus tereticornis*)

No. of tree	Before sowing		After harvesting	
	Height (m)	DBH(cm)	Height (m)	DBH(cm)
1	30.14	26.9	30.21	26.9
2	17.2	19.9	17.9	20.1
3	32.12	27.7	32.21	27.8
4	20.12	21.8	20.21	21.9
5	29.4	26.5	29.9	26.6
6	25.9	24.6	26.1	24.7
7	19.15	20.2	19.22	20.3
8	22.13	23.5	22.21	23.6
9	21.15	22.8	21.22	22.9
10	30.12	26.5	30.19	26.5
11	22.16	23.9	22.21	23.9
12	22.9	24.1	23.1	24.2
13	35.4	29.5	35.9	29.6
14	29.5	26.8	29.9	26.9
15	23.5	24.4	23.9	24.5
16	25.9	25.7	26.12	25.8
17	32.13	27.8	32.22	27.9
18	33.15	28.6	33.24	28.7
19	26.2	25.9	26.9	25.9
20	28.5	26	28.9	26.1
21	34.9	28.9	35.11	28.9
22	30.9	26.2	31.12	26.3
23	30.5	26.1	30.9	26.2
24	32.6	27	32.15	27.1
Average	27.31	25.47	27.54	25.55

diameter was obtained in T_9 control no organic manure (4.57 mm).

2nd harvesting

At 30 days after 1st harvesting maximum Collar diameter per plant was observed in T_1 100% FYM (18.23 mm) followed by T_2 100% vermicompost (15.97 mm), T_4 75% FYM + 25 % Vermicompost (10.70 mm) and minimum Collar diameter was obtained in T_9 control no organic manure (5.63mm). At 60 days after 1st harvesting maximum Collar diameter per plant was observed in T_1 100% FYM (18.33 mm) followed by T_2 100% vermicompost (16.10 mm), T_4 75% FYM + 25% Vermicompost (10.87 mm) and minimum Collar diameter was obtained in T_9 control no organic manure (5.83 mm). At 90 days after 1st harvesting maximum Collar diameter per plant was observed in T_1 100% FYM (16.37 mm) and followed by T_2 100% vermicompost (15.30mm), T_4 75% FYM+ 25 % Vermicompost (10.37 mm) and minimum Collar

diameter was obtained in T_9 control no organic manure (5.00 mm).

Tree growth parameter

Tree growth characteristic *i.e.* tree height (m) and DBH (Diameter at breast height) were recorded before sowing of Tulsi crop *i.e.* June 2019 and after the harvest of Tulsi crop *i.e.* December 2019 and data are presented in table 1.

Height (m)

It is clearly depicted in the above table 1 that average tree height growth of *Eucalyptus tereticornis* was observed as before sowing and after harvesting of CIM saumya. The before sowing average tree height was 27.31 m and after harvesting average tree height was 27.54 m.

Diameter at Breast Height (cm)

Table shows that the average tree DBH is 25.47 cm before transplanting of Tulsi and after harvesting the crop measure the average tree DBH is 55cm. Before sowing of Tulsi crop and after harvesting of crop respectively, the results showed that there was a minor difference in height and diameter. As a results, after the harvest of intercrops due to six months period did not showed much difference in height and diameter at breast height. Normally agroforestry practices of Eucalyptus with Tulsi crop reduced the growth parameter *viz;* Tree height and DBH (at breast height) as compared to pure plantation due to nutrient supply to rainfed farming. Similar results were observed by (Singh and Sharma 2007).

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