

## Effect of different organic manure on CIM Saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based Agro forestry system

YAMINI NETAM<sup>1</sup>, PRATAP TOPPO AND YEMAN DEWANGAN<sup>1</sup>

Deptt. of Forestry, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya Raipur (C.G.)

### Abstract

An experiment was carried out during season 2019– 2020 in Herbal Garden of Indira Gandhi Krishi Vishwavidyalaya Raipur, Chhattisgarh to study the effect of different organic manure on CIM Saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based Agro forestry 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 maximum herbage yield was obtain in T1 100% FYM (19.83t/ha) followed by T2 100% vermicompost (18.73t/ha) ,T4 75% FYM + 25 % Vermicompost ( 17.86t/ha) and minimum herbage yield was recorded in T9 control with no organic manure (11.73t/ha) at the first harvest and second harvesting also performed the same pattern of yield in all attributes. It was found that the highest gross returns (Rs 102212) and net returns per ha (Rs. 69780) were registered in T1 treatment with 100% FYM and the lowest were recorded in the T9 treatment with control zero fertilizer. The highest Benefit-cost ratio (3.15) registered in the T1 treatment with 100% FYM while the minimum (1.00) was obtained with T9 treatment with control zero fertilizer. The treatment - T1(100% FYM) gave colossal net realization Rs 69780 ha-1 and an unmatched B:C ratio (3.15).

**Keywords:** Organic sources, saumya yield, oil content, economics and agro forestry system

### Introduction

Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are used on the same land-management units as agricultural crops and animals, in some form of spatial arrangement or temporal sequence. 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, agro forestry 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.

CIM Saumya is belong to the family of Lamiaceae. Its botanical name is [*Ocimum basilicum* (L.)] . CIM Saumya Tulsi is local to tropical and subtropical Asia. It is a perennial plant and can grow between 30 to 130 cm tall. CIM Saumya (now spelled Tulsi) or Tulsi, is a perennial sweet-smelling Tulsi plant known for the purposes of religious and traditional medicine, and for its essential oil. It is usually used as a home-grown tea, widely used in Ayurveda, and includes a place inside Hinduism's Vaishnava convention where fans enjoy seeing blessed basil plants or leaves.

Tulsi [*Ocimum basilicum* (L.)] is believed the “Queen of Herbs”, the Legendary, “Incomparable One” is one of the holiest and highly respectable for

<sup>1</sup>Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya Raipur (C.G.)

most therapeutic and restorative herbs distributed mainly in the all regions of India Tulsi is widely grown, sacred plant, it is found growing in environment having moist soil nearly all over the world which is original from its wild form (Vana Tulsi). *Ocimum* varieties have around 50 to 150 types of spices and bushes from the tropical native of Asia. Tulsi has square stems, fragrant inverse leaves and whorled bloom on spiked inflorescence. The essential oil of Tulsi is extracted by hydro distillation from the leaves and flavouring tops are used into foods, dental and oral items, in aromas and in conventional ceremonies and medications. Extracted basic oils have additionally been appeared to contain naturally dynamic constituents that are insecticidal are nematicidal and fungicidal. Tulsi leaves contained higher Na, Cu and Zn proportions (Bhowmik *et al.*, 2008). Fresh leaves and *Ocimum sanctum* L. Extricated developed several phenolic blends. *Ocimum basilicum* leaves contain 0.7 percent volatile oil that includes about 71 percent eugenol and 20 percent methyl eugenol.

The various source of organic composts, *viz.*, animal, plant, wastage and bio-dynamic manure which contains variable measure of nutrients among the different source of organic manure, FYM, decayed press mud, vermicompost, bio- fertilizer, other plant based waste materials and micro nutrients are mainly used as organic manures. The application of organic sources is also helpful to improve the soil properties and microbial population. The use of vermicompost in horticultural, medicinal crops found to be most effective organic which influence the physico-chemical properties of soil *viz.* soil structure, porosity and good aeration.

*Eucalyptus tereticornis* tree belong to Myrtaceae family native to Australia, and adjusted an excessive number of various territories. It is the most typical decision to be planted along the edges, or bunds of agricultural field and gives off an impression of being very much incorporated and accepted in agroforestry in India (Tejwani, 1994) for the paper and pulp. The tree develops to a height of 20 to 50 meters with a girth of up to 2 meters dbh. The trunk is straight and is usually un-branched for most of the tree's full length.

### 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 Agro forestry

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 fresh herbage yield was recorded after harvesting the intercrop. Fresh herbage yield weight was taken with the help of electronic balance machine. Thereafter, the representative sample, from all treatment and replications were taken and brought to laboratory and dried in sheds room in one days. Oil recovery was estimated by hydro distillation method using Clevenger Apparatus. To estimate the oil of fresh herbage sample, comprising of leaves, inflorescence and very small twigs was taken. The chopped sample was put in 500 ml capacity flask half filled with water. Distillation was done for about four hour. The oil being lighter than water was collected in the burette and reading was recorded and the moister content for the distilled oil is removed by sodium chloride for every liter of oil. The oil yield per hectare was estimated.

### Results and Discussions

#### *Harbage yield of CIM saumya*

In both the harvest herbage yield was significant influenced by the different organic manure. Application of various organic manure in treatment and observed the maximum and minimum herbage yield was clearly presented in table 1. After harvesting maximum herbage yield was obtain in T1 100% FYM (19.83t/ha) followed by T2 100% vermicompost (18.73t/ha), T4 75% FYM + 25 % Vermicompost (17.86 t/ha) and minimum herbage yield was recorded in T9 control with no organic manure (11.73t/ha). And the 2nd harvesting also performed the same pattern of yield in all attributes. The highest herbage yield was obtained in T1 100% FYM (18.56t/ha) followed by T2 100% vermicompost (17.63t/ha), T4 75% FYM + 25 % Vermicompost (16.67 t/ha) and minimum herbage yield was recorded in T9 control no organic manure (10.73t/ha). The herbage yield evinced that agroforestry system significant affected the yield of *Eucalyptus* based agroforestry system. Different treatment was applied and then observed the the yield attributes .Maximum herbage yield was obtained in

Table 1: Effect of different organic manure on herbage yield (t ha<sup>-1</sup>) of CIM saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

Treatment	Herbage yield (t ha <sup>-1</sup> )	
	1st harvesting (t ha <sup>-1</sup> )	2 <sup>nd</sup> harvesting (t ha <sup>-1</sup> )
T <sub>1</sub>	19.83	18.56
T <sub>2</sub>	18.73	17.63
T <sub>3</sub>	12.76	11.77
T <sub>4</sub>	17.86	16.67
T <sub>5</sub>	15.73	14.63
T <sub>6</sub>	13.73	12.76
T <sub>7</sub>	16.76	15.73
T <sub>8</sub>	14.77	13.83
T <sub>9</sub>	11.73	10.73
SEm±	0.09	0.11
CD @ (P=0.05)	0.28	0.33

T1 with application of 100% organic manure (FYM) under the agroforestry system and minimum yield was recorded in control without organic manure. The beneficial responses of FYM on the herbage yield have also been reported by other workers. The maximum dry herbage yield was obtained due to application of FYM 10ton/ha. Similar result was observed by (Ram *et al.* 2002 and Rahman *et al.* 2014).

#### Oil yield of CIM saumya

The data of oil yield revealed that significantly influenced by the different organic manure treatments and both the harvest shows that the significant differences to the data related to oil yield in Table 2. After 1st harvesting maximum oil yield was obtained in T1 100% FYM (22.67kg/ha) followed by T2 100% vermicompost (21.76 kg/ha), T4 75% FYM + 25 % Vermicompost (20.73 kg/ha) and minimum oil yield was recorded in T9 control no organic manure (14.76kg/ha). In The 2nd harvesting oil yield was noted that the similar pattern of yield was recorded. maximum oil yield was obtained in T1 with application of 100% FYM (21.77kg/ha) followed by T2 100% vermicompost (20.76kg/ha), T4 75% FYM + 25 % Vermicompost (19.73 kg/ha) and minimum oil yield was recorded in T9 control no organic manure (13.67kg/ha). The oil yield of Tulsi were found to be higher during first harvesting of study as compared to second harvesting. Essential oil yield highly depends on herbage yield of Tulsi crop. The presented result of yield may be due to the influence of FYM in promoting the vegetative growth, which resulted in increased herbage production, consequently,

Table 2: Effect of different organic manure on oil yield (kg ha<sup>-1</sup>) of CIM saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

Treatment	Oil yield (kg ha <sup>-1</sup> )	
	1 <sup>st</sup> Harvesting (kg ha <sup>-1</sup> )	2 <sup>nd</sup> Harvesting (kg ha <sup>-1</sup> )
T <sub>1</sub>	22.67	21.77
T <sub>2</sub>	21.76	20.76
T <sub>3</sub>	15.66	14.63
T <sub>4</sub>	20.73	19.73
T <sub>5</sub>	18.73	17.83
T <sub>6</sub>	16.77	15.73
T <sub>7</sub>	19.73	18.63
T <sub>8</sub>	17.83	16.87
T <sub>9</sub>	14.76	13.67
SEm±	0.08	0.17
CD @ (P=0.05)	0.24	0.52

essential oil yield increased. The application of FYM @ 5 t/ha significantly increased fresh herbage yield as compare to the rest of the treatments which ultimately results in higher oil yield (22.67 kg/ha). Oil yield is significantly influence by the different treatment under the agroforestry system. Similar result supports. It is demonstrated that using vermicompost and compost increase the relative content of linalool and methyl chavicol in basil (*Ocimum basilium*) (Anwar *et al.*, 2012).

#### Cost of cultivation (Rs. ha<sup>-1</sup>)

Data on Cost of cultivation were given in table 3 data regarding cost of cultivation showed the highest (Rs. 68105) was obtained under the treatment T3 100% Neem cake, followed by T9 control zero organic manure (Rs.63833), T6 50% Vermicompost + 50 % Neem cake (Rs.62303), T8 25% FYM + 25 % Vermicompost + 50 % Neem cake (Rs.58205), T5 75% FYM + 25% Neem cake (Rs.50372), T7 50% FYM + 25 % Vermicompost + 25% Neem cake (Rs.49797), T2 100% Vermicompost (Rs.43702), T4 75% FYM + 25 % Vermicompost (Rs. 42032) and the lowest recorded in T1 100 % FYM was (Rs.32432).

#### Gross return (Rs. ha<sup>-1</sup>)

Data on Gross return were given in table 3 data regarding Gross return showed the highest (Rs. 102212) was obtained under the treatment T1 100 % FYM , followed by T2 100% Vermicompost (Rs. 97796), T4 75% FYM + 25 % Vermicompost (Rs. 93058), T7 50% FYM + 25 % Vermicompost + 25% Neem cake (Rs. 88228) T5 75% FYM + 25% Neem cake (Rs. 84088), T8 25% FYM + 25 % Vermicompost

Table 3: Effect of different nutrient on Benefit Cost Ratio of CIM saumya [*Ocimum basilicum* (L.)] under Eucalyptus (*Eucalyptus tereticornis*) based agroforestry system

Treatment	Cost of cultivation (Rs. ha <sup>-1</sup> )	Oil yield (kg ha <sup>-1</sup> )	Gross return (Rs. ha <sup>-1</sup> )	Net return (Rs. ha <sup>-1</sup> )	Benefit cost ratio (B:C)
T <sub>1</sub>	32432	44.44	102212	69780	3.15
T <sub>2</sub>	43702	42.52	97796	54094	2.23
T <sub>3</sub>	68105	30.29	69667	1562	1.02
T <sub>4</sub>	42032	40.46	93058	51026	2.21
T <sub>5</sub>	50372	36.56	84088	33716	1.66
T <sub>6</sub>	62303	32.5	74750	12447	1.19
T <sub>7</sub>	49797	38.36	88228	38431	1.77
T <sub>8</sub>	58205	34.7	79810	21605	1.37
T <sub>9</sub>	63833	28.43	65389	1556	1.00

+ 50 % Neem cake (Rs. 79810), T6 50% Vermicompost + 50 % Neem cake (Rs. 74750) and T3 100% Neem cake (Rs. 69667) while the lowest 45 recorded in T9 (Control) was (Rs. 65389).

#### Net return (Rs. ha<sup>-1</sup>)

Data on Net return were given in table 3 data regarding net return showed the highest (Rs. 69780) was obtained under the treatment T1 100 % FYM , followed by T2 100% Vermicompost (Rs. 54094), T4 75% FYM + 25 % Vermicompost (Rs. 51026), T7 50% FYM + 25 % Vermicompost + 25% Neem cake (Rs. 38431) T5 75% FYM + 25% Neem cake (Rs. 33716), T8 25% FYM + 25 % Vermicompost + 50 % Neem cake (Rs. 21605), T6 50% Vermicompost + 50 % Neem cake (Rs. 12447) and T 3 (100% Neem cake Rs. 1505) while the lowest recorded in T9 (Control) was (Rs. 746).

#### B: C ratio

Data on Benefit Cost Ratio were given in table 3 data regarding benefit cost ratio (B/C) showed the highest (3.15) was obtained under the treatment T1 100 % FYM (3.15) , followed by T2 100% Vermicompost (2.23), T4 75% FYM + 25 % Vermicompost (2.21), T7 50% FYM+ 25 % Vermicompost + 25% Neem cake (1.77), T5 75% FYM + 25% Neem cake (1.66), T8 25% FYM + 25 % Vermicompost + 50 % Neem cake (1.37), T6 50% Vermicompost + 50 % Neem cake (1.19) and T 3 100% Neem cake ( 1.02) while the lowest recorded in T9 (Control) was (1.01). The data revealed that the highest gross returns (Rs 102212) and net returns per ha (Rs. 69780) were registered in T1 treatment with 100% FYM and the lowest were recorded in the T9 treatment with control zero fertilizer. The highest Benefit-cost ratio (3.15) registered in the T1 treatment

with 100% FYM while the minimum (1.00) was obtained with T9 treatment with control zero fertilizer. Similar results were observed by (Thakur *et al.*, 2009) in Tulsi. The outcomes of net return from oil production in the present study were higher than those accrued from essential oil of *O. sanctum* cultivated under different agroforestry systems.

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