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Effect of organic manures on different plant varieties of chilli (*Capsicum annum*) under subabul (*Leucaena leucocephala*) based Horti silviculture system

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Abstract
The unrepressed use of inorganic fertilizers for the growth and development of trees and crops for obtaining higher yields has deteoriated the soil quality, hence organic farming is now being promoted for increasing the sustainability of the soil and to prevent environmental deteoration. Organic farming has now become popular as it is eco-friendly and is of plant and animal origin which release vital nutrients to the plant for its development. Hence in order to check the significance and importance of organic manures for the cultivation of chillies under agroforestry model the present experiment entitled "Effect of Organic manures on different plant varieties of chilli (*Capsicum annum*) under Subabul (*Leucaena leucocephala*) based Horti silviculture system" was conducted in the experimental fields of nursery of College of Forestry SHUATS under the objective to find the effect of organic manures for the growth and development of chilli plant. The experimental trial consisted of 18 treatment combinations comprising of 3 different varieties of chilli carried out in Randomized Block Design (factorial). The chilli varieties used were Chilli kargil, Chilli G-4 and SPS-425. The treatments included F_0= control, F_1= 100% vermicompost, F_2= 100% FYM, F_3= 100% neem cake, F_4= 100% poultry manure and F_5= 50% vermicompost and 50% FYM, all the organic manures were given according to the recommended dose of fertilizers. The data recorded for the parameters of plant height, number of branches, number of flowers, number of fruits and fresh fruit weight (gm) at regular intervals. The overall best variety and treatment noticed was [Chilli G-4] and F_4 [100% poultry manure]. Hence treatment [F_4] [100% poultry manure] can be recommended to farmers for cultivation of chilli under Subabul based Horti silviculture (agroforestry) system.

Keywords: Organic manures, deteoration, vermicompost, poultry manure, neem cake, FYM.

Introduction
Cultivating trees and agricultural crops in intimate combination with one another is ancient practice that farmers are using since ancient times throughout the world. "Agroforestry is a land use system that integrates trees crops and animals in a way that is scientifically sound, practically feasible and socially acceptable to the farmers", Nair (1979).

Capsicum annum **(Chilli)** is the fruit of plants from the genus *Capsicum*, members of the nightshade family *Solanaceae*. The substance that gives chilli peppers their intensity when ingested or applied are capsaicin and several related chemicals collectively called capsaicinoids. Chilli is believed to be originated in America. Chilli pods which are berries are used fresh or dried, they are usually dried to preserve for a longer period of time. Chillies are used fresh or dried, whole or powdered in cooking to give food its characteristic hot, spicy and pungent taste. Chillies are pickled in salt, eaten raw in salads, made into sauces or stored in brine. A liquid chilli extract is used in colouring food as well as animal feed. Chillies are a good source of Vitamin C. Oil extracted from chillies is used as drying oils. Malays use it to treat vomiting, dyspepsia, diarrhoea and cholera. They also use it as a stimulant, and sometimes give it to infants to treat diarrhoea.

Subabul (*Leucaena leucocephala)*: Botanically, *leucaena* belongs to the family Mimosaceae; it is the best known species of the *Leucaena* genus and has a variety of common names. During the 1970s and early 1980s, *Leucaena leucocephala* was known as the 'miracle

tree' because of its worldwide success as a long-lived and highly nutritious forage tree, and its great variety of other uses. As well as forage, leucaena can provide firewood, timber, human food, green manure, and shade and erosion control. It is estimated to cover 2-5 million ha worldwide Leucaena has its origins in Central America and the Yucatan Peninsula of Mexico where its fodder value was recognised over 400 years ago by the Spanish conquistadores who carried leucaena feed and seed on their galleons to the Philippines to feed their stock. The wood from the tree is used for making agricultural implements, as firewood and fuelwood and produces low smoke charcoal.

Materials and Methods

The present research work entitled "Effect of organic manures on different plant varieties of chilli under Subabul based Horti Silviculture System", was carried out at research field of College of Forestry and Environment, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad, during the kharif season of 2016- 17. Three different plant varieties of chilli were used for the experiment *viz.* SPS 425, chilli G-4 and chilli kargil,, the varieties were abbreviated as V_1, V_2 and V_3 respectively. There were a total of 6 treatments which were F0= control, F1=100% vermicompost, F2= FYM, F3= neem cake, F4= poultry manure and F5=50% vermicompost+50% FYM. The plot was ploughed thoroughly using a single disc harrow twice before transplanting of seedlings. The experimental plot was prepared and each plot was of size $2x2m^2$. The experiment was laid out in factorial RBD with 3 replications having 6 treatments. The manures were given according to the recommended dose of fertilizers. The chilli seeds were first germinated in the green house and were kept there for a period of 45 days, about 75% of germination was recorded. The different plant varieties of chilli were transplanted after 45 days in the main fields. Irrigation and weeding were performed as and when it was required. Various growth parameters like plant height, number of branches, number of flowers, and number of fruits were taken at regular intervals.

Result and Discussion

The results provided in the table indicate the significant effect of organic manures on the growth and development of chilli under various parameters. It was observed furthermore that the application of the organic manures according to the recommended dose was helpful in the growth and development of chilli. It was found that the height of chilli plant was greatly influenced by two organic manures, namely poultry manure and neem cake. The overall results shows that poultry manure gives more positive results than other organic manures during the experimental trial. The superiority of poultry manure over other organic manures has been discussed by Ikeh *et al* (2007-08).

Plant height: According to the tabulated data in table 4.1.1 the maximum plant height was recorded in treatment (F_4) 71.11 cm and the plants belonged to variety (V_2), followed by variety (V_2) subjected to treatment (F_3) having height 65.34 cm. The plants belonging to variety (V_3) which were subjected to treatment (F_0) showed the minimum height i.e. 35.19 cm. The interaction between the treatments and the varieties was found to be significant with each other. The results recorded were similar to the results given by Ikeh *et al* (2007-08).

Number of branches: According to the data given in the table and fig the number of branches was recorded 150 DAT and it was found that the number of branches per plant was highest in the plants subjected to treatment (F_4) and belonged to variety (V_2) and was recorded to be 21.15followed by variety (V_2) which also went the treatment (F_3) and was recorded to be 20.27. The minimum number of branches was observed per plant in variety (V_3) which was exposed to treatment (F_0) and was recorded to be 10.37. The interaction between the treatments and the varieties was found to be non-significant. Such similar results were observed by Ikeh *et al* (2007-08) and Ahsanur Rehman (2012).

Number of flowers: As per the data appended in table and fig, it was found that the number of flowers were recorded after a time interval of 100 DAT and it was observed that flowers per plant were maximum in variety (V_2) 38.41**,** which had undergone treatment (F_4). This was followed by the same variety (V_2) 34.43 but it was subjected to treatment (F_3). The minimum number of flowers were recorded to be 15.33 which was subjected to treatment (F_0) belonging to variety (V_3). The interaction between the treatments and the varieties was found to be significant. Similar observations were given by Ikeh *et al* (2007-08).

Number of fruits or yield: The data given in the table and concludes that the fruits or the yield per plant was counted after their full growth and the observations were recorded. It was observed that the chilli plants which were subjected to treatment (F_4) under the variety (V_2) showed the maximum number of fruits per plant i.e. 36.16 followed by variety (V_1) which had 32.63 fruits per plant and which was also subjected to the same treatment (F_3). The minimum average number of fruits per plant was observed in plants subjected to treatment (F_0) and belonged to variety (V_3) and it was recorded to be 13.28. The interaction between the treatments and the varieties was found to be significant.The results are similar to the observations given by Ikeh *et al* (2007-08).

Summary and Conclusion

The experimental work entitled "Effect of organic manures different plant varieties of Chilli (*Capsicum annum*) under Subabul *(Luceana leucocephala)* based Horti Silviculture System", was conducted in the experimental fields of nursery of College of Forestry, SHUATS, Allahabad, in the kharif season of 2016. The results of the given experiment is summarised as follows:

Plant height (cm): The maximum height was recorded to be 71.11 cm of variety (V2) under treatment (F4) and the minimum height was found to be 35.19 cm in variety (V3) under treatment (F0). The interaction between the treatments and the variety was found to be significant.

Number of Branches: The maximum number of branches was found to be in plants of variety (V_2), 21.15 under treatment (F_4) and the minimum number of branches was found to be 10.37 under variety (V_3) subjected to treatment (F_0). The interaction was found to be non-significant between the treatments and variety.

Number of Flowers: The maximum number of flowers were found to be in plants subjected to treatment (F_4) [100% poultry manure], 38.41 of variety (V_2) and it was followed by plants of the same variety but subjected to treatment (F_3) [100% neem cake], the minimum number of flowers were found to be in variety (V_3), 15.33, subjected to treatment (F_0). The interaction was found to be significant between the

treatments and the variety.

Number of fruits: The maximum number of fruits was found to be in variety (V_2) 36.16 under treatment (F_4) followed by the same variety under treatment (F_3), 32.63 and the minimum number of fruits were found in plants of variety (V_3) under treatment (F_0).

Conclusion

The results of the experimental field trial conducted under the title "Effect of organic manures on different plant varieties of chilli (*Capsicum annum*) under subabul (*Leucaena leucocephala*) based Horti silviculture system", can hence be concluded as follows:

The different varieties of chilli namely SPS 425 (V_1), chilli G-4 (V_2) and chilli kargil (V_3) were subjected to the various doses of organic manures and it was found that there was significant difference in the response given by the chilli varieties to the organic manure doses. The best treatment overall was F_4 (100% poultry manure) which gave the maximum positive results in most of the parameters which were considered for the growth and development of chilli plants and the minimum results were obtained in treatment F_0 (control).

Table 1: Effect of different organic manures on the plant height and number of branches of chilli (*Capsicum annum*) under subabul (*Leucaena leucocephala*) based Horti silviculture system.

Treatments (F)	Plant Height	Varieties (V)		Mean (F)	Treatments (F)	No. Of Branches	Varieties (V)		Mean (F)
	V_1	V_2	V_3			V_1	V_2	V_3	
F0	38.05	40.23	35.19	37.82	F0	11.23	14.19	10.37	11.93
F1	52.11	61.22	47.21	53.51	F1	16.24	20.28	13.17	16.56
F2	44.31	54.23	39.37	45.97	F2	14.27	17.18	12.04	14.49
F3	58.29	65.34	53.19	58.94	F3	18.12	20.27	15.11	17.83
F4	62.18	71.11	55.16	62.81	F4	17.11	21.15	14.17	17.47
F5	51.28	59.48	46.12	52.29	F5	16.21	19.11	13.08	16.13
Mean(V)	51.03	58.60	46.04		Mean(V)	15.53	18.69	12.99	
Comparisons	F calc	SED±	C.D.	f-test	Comparisons	F calc	SED±	C.D.	f-test
Due to V	10.47	0.50	1.021	S	Due to V	4.71	0.28	-	NS
Due to F	1.79	0.70	-	N S	Due to F	1.52	0.20	-	NS
Due to (VxF)	4.63	1.22	2.501	S	Due to (VxF)	0.74	0.48	-	NS

Table 1.1: Effect of different organic manures on the number of flowers and number of fruits of chilli (*Capsicum annum*) under subabul (*Leucaena leucocephala*) based Horti silviculture system.

Treatments (F)	No. Of Flowers	Varieties (V)		Mean (F)	Treatments (F)	No. Of Fruits	Varieties (V)		Mean (F)
	V_1	V_2	V_3			V_1	V_2	V_3	
F0	16.06	18.76	15.33	16.71	F0	15.08	17.16	13.28	15.17
F1	27.01	28.11	25.02	26.71	F1	26.04	26.35	23.19	25.19
F2	22.23	26.37	20.09	22.89	F2	20.47	24.21	18.23	20.97
F3	30.26	34.43	28.23	30.97	F3	28.56	32.63	25.81	29.00
F4	34.38	38.41	29.52	34.10	F4	32.17	36.16	26.52	31.61
F5	28.58	30.16	26.29	28.34	F5	26.15	28.14	24.23	26.17
Mean(V)	26.42	29.37	24.08		Mean(V)	26.17	27.44	21.87	
Comparisons	F calc	SED±	C.D.	f-test	Comparisons	F calc	SED±	C.D.	f-test
Due to V	7.86	0.14	0.30	S	Due to V	4.34	1.59	3.2	S
Due to F	18.33	0.20	-	NS	Due to F	0.49	2.25	0.6	S
Due to (VxF)	5.72	0.36	0.73	S	Due to (VxF)	0.81	3.89	1.2	S

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