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Effect of different levels of fertilizers on Maize (*Zea mays L.*) varieties under Subabul (*Laucaena leucocephala)* based Agroforestry system

Yatendra Singh, Ramchandra, Rajiv Umrao
School of Forestry & Environment, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed-to-be-University) Allahabad-211007 (U.P.)
Corresponding Author: yatendrasinghsengar90@gmail.com

Abstract

The research paper entitled "Effect of Different levels of Fertilizer on Maize (*Zea mays* L.) varieties cultivation under Subabul (*Leucaena leucocephala*) based Agroforestry system" had been conducted in research field School of Forestry and Environment, Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad-211007 (U.P.) during 2014-15 consisting three fertilizer doses(120:60:40 kg/ha, 90:50:30 kg/ha, 60:40:20 kg/ha NPK) and three varieties viz. S-601,K-25,DHS-42 were selected for observation and 9 treatments (T_1-T_9) of different fertilizers doses were applied. The observation of following parameters viz. Plant Height, No. of leaves, Fresh weight of shoot, Dry weight of shoot, No. of cobs per plant, Length of cob, No. of grain per cob, Thousand grain weight, Grain yield Straw yield Harvest Index, Benefit cost ratio were observed.

Keywords: Maize (*Zea mays* L.), Agroforestry, Subabul, *Fertilizer* (NPK)

Introduction

The National Forest Policy (1988) stipulated that 1/3rd of the geographical of the country should be under forest/tree cover. Presently, 69 m ha are under forests which 20 m ha are degraded. Only 37.73 m ha areas exist under forest cover. However, it is estimated that about 20 m ha outside the forest area has been brought under tree cover to 57.73 m ha. Therefore, another 42 m ha are required to be brought under tree cover within and outside forest area, i.e., Agroforestry and social forestry. The forest survey of India estimated the country's forest cover to be 69.2 million hectares (Anonymous 2001). This 21.05 % (2013) FSI of the area under forest is a beyond the normal desired forest cover.

Subabul

Leucaena leucocephala

Subabul is a popular farm forestry tree in the coastal areas. It is the fast growing hardy evergreen species. It is a vigorous coppice and responds well to pollarding, lopping and pruning. It has deep and strong taproot and even the seedling are deep rooted. Subabul is best suited for warm regions and grows well between 22 and 30 c in regions of 500 to 2000 mm rainfall. Because of its strong and deep root system, the tree is highly drought resistant. It is restricted to elevations below 500 m but withstands variations in rainfall, sunlight, windstorm, slight frost and drought. It requires deep well drained neutral soil and can tolerate saline and acid soil.

Maize (*Zea mays* L.)

Maize is one of the most important cereal crops in the world agriculture economy both as food for man and feed for animals (Ebrahimpour *et al.* 2011). It is a miracle crop. It has very high yield potential, there is no cereal on the earth which has so immense potentiality and that is why it is called Queen of cereals. Maize grain contains about 10% protein, 4% oil, 70% carbohydrate, 2.3% crude fiber, 10.4% albuminoides and 1.4% ash maize protein zein is deficient in tryptophan and lysine, maize grain has significant quantities of vitamin A, nicotinic acid riboflavin and vitamin E. Maize is low in calcium, fairly high in phosphorus. Maize crop furnishes huge quantities of green fodder for cattle. Several industries like starch, milling etc., are based on maize products and by product.

Materials and methods

The present investigation entitled, “Effect of different levels fertilizers on maize (*Zea mays* L.) varieties cultivation under subabul (*Leucaena leucocephala*) based agroforestry system conducted at the Research and Nursery area of the Department of Agroforestry, Sam Higginbottom Institute of Agriculture, Technology & Sciences, (Deemed-to-be University), Allahabad (U.P) during zaid season of 2014-15. The experiment was laid out in Randomized Block design (R.B.D) having 3 replication and 9 treatments and variety selected for Allahabad reason V_1- S-601, V_2- DHS-42 and V_3- K-25. The recommended dose of nutrients for maize in Allahabad region is 120: 60: 40, 90.50.30, 60.40.20 NPK per ha. Therefore, each treatment the requirement of manures in each plot is worked out. The fertilizers were applied in split doses sowing time and given urea. Both levels of phosphorus were given through single super phosphate (SSP) and potash was given through murate of potash (MOP) at the time of sowing as a basal dose. Whereas the nitrogen was applied through urea, half dose at sowing time and remaining between at 30 DAS at top dressing.

Result

Plant height At 30 DAS was observed that the plant height was highest in T_1 (67.50cm) followed by T_2 (66.27 cm) and minimum plant height was found in T_9 (60.03 cm) under subabul condition. The plant height: at 45 DAS was observed that the plant height highest in T_1 (97.28 cm) followed by T_2 (92.51 cm) and minimum plant height was found in T_9 in (86.09 cm) under subabul condition. The Plant height: at 60 DAS was observed that the plant height highest in T_1 (130.76 cm) followed by T_2 (128.90) cm and minimum plant height was found in T_9 in (120.53) cm height under subabul condition and plant height at 75 DAS was observed that the plant height was highest in T_1 (130.67 cm) followed by T_2 (128.90 cm) and minimum plant height was found in T_9 (120.53 cm) height under subabul condition with the dose of NPK 120:60:40, 90:50:30, 60:40:20, respectively. The grain yield (t ha^1) was higher in T_1 (5.63) followed by T_2 (7.66) and minimum was found in T_9 (4.22) under subabul condition with the dose of NPK 120:60:40, 90:50:30, 60:40:20, respectively.

Table 1 Effect of different fertilizer levels, their interction on plant height (cm) of Maize (*Zea mays* L.) varietes under Subabul (*Laucaena leucocephala*) based agroforestry system at different intervals

	30 DAS				45 DAS			
Levels of Variety (V)	Levels of Fertilizer (F)			Mean (V)	Levels of Fertilizer (F)			Mean (V)
	F1-(NPK 120: 60:40)	F2-(NPK90: 50: 30)	F3-(NPK60: 40:20)		F1-(NPK 120: 60:40)	F2-(NPK90: 50: 30)	F3-(NPK60:40 :20)	
V1-S-601	67.5	66.27	65.76	66.51	97.28	92.51	91.63	93.81
V2-DHS-42	65	63.76	62.56	63.77	90.45	88.81	87.29	88.85
V3-K-25	62.98	61.38	60.03	61.46	86.81	86.36	85.09	86.09

Table Contd. ...

Mean (F)	65.16	63.80	62.78		91.51	89.23	88.00	
	F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%	
Variety (V)	S	0.62	1.33		S	0.56	1.18	
Fertilizer (F)	S	0.62	1.33		S	0.56	1.18	
Inter (V X F)	NS	0.94	2.001		S	0.84	1.78	

	60 DAS				75 DAS			
Levels of Spacing (S)	Levels of Fertilizer (F)			Mean (S)	Levels of Fertilizer (F)			Mean (S)
	F1-(NPK 120: 60:40)	F2-(NPK90: 50: 30)	F3-(NPK60: 40:20)		F1-(NPK 120: 60:40)	F2-(NPK90: 50: 30)	F3-(NPK60: 40:20)	
V1-S-601	130.78	128.9	127.04	128.90	130.78	128.9	127.04	128.90
V2-DHS-42	126.78	123.32	122.77	124.29	126.78	123.32	122.77	124.29
V3-K-25	122.31	121.05	120.53	121.3	122.31	121.05	120.53	121.3
Mean (F)	126.62	124.42	123.44		126.62	124.42	123.44	
	F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%	
Variety (V)	S	0.33	0.71		S	0.33	0.71	
Fertilizer (F)	S	0.33	0.71		S	0.33	0.71	
Inter (V X F)	S	0.50	1.07		S	0.50	1.07	

Table -2 Effect of different fertilizer levels their interaction on Grain yield ton/ha (g) of Maize (*Zea mays* L.) under Subabul (*Leucaena leucocephala*) based agroforestry system at different intervals

Levels of Variety (V)	Levels of Fertilizer (F)			Mean (S)
	F1-(NPK 120: 60:40)	F2-(NPK90: 50: 30)	F3-(NPK60:40:20)	
V1-S-601	5.63	7.66	4.95	6.08
V2-DHS-42	5.55	7.13	4.98	5.89
V3-K-25	5.55	7.65	4.15	5.78
Mean (F)	5.57	7.48	4.69	
	F-test	S. Em. (±)	C.D. at 5%	
Variety (V)	S	0.15	0.33	
Fertilizer (F)	S	0.15	0.33	
Inter (S X F)	S	0.23	0.49	

Discussion

Performance of Maize (*Zea Mays L.*) with Subabul (*Leucaena leucocephala*) was discussed here critically and analogically as per our experimental results. In Agroforestry system the tree crop interaction is often negative due to severe competition from subabul for light, moisture and nutrients suppressing the field crop. In present study, variety S-601 with fertilizer levels performed well in all growth and yield parameters compared to other varieties *viz*., DHS-42 and K-25, minimum with fertilizer levels F_1 (120:60:40), F_2 (90:50:30), F_3 (60:40:20), under subabul based Agroforestry system. It was observed that the plant height was highest in T_1 with (130.67 cm) under subabul condition followed by T_2 with 128.90 cm and minimum plant height was found in T_9 with 120.53 cm height. This might due to severe competition for light, moisture and nutrients at 75 DAS.

Similar finding reported by Islam *et al.* (2012), Morgado & Willey (2008), Zhang *et al.* (2012). It was observed that grain yield (t ha^1) was higher in under subabul condition. The highest grain yield (t ha^1) was observed in T_1 5.63 followed by T_2 7.66 and minimum was found in T_9 4.22. This might due to severe competition for light, moisture and nutrients. Similar finding reported by Rafiq (2010), Amoah *et al.* (2011).

Conclusion

The present study concluded that the experimental observations obtained during the investigation, highlights that treatment T_1 i.e. S-601 emerged as the most superior over all the other two varieties with regard to its growth performance and yield attributes in and under subabul based agroforestry system whereas, the treatment F_1 i.e. fertilizer dose 120:60:40 (N.P.K) emerged as the best comparison to other with regards to its growth but 90:50:40 (N.P.K) emerged as the best in yield under subabul based agroforestry system. So variety S- 601 of maize with the F_2 fertilizer is highly recommended for cultivation under Subabul based agroforestry system during Kharif season in Allahabad conditions. However, since these conclusions are on the basis of only one season experiment, further experimentation with the same factors should be conducted to substantiate the results.

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