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Effect of Organic Manure and Spacing on the Growth and Yield Performance of Baby Corn under Poplar Based Agroforestry System

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A B S T R A C T

Present investigation was under taken to study and compare how spacing influenced the performance and yield of two varieties of Baby corn under poplar based Agroforestry system. Three different spacing patterns i.e. 45x25, 55x25 and 65x25cm were evaluated in two varieties, HIM-123 and DHM-107 of Baby corn in two consecutive years i.e. 2014 and 2015. Following seven parameters (Plant height, Crop growth rate, Collar diameter (cm), Number of cobs per plant, length of Cob (cm), girth of cob (cm) and cob yield (q ha^{-1}) were evaluated. Spacing pattern of 55x25 gave best results in both varieties in all the treatments investigated; organic manure in the form of vermicompost was used in all the treatments. It is interesting to know that spacing pattern of 65x25 gave the worst performance in both the varieties.

Introduction

Agroforestry is a land use system, which contributes pragmatically in all these spheres to materialize the desired goals. The theme of agroforesty centered around sustainability in terms of economics (productivity and profitability), ecology (environmental and resource conservation) and social issues (food security, health and safety) that make it an unparallel land use system (Pandey, 2007). Poplar (Populous deltoids) based agroforestry system is adopted extensively by the farmers on a commercial scale will play a significant role to meet the economic, social and environmental concern of the people. Poplar has become the most preferred cash crop in north-western states (Chauhan and Mangat 2006). Almost any crop (cereals, pulses, vegetables, forage, fruit, vegetable crop etc.) can be grown with it (Hymavathi *et al.*, 2010).

Poplar wood is used in packing cases, hard boards, sports goods, construction works and as pulp wood and poles (Garima and Pant, 2017). Vermicompost is organic manure produced by the activity of earthworms. It is mixture of worm casts which are rich in macro and micronutrients. The casts of earthworm have several enzymes and some growth

regulating substances. The average nutrient content of vermicompost is much higher than that of F.Y.M. Vermicompost contains 1.60%N, 5.04% P_2O_5 and 0.80% K_2O with small quantities of micronutrients. The C: N ratio of vermicompost is much higher (1:16) than that of F.Y.M. (1:30). The activity of earthwarms is recognized as beneficial for the improvement of soil physical condition and plant growth (Das *et al.,* 2017).

Baby Corn (*Zea mays* L.), belongs to the gram family of Gramineae, and originated from Central America. Baby corn is widely grown in both tropical and subtropical regions of the world.

Its grains, which serve as food, feed as well as industrial raw materials containing carbohydrate in form of starch up to 80% and crude protein up to 10% (Sridhar and Adeoye, 2003). Baby corn production can be increase by solving few problems such as rapid redection in soil fertility, failure to identify and plant high yielding Baby corn varieties and use of inappropriate plant spacing which determine the plant population and the final yield.

Yield potentials have usually been represented in parts under the most favorable combination of soils, climate and crop management in certain places without considering spacing which is a major factor in increased yield potential of Baby corn. Increasing population density remains the most effective way to increase whole plant yield in corn will 13% advantage. Narrow row spacing was found not to have a negative effect on whole plant yield and nutritive value (Boloyi, 2014).

Hence the present investigation was undertaken to study the effect of organic manure and spacing pattern on the growth and yield of Baby corn under poplar based agroforestry system.

Materials and Methods

The experiment was conducted at The Forest Nursery, College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences Allahabad (U.P.) India. In this present research work the effect of different spacing pattern (45x25, 55x25 and 65x25 cm) and use of organic manure (Vermicompost) on growth and yield parameters of Baby corn was studied. Two varieties (HIM 123 and DHM-107) were investigated in two consecutive years 2014 and 2015. Growth parameters such as plant height, crop growth rate, collar diameter (cm), crop growth rate, collar diameter (cm), number of cobs per plant, length of cob (cm), girth of cob (cm) and cob yield were studies during the investigation. The data reordered during the course of investigation were subjected to statistical analysis as per method of analysis of variance (Fisher, 1921).

Results and Discussion

Results obtained from the investigation undertaken to study the effect of spacing pattern (45x25, 55x25 and 65x25 cm) and organic manure (Vermicompost) an growth and yield parameters of the Baby corn plant in 2014 and 2015 are presented in Table 1 and 2 respectively.

Plant height

Plant height was significantly affected by different spacing pattern. The tallest plants were recorded of V_2S_2F in both years. In 2014 it was 97.20 cm, whereas in 2015 it was 103.27 cm. The shortest plants were observed in V_1S_3F in both years. In 2014 was 85.80 cm and in 2015 it was 91.07 cm. Among varieties there is also variation in performance regarding plant height, variety DHM-2017 is the best performer in all the treatments investigated.

Table.1 (2014)

	P.H	CGR	CD	NCP	LC	GC	CY
$V_1 S_1 F$	86.67	16.74	1.82	2.33	8.33	2.40	29.79
$V_2 S_1 F$	86.80	16.99	1.92	2.40	8.47	2.47	31.33
$V_1 S_2 F$	93.80	16.38	2.47	3.13	9.00	3.07	46.87
$V_2 S_2 F$	97.20	17.40	2.68	3.53	9.47	3.60	55.97
$V_1 S_3 F$	85.80	13.93	1.33	1.87	7.60	1.87	19.99
$V_2 S_3 F$	85.93	14.42	1.42	1.93	7.73	1.93	21.41
Interaction (VxSxF) F test	S	S	S	S	S	S	S
S. Ed. (+)	0.31	0.15	0.03	0.05	0.06	0.07	0.81
C.D at 5%	0.63	0.30	0.06	0.11	0.12	0.15	1.66

Table.2 (2015)

	P.H	CGR	CD	NCP	LC	GC	CY
$V_1 S_1 F$	92.07	18.58	2.13	2.53	8.93	2.60	34.01
$V_2 S_1 F$	92.20	18.88	2.27	2.60	9.07	2.67	35.85
$V_1 S_2 F$	98.60	18.89	2.93	3.33	9.67	3.33	52.80
$V_2 S_2 F$	103.27	19.51	3.13	3.80	10.13	3.93	64.67
$V_1 S_3 F$	91.07	15.40	1.47	2.00	8.13	2.07	22.73
$V_2 S_3 F$	91.27	15.99	1.60	2.07	8.27	2.13	24.26
Interaction (VxSxF) F test	S	S	S	S	S	S	S
S. Ed. (+)	0.09	0.17	0.05	0.06	0.06	0.08	0.99
C.D at 5%	0.19	0.34	0.09	0.13	0.11	0.15	2.01

Crop growth rate

In both years 2014 and 2015 the highest CGR was reordered in the V_2S_2F treatment. In 2014 it was 17.40 along with 16.38 of V_1S_2F. In 2015 it was 19.51 followed by 18.89 observed of V_1S_2F treatment in 2014. The lowest CGR was recorded in V_1S_3F (13.93) along with 14.42 of V_2S_3F.

Collar diameter (cm)

Variety DHM-107 is the best performer in both the years of the experiment i.e. 2014 and 2015, under the spacing pattern of 55x25 it shows 2.68 and 3.13 respectively. The spacing pattern of 65 x25 is the worst performer in both the years and in both the varieties too.

Number of Cobs per Plant (N.C.P)

Number of Cobs per plant was significantly influenced by the spacing pattern.

Maximum number of Cobs per plant was observed in the spacing of 55x25 in both the varieties, in the treatment of V_2S_2F (3.53 and 3.80) in both the years of investigation i.e. 2014 and 2015 respectively.

Length of cob (cm)

In both the years 2014 and 2015 the maximum length of Cob was observed in the V_2S_2F treatment it was 9.47 and 10.13 in the years 2014 and 2015 respectively. The maximum length of Cob was observed in V_1S_3F (7.60 and 8.27) in the years 2014 and 2015 respectively.

Girth of cob (cm)

Among the two varieties under investigation it was clear from the data that variety DHM-107 is the best performer in both the years. In 2014 the girth of cob was maximum in the case of V_2S_2F (3.60) and minimum in the case of V_1S_3F (3.93) and minimum in the case of V_1S_3F (2.07).

Cob yield (q/ha)

The maximum Cab yield was observed in V_2S_2F treatment. In 2014 it had 55.97 along with 46.87 in V_1S_2F and minimum in V_1S_3F (19.99). In 2015 it he was 64.67 along with 52.80 in V_1S_2F and minimum was recorded in the treatment V_1S_3F (22.73) followed by 24.26 in V_2S_3F.

Among the three different row spacing pattern it is quite interesting to know that in all the characters studied in the investigation, performance of treatment V_2S_2F (DHM-107+55x25+Vermicompost) was best in comparison to all other treatments, this might be due to this reason that by increasing the spacing from 45x25 to 55x25, the plant will get adequate amount of nutrition, space and water for its growth but as we increase the spacing further to 65x25 the total yield parameters were markedly reduced due to the decreased number of plants. In the case of 45x25 spacing pattern due to the increase in number of plants increased in a given area the competition among the plants for nutrients and sunlight interception also increased (Reid, 2015). Boomsna *et al.*, 2009 found that decreased spacing declines the growth parameters while (Sangoi *et al.*, 2001) observed that reducing spacing increased crop yield and performance. Among the two varieties studied it was quite clear by the data that variety DHM-107 was the best performer regarding all the parameters studied. There might be few reason behind the difference of the performance of these two varieties, probably the vigour of the variety DHM-107 was better than HIM-123, the other major reason can be the better use of climate condition and better suited soil properties of the experimental area. This is in agreement with the findings of (Garima and Pant, 2017) that there might be the difference in the performance of different varieties sown in same area under same climatic conditions.

Spacing significantly affected the performance of both the two varieties studied during the present investigation. Among the three different spacing pattern studied the performance of 55x25 was found to be the best, followed by 45x25 and 65x25. Among the two varieties studied variety DHM-107 has shown better performance in all the parameters studied. So we will suggest the farmers of the adjoining area of the experimental area that they should follow the 55x25 spacing pattern and sow the DHM-107 variety for better performance.

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