Int.J.Curr.Microbiol.App.Sci (2022) *11*(10): 149-157

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 11 Number 10 (2022)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2022.1110.018

Effect of Organic Manure on Plant Growth Attributes of Krishna Tulsi [*Ocimum tenuiflorum* (L.)] Under Eucalyptus (*Eucalyptus tereticornis*) Based Agroforestry System

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Keywords

Growth parameter, Forestry, Krishna Tulsi intercrops, Eucalyptus tree crop

Article Info

Received:
04 September 2022
Accepted:
30 September 2022
Available Online:
10 October 2022

A B S T R A C T

A field experiment was conducted at the Herbal Garden of Department of Forestry, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). During the season of 2021-22 with a view to study the "Effect of organic manure on plant growth attributes of Krishna Tulsi [*Ocimum tenuiflorum* (L.)] Under Eucalyptus (*Eucalyptus tereticornis*) based Agroforestry system". The field experiment was conducted on Krishna Tulsi intercrops under Eucalyptus tree crop were used to grown and treatment was replicated three times in Randomized Block Design (RBD) with plant spacing 40cm × 40cm. The soil of experimental field was clay to loam soil. The investigation, There were The fertilizer mixture FYM and vermicompost were used, which were applied at different concentrations in Tulsi intercrop in eight treatments *viz*., T_1: - FYM 100%, T_2: - Vermicompost 100%, T_3:- Neem cake 100 %, T_4:- FYM 75% + Vermicompost 25 %, T_5:- FYM 75% + Neem Cake 25%, T_6:- Vermicompost 50% + Neem Cake 50%, T_7: - FYM 50 % + Neem Cake 25 %+ Vermicompost 25 % and T_8:- Control (No Manures). The crop growth parameters *i.e.*, Plant height (cm), Number of branches plant^{-1} and Collar diameter (mm) were significantly superior in the treatment T_2 (Vermicompost 100%) at different crop growth stages at 30, 60, 90 and at time of harvest. On the basis of above findings, treatment T_2 (Vermicompost 100%) stand could be better performance first in position and T_1 (FYM 100%) stand in second order of preference. However, treatment T_4 (FYM 75% + Vermicompost 25 %) comes in next in order. Therefore, it may be concluded that treatment T_2 (Vermicompost 100%) may be prefer for higher growth in crop Krishna Tulsi.

Introduction

The "Krishna Tulsi" (*Ocimum tenuiflorum* Linn (2n = 32) is abiennial or triennial shrub belonging to the family lamiaceae. *Ocimum tenuiflorum* has a wide distribution, covering the entire Indian sub-

continent, ascending upto1800 m in the Himalayas and as far as the Andaman and Nicobar Islands. The leaves of this basil, on steam distillation, yield a bright yellow, volatile oil possessing a pleasant odour of the plant (20%), nerol, caryophyllene, selinene, α-pinene, camphor, cineole, linalool and carvacrol (3%). The seed of this plant give a greenish yellow fixed oil and also contains antistaphylo coagulase which can be extracted with water andalcohol (Chauhan *et al.,* 2012; Al-mansour *et al.,* 2017; Bhagat *et al.,* 2021).

In India it has been cultivated due to its habits and short duration benefits as MPTs for timber, fuel, wood essential oil and pulp, thus large scale plantation of Eucalyptus species is taken care in each sector viz; roadside plantation, canal side plantation farm forestry to get production of bole wood and pulp as well aesthetic values hence, *E. tereticornis* being a lesser rotation period and better coppice as well as soil and climate adaptability, is widely planted in India (Tewari, 1991; Eirini, *et al*., 2016). Beginning it was adopted aiming fulfilling the raw material supplied for paper and pulp industries and to remove the scarcity of fuel wood for folk. Recently its utilization has increased in commercial purposes as timber. In agroforestry systems, the use of organic manures is found to increase the efficiency because the leaves or small twigs fall directly on to the surface where crop is growing. This adds organic matter into the soil, and also acts as mulch that helps to suppress the weed growth and conserve moisture by reducing summer temperature (Prabu and Shakila, 2013; Netam, *et al*., 2020).

Organic manure is well suited to achieve both production and conservation goals. Sometimes yield reductions in various intercrops have been reported due to such interactions but the crop yield loss may well be compensated by economically through yield of timber, fodder and fuel wood tree species. Agroforestry is "a dynamic, ecologically based, natural resources 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" (World Agroforestry Centre, n. d.).

Materials and Methods

The field experiment was conducted at the Herbal Garden of Department of Forestry, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). Raipur is situated in mid-eastern part of Chhattisgarh at a latitude of 21°16' N, longitude of 81°36' E and at an altitude of 289.56 meters above the mean sea level. On the basis of prevailing climatic conditions, Raipur is characterized as slightly moist and sub-humid zone where the average annual rainfall received ranges from 1200 to 1400 mm. The soil of experimental field was clay to loam soil. Samples from 20 cm depth were collected randomly from five places a day before layout of experiment. The collected sample was mixed thoroughly and composite sample was analyzed to determine physic-chemical composition of soil.

The fertilizer mixture was applied by broadcasting uniformly in rows to individual plots as per the treatment and as per recommended quantity of manure then mixed thoroughly into the soil. The FYM and vermicompost were applied in the random plots with recommended quantity of treatments. The destructive sampling was taken at an interval of 30 days interval. Five plants were selected randomly and dug out along with the root system. The roots were washed thoroughly to remove the soil particles. Observations on growth parameters were recorded on five randomly selected plants in the netplot.

Results and Discussion

Data pertaining to growth attributes influenced by various treatments has been given in table.1, 2 & 3 and fig 1, 2 & 3. The plant height of Krishna Tulsi was statistically significantly difference were observed among the different treatments, at 30 DAT significant maximum was noticed (65.11) in treatment T_2 (Vermicompost 100%), while significant minimum plant height (cm) (38.25) was noted in treatment T_8 (Control (No Manures). At 60

DAT significant maximum plant height (cm) (75.13) was noted in treatment T_2 (Vermicompost 100%), Significant minimum plant height (cm) (44.25) was noted in treatment T_8 (Control (No Manures). At 90 DAT significant maximum plant height (cm) (96.16) was noted in treatment T_2 (Vermicompost 100%), Significant minimum plant height (cm) (52.21) was noted in treatment T_8 (Control (No Manures). And at harvest significant maximum plant height (cm) (99.10) was noted in treatment T_2 (Vermicompost 100%), while significant minimum plant height (cm) (57.27)was noted in treatment T_8 (Control (No Manures)).

Similar result was also found by Singh and Ramesh (2002) reported that in sweet basil (*Ocimum basilicum* L.) application of N at 150 kg per ha or vermicompost at 2.5 tonnes per ha + NPK 75:25:25kg per ha respectively recorded similar plant height which were significantly higher than application of 5.0 t per ha vermicompost.

The number of branches of Krishna Tulsi was found statistically significantly difference among the different treatments, at 30 DAT significant maximum no. of branches plant^{-1}(11.15) was noted in treatment T_2 (Vermicompost 100%), Significant minimum no. of branches plant^{-1}(4.20) was noted in treatment T_8 (Control (No Manures)). At 60 DAT significant maximum no. of branches plant^{-1}(22.04) was noted in treatment T_2 (Vermicompost 100%), Significant minimum no. of branches plant^{-1}(15.09) was noted in treatment T_8 (Control (No Manures)).

At 90 DAT significant maximum no. of branches plant^{-1} (37.05) was noted in treatment T_2 (Vermicompost 100%), Significant minimum no. of branches plant^{-1}(30.04) was noted in treatment T_8 (Control (No Manures). At harvest significant maximum no. of branches plant^{-1} (40.15) was noted in treatment T_2 (Vermicompost 100%), while significant minimum no. of branches plant^{-1}(33.05) was noted in treatment T_8 (Control (No Manures). The results obtained in the present study are supported by the works of Raina *et al.*, (2013) reported that use of N @ 60 kg ha^{-1} and vermicompost @ 3tha^{-1}recorded maximum number of branches.

The collar diameter of Krishna Tulsi was found statistically significantly difference among the different treatments, at 30 DAT significant maximum collar diameter (mm) (7.09) was noted in treatment T_2 (Vermicompost 100%), Significant minimum collar diameter (mm) (2.05) was noted in treatment T_8 (Control (No Manures)). At 60 DAT significant maximum collar diameter (mm) (14.04) was noted in treatment T_2 (Vermicompost 100%), Significant minimum collar diameter (mm) (2.71) was noted in treatment T_8 (Control (No Manures)). At 90 DAT significant maximum collar diameter (mm) (15.02) was noted in treatment T_2 (Vermicompost 100%), Significant minimum collar diameter (mm) (3.42) was noted in treatment T_8 (Control (No Manures)).

And at harvest significant maximum collar diameter (mm) (17.12) was noted in treatment T_2 (Vermicompost 100%), while significant minimum collar diameter (mm) (4.56) was noted in treatment T_8 (Control (No Manures)). Both nutrients play important role in the growth and improvement of new cells. Similar results were also observed by Chandraker (2017).

The crop observation like plant height (cm), number of branches plant^{-1} and collar diameter (mm) were significantly higher in the treatment T_2 (Vermicompost 100%) and similar trend find with treatment T_1 (FYM 100%), T_4 (FYM 75%+Vermicompost 25 %) and T_5 (FYM 75% + Neem Cake 25%). On the basis of above findings, treatment T_2 (Vermicompost 100%) stand could be better performance first in position and T_1 (FYM 100%) stand in second order of preference.

However, treatment T_4 (FYM 75% + Vermicompost 25 %) comes in next in order. Therefore, it may be concluded that treatment T_2 (Vermicompost 100%) may be prefer for higher growth in crop Krishna Tulsi.

Table.1 Effect of organic manure of plant height (cm) at 30, 60, and 90 DAT and at the time of harvesting

Tr. No.	Treatment details	Plant height (cm)			
		30 DAT	60 DAT	90 DAT	At harvest
T_1	FYM 100%	61.03	71.07	87.28	92.14
T_2	Vermicompost 100%	65.11	75.13	96.16	99.10
T_3	Neem cake 100 %	41.05	47.18	55.09	59.17
T_4	FYM 75% + Vermicompost 25 %	57.12	67.20	80.25	84.14
T_5	FYM 75% + Neem Cake 25%	53.07	62.14	73.22	80.12
T_6	Vermicompost 50% + Neem Cake 50%	49.10	57.21	66.03	73.22
T_7	FYM 50 % + Neem Cake 25 %+ Vermicompost 25 %	45.03	52.13	60.22	65.18
T_8	Control (No Manures)	38.25	44.25	52.21	57.27
	SEm (±)	3.11	3.57	5.21	1.17
	CD (P=0.05)	9.44	10.84	15.83	3.55
	CV (%)	10.52	10.40	12.67	2.66

Table.2 Effect of organic manure of branches plant^{-1} at 30, 60, and 90 DAT and at harvest

Tr. No.	Treatment details	Number of branches plant^{-1}			
		30 DAT	60 DAT	90 DAT	At harvest
T_1	FYM 100%	10.47	21.30	36.12	39.52
T_2	Vermicompost 100%	11.15	22.04	37.05	40.15
T_3	Neem cake 100 %	5.58	16.42	31.54	35.50
T_4	FYM 75% + Vermicompost 25 %	8.78	20.03	35.40	39.12
T_5	FYM 75% + Neem Cake 25%	7.60	19.12	34.82	38.13
T_6	Vermicompost 50% + Neem Cake 50%	6.90	18.09	33.50	35.09
T_7	FYM 50 % + Neem Cake 25 %+ Vermicompost 25 %	6.11	17.20	32.39	36.12
T_8	Control (No Manures)	4.20	15.09	30.04	33.05
	SEm (±)	0.81	1.11	1.45	1.19
	CD (P=0.05)	2.47	3.37	4.40	3.62
	CV (%)	18.56	10.31	7.43	5.58

Table.3 Effect of organic manure of collar diameter (mm) at 30, 60, and 90 DAT and at harvest

Tr. No.	Treatment details	Collar diameter (mm)			
		30 DAT	60 DAT	90 DAT	At harvest
T_1	FYM 100%	6.52	13.02	13.93	15.81
T_2	Vermicompost 100%	7.09	14.04	15.02	17.12
T_3	Neem cake 100 %	3.03	6.03	7.05	8.17
T_4	FYM 75% + Vermicompost 25 %	6.02	12.02	13.02	15.08
T_5	FYM 75% + Neem Cake 25%	5.21	11.51	11.53	13.14
T_6	Vermicompost 50% + Neem Cake 50%	4.63	9.01	10.10	12.42
T_7	FYM 50 % + Neem Cake 25 %+ Vermicompost 25 %	3.81	7.53	8.55	10.06
T_8	Control (No Manures)	2.05	2.71	3.42	4.56
	SEm (±)	0.54	0.98	0.82	1.10
	CD (P=0.05)	1.64	2.98	2.51	3.35
	CV (%)	19.51	17.97	13.89	15.89

Fig.1 Effect of organic manure of Plant height (cm)

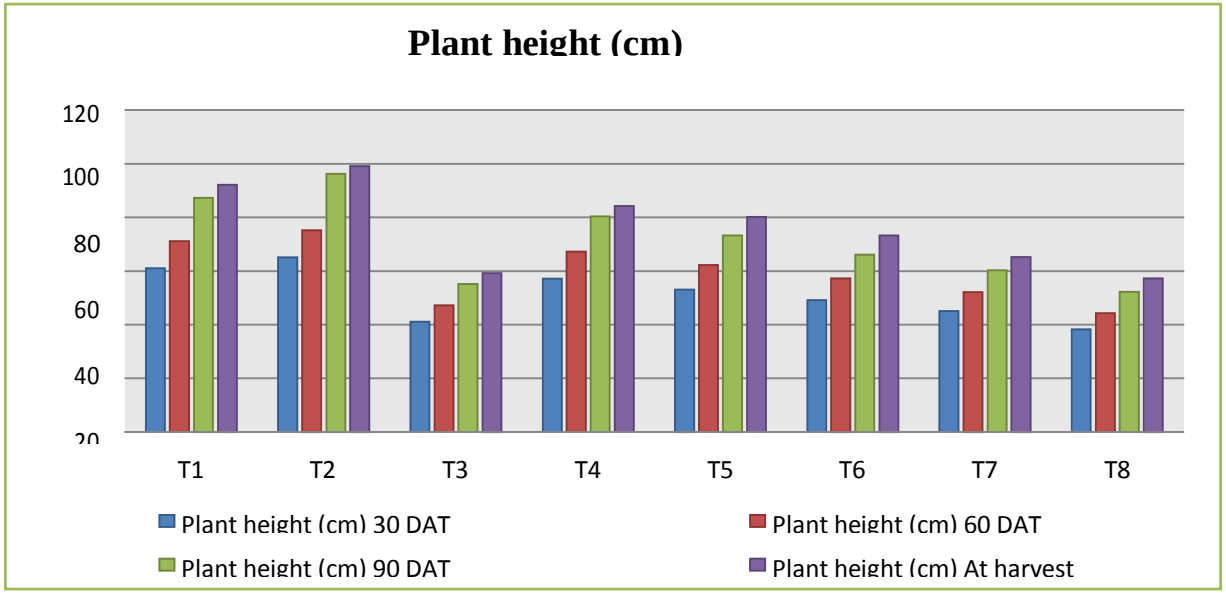

Fig.2 Effect of organic manure of Number of branches plant^{-1}

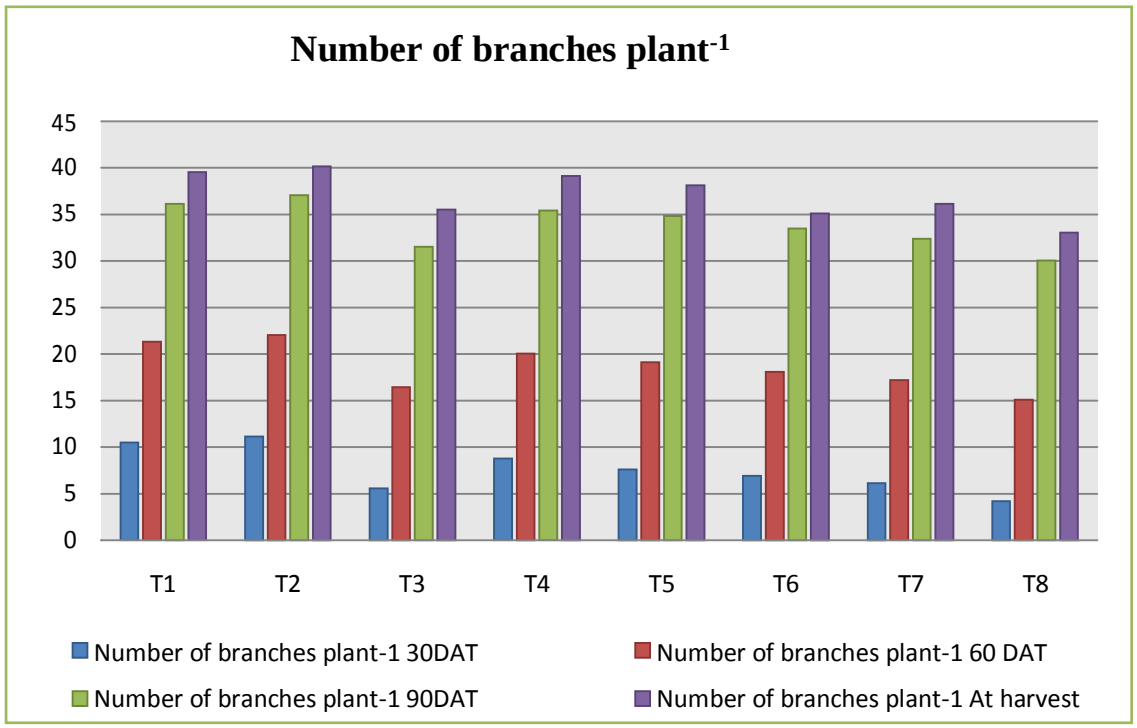

Fig.3 Effect of organic manure of Collar diameter (mm)

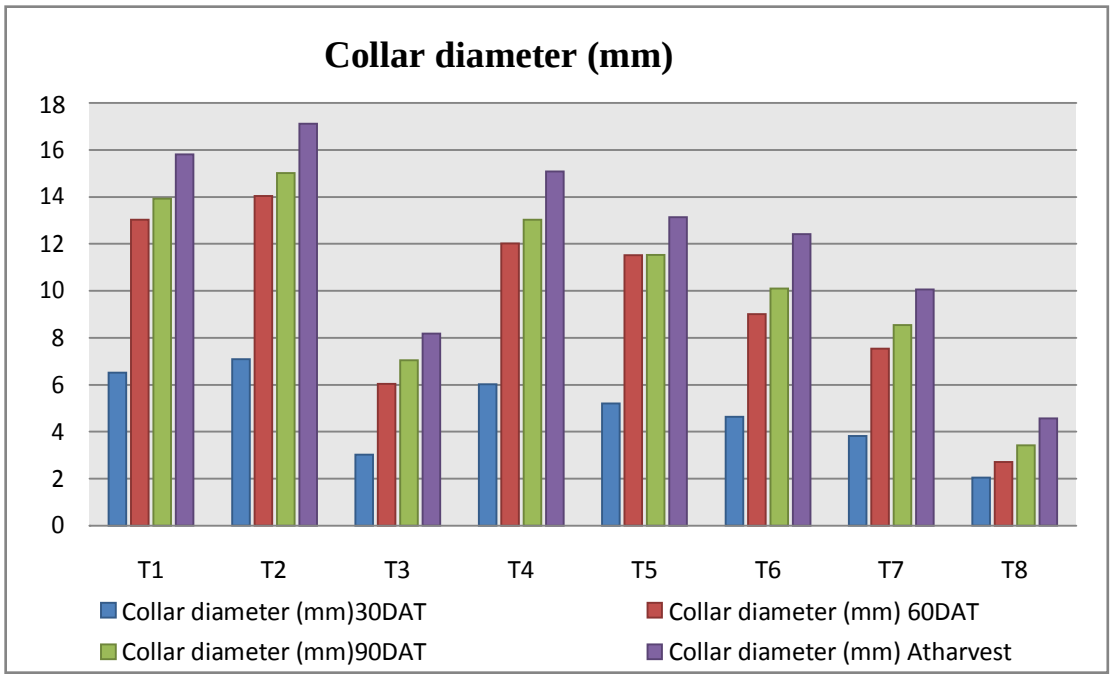

Plate.1 Field View

Plate.2 Plant at 60 DAT

Plate.3 Fresh Herbage harvest

Plate.4 Plant height observation recorded

Plate.5 Plant observation recorded

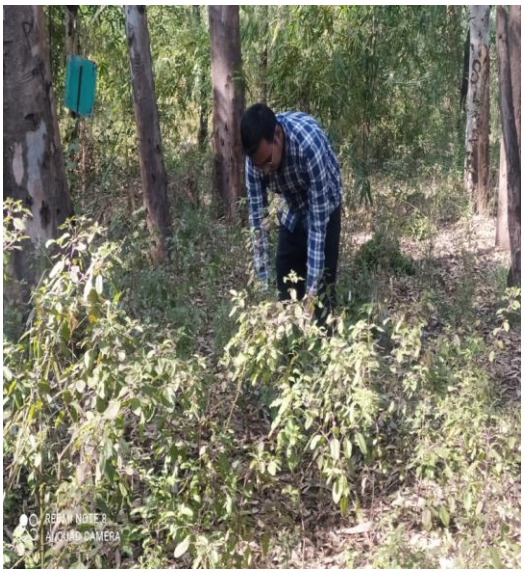

Plate.6 Oil observation recorded

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How to cite this article:

Pankaj, Pratap Toppo, Mohit Anand Sandiman, Himanshu, Dayanand Sai Painkra, Khumita Verma, Anish mankur and Shani Raj. 2022. Effect of Organic Manure on Plant Growth Attributes of Krishna Tulsi [*Ocimum tenuiflorum* (L.)] Under Eucalyptus (*Eucalyptus tereticornis*) Based Agroforestry System. *Int.J.Curr.Microbiol.App.Sci*. 11(10): 149-157. doi: https://doi.org/10.20546/ijcmas.2022.1110.018