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Comparative analysis of three different organic manures on production potential of baby corn under poplar-based agroforestry system

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ABSTRACT

The present study was aimed at evaluating the effect of different organic manures viz farmyard manure, vermicompost and neem cake on the growth and yield of baby corn under single spacing pattern (55 x 25 cm) in a poplar-based agroforestry system. Two varieties (HIM-123 and DHM-107) were tested for few parameters viz plant height, crop growth rate, collar diameter, number of cobs per plant, cob length, cob girth and cob yield. Influence of vermicompost was significantly observed in both the varieties investigated and found to be the best performer in the experiment followed by farmyard manure and neem cake.

Keywords: Vermicompost; farmyard manure; neem cake; baby corn; poplar; agroforestry

INTRODUCTION

Agroforestry involves the cultivation and use of trees in farming systems and is practical and low cost means of complementing many forms of integrated land management especially for small scale producers. The major benefit is its role in enhancing the most important properties of soil which are biological activities, aeration, nutrient status, structure and moisture retention (Arancon et al 2008).

Indian soils are poor in organic matter and in major plant nutrients. Soil organic matter is the key to soil fertility and productivity. In the absence of organic matter the soil is a mixture of sand, silt and clay. Organic matter induces life into this inert mixture and promotes biological activities. Although the beneficial influences of organic matter on the physical, chemical and biological properties of the soil are widely known, the full appreciation of the same remains largely ignored in modern agriculture (Hutchinson et al 2005). Farmyard manure is partially composed of dung, urine, bedding and straw. Dung comes mostly as undigested material and the urine from the digested material. More than 50 per cent of the organic matter that is present in dung is in the form of complex products consisting of lignin and protein which are resistant to further decomposition and therefore the nutrients present in dung are released very slowly (Lazcano and Dominguez 2010). Vermicompost is the organic manure made by earthworms. Earthworms play a major role in soil improvement, organic matter decomposition and enhancing the quality of agricultural produce. Vermicomposting is applied for composting various non-toxic organic solids and liquid wastes available from cities, dairies, sugar and distillery units, pulp and paper mills, tanneries, fermentation industries and food processing units (Lazcano et al 2011). The neem cake is mainly obtained from fresh fruits of neem (*Azadirachta indica* L) after extraction of oil as a residue. Neem cake contains not only nitrogen but also some phosphoric acid and a large quantity of potash. The organic nitrogen is converted into ammonia and finally nitrate nitrogen through bacterial action and then utilized by the crops (Weber et al 2007).

Baby corn is strongest and largest crop absorbing and releasing energy stored in the earth and energetically very favorable for livestock forage. As a high-energy food it is very important and is main dish

of large group of people either directly or indirectly through livestock products and plant accounts and the highest value compared to other grains (Garima and Pant 2017). Organic farming is a productive system which reduces or avoids entirely the use of chemical fertilizers, pesticides, growth regulators and other agricultural chemicals.

Therefore the present study was undertaken to evaluate the effect of different organic manures on the production potential of baby corn under poplar-based agroforestry system.

MATERIAL and METHODS

The experiment was conducted at the forest nursery of College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh. The effect of different organic manures (farmyard manure, vermicompost and neem cake) on growth and yield parameters of baby corn under single spacing pattern (55 x 25 cm) was studied. Two varieties (HIM 123 and DHM 107) were tested in two consecutive years 2014 and 2015. Growth parameters such as plant height, crop growth rate, collar diameter, number of cobs per plant, cob length, cob girth and cob yield were studies. The data recorded were subjected to statistical analysis as per the method of analysis of variance (Fisher 1921).

RESULTS

Data on growth and yield attributes of baby corn in 2014 and 2015 are presented in Table 1.

Plant height: In both the years 2014 and 2015 the treatment having vermicompost observed tallest plant height in both the varieties. In 2014 it was 97.20 cm whereas in 2015 it was 103.27. The shortest plants were observed in treatment having neem cake. In 2014 it was 86.93 cm and in 2015 it was 92.33 cm. Variety DHM-107 was observed to be the best performer in comparison to variety HIM-123.

Crop growth rate (CGR): Crop growth rate was significantly influenced by the different treatments of organic manures. By the use of vermicompost the crop growth rate was maximum among all the treatments investigated. In 2014 the CGR was 17.40 and in 2015 it was 19.51 whereas the minimum CGR was recorded in the treatment of neem cake in both the years. In 2014 it was 14.81 and in 2015 it was 16.48. Variety DHM-107 recorded higher CGR in comparison to HIM-123.

Collar diameter: In both the years 2014 and 2015 the collar diameter was maximum in variety DHM-107 under the treatment of vermicompost. Collar diameter was 2.68 and 3.13 cm in 2014 and 2015

Table 1. Effect of different organic manures on the growth and yield of baby corn

Treatment	PH (cm)		CGR		CoD (cm)		NCP		CL (cm)		CG		CY (q/ha)	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
V_1SM_1	87.33	92.87	15.20	16.67	2.10	2.63	2.87	3.07	8.73	9.33	3.07	3.33	40.17	45.44
V_1SM_2	93.80	98.60	16.38	18.19	2.47	2.93	3.13	3.33	9.00	9.67	2.53	2.73	46.87	52.80
V_1SM_3	86.93	92.33	14.81	16.48	1.98	2.40	2.53	2.67	8.53	9.13	1.77	1.93	33.82	37.75
V_2SM_1	90.80	95.40	15.74	17.47	2.25	2.80	3.00	3.20	8.87	9.47	2.87	3.13	44.00	49.75
V_2SM_2	97.20	103.27	17.40	19.51	2.68	3.13	3.53	3.80	9.47	10.13	3.60	3.93	55.97	64.67
V_2SM_3	87.13	92.53	15.11	16.71	2.05	2.53	2.60	2.80	8.67	9.27	2.60	2.87	35.85	40.86
F-test (V x S x M)	S	S	S	S	S	S	S	S	S	S	S	S	S	S
SEd+	0.31	0.09	0.15	0.17	0.03	0.05	0.05	0.06	0.06	0.06	0.07	0.08	0.81	0.99
$CD_{0.05}$	0.63	0.19	0.30	0.34	0.06	0.09	0.11	0.13	0.12	0.11	0.15	0.15	1.66	2.01

PH= Plant height, CGR= Crop growth rate, Cod= Collar diameter, NCP= Number of cobs per plant, CL= Cob length, CG= Cob girth, CY= Cob yield, V_1= HIM-123, V_2= DHM-107, S= Spacing, M_1= Farmyard manure, M_2= Vermicompost, M_3= Neem cake

respectively. Minimum collar diameter was observed in case of neem cake in both the varieties and it was 1.98 and 2.40 cm in 2014 and 2015 respectively.

Number of cobs per plant (NCP): Varicty DHM-107 proved better performer in both the years of the experiment under the treatment of vermicompost. NCP was 3.53 and 3.80 in 2014 and 2015 respectively. Lowest NCP was recorded in the treatment of neem cake which proved weakest performer among all the three treatments applied.

Cob length: The cob length was significantly influenced by the use of vermicompost. Maximum cob length was recorded in variety DHM-107 which was 9.47 cm in 2014 and 10.13 cm in 2015 while the minimum length was observed in variety HIM-123 with 8.53 cm in 2014 and 9.13 cm in 2015.

Cob girth: The maximum cob girth was recorded in vermicompost treatment in variety DHM-107 which was 3.60 and 3.93 cm in 2014 and 2015 respectively. However minimum cob length was observed in the treatment of neem (1.77 cm in 2014 and 1.93 cm in 2015). Variety HIM-123 performed poorer among all the treatments in both the years of study.

Cob yield: Among the two varieties DHM-107 recorded maximum cob yield under all the treatments investigated whether it was use of vermicompost or farmyard manure or neem cake. Maximum cob yield (55.97 and 64.67 q/ha in 2014 and 2015 respectively) was recorded in case of vermicompost. Variety HIM-123 recorded minimum cob yield with 33.82 and 37.75 q/ha in 2014 and 2015 respectively.

DISCUSSION

Maize growth and yield were effectively increased in the presence of organic amendments may be due to the reason that they increased the amount of nutrients and water available to the plants.

Vermicompost is produced under mesophilic conditions. Earthworms act as mechanical blenders and by fragmenting the organic matter they modify its physical and chemical status by gradually reducing the C-N ratio and increasing the surface area exposed to microorganism thus making it much more favorable for microbial activity and further decomposition (Dominguez et al 2010). The average nutrient content of vermicompost is much higher than that of farmyard manure. The C-N ratio of vermicompost is much lower (1:16) than that of FYM (1:30).

As a result of the different processes involved in the production of compost and vermicompost they exhibit different physical and chemical characteristics that affect soil properties and plant growth in diverse ways. Vermicomposting generally converts organic matter to a more uniform size which gives the final substrate a characteristic earthy appearance whereas the material resulting from composting usually has a more heterogeneous appearance (Tognetti et al 2005).

Due to the different biological properties of the final substrate of FYM and vermicompost there is huge difference in bacterial community composition and fungal abundance (Vivas et al 2009). These differences may lead to rather different effects on plant growth and morphology.

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