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Research article

GROWTH AND PRODUCTIVITY OF SPECIALITY CORN AS INFLUENCED BY DIFFERENT LEVELS OF NITROGEN UNDER *PONGAMIA* PLANTATIONS

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ABSTRACT: A field experiment was conducted during *kharif* 2011 at the Student's Farm, College of Agriculture, Rajendranagar, Hyderabad on red sandy loam soils to study the effect of nitrogen management in speciality corn under *Pongamia* + maize agri-silvi system. All the growth and yield attributes such as plant height, dry matter production, leaf area index, cob length, cob girth, number of cobs plant^{-1}, number of rows cob^{-1}, number of kernals cob^{-1} and 100 kernel weight were found maximum at 120 kg N ha^{-1} than at the remaining nitrogen levels. Whereas, cob weight (with husk) was found maximum at 120 kg ha^{-1} but was on par with 90 kg N ha^{-1}. Similarly cob yield (with husk), green fodder/stover yield, harvest index, kernel yield of popcorn and shelling percentage of popcorn were found significantly higher at 120 kg N ha^{-1} than the other two lower doses of nitrogen. The different types of corn were found significantly different from each other regarding growth parameters such as plant height, days to 50 per cent silking and days to maturity. Regarding the effect on yield attributes and yield, all the three types of corn were found significantly different from each other in cob length, cob girth, cob weight (with husk), green cob yield as well as green fodder/stover yield.

Key words: Nitrogen, Baby corn, Sweet corn, Popcorn.

INTRODUCTION

Maize (*Zea mays* L.) is the 3rd most important cereal in the world next to rice and wheat and has the highest production potential among the cereals. In India, the production of maize is about 15.09 M.t from an area of 7.89 M.ha, with an average productivity of 1,904 kg ha^{-1} (2009-2010) (CMIE, 2010). Of the various types of maize sweet corn, baby corn and popcorn are most important. Baby corn is nothing but maize being grown for vegetable purpose. Moreover it is a short duration crop and free from pests and diseases and its nutritive value is comparable with that of several high priced vegetables. Sweet corn is used as a human food in soft dough stage with succulent grain and 13 to 15 per cent sugar. It is gaining popularity because of its high sugar and low starch content. The other type i.e., popcorn is very popular as snack food in many parts of the world. The use of popcorn confectionaries and popcorn products especially in amusement parks, moving picture theaters etc., greatly increased the demand for popcorn products and has made a profitable outlet for those who desire to grow popcorn on a commercial scale. Hence for improved production of these corns efficient nitrogen management is needed besides sustaining soil health. Thus an integrated approach of using agroforestry and inorganic fertilizers to supplement N is promoted.

MATERIAL AND METHODS

The experiment was conducted at Student's Farm, College of Agriculture, Rajendranagar, Hyderabad on red sandy loam soils of Southern Telangana Agro-climatic Zone of Andhra Pradesh. The Farm is geographically situated at an altitude of 542.3 m above mean sea level at 170 19' N latitude and 780 28' E longitude. The soil of the experimental field was sandy loamy in texture(coarse sand-34.3%, sand-36.8%, silt-16.2% and clay-12.7 %), slightly alkaline in reaction (pH 7.2), Electrical conductivity (0.11 ds m^{-1}), low in organic carbon (0.52%) and nitrogen (121.4 kg ha^{-1}) and medium in available phosphorus (48.2 kg ha^{-1}) and available potassium (343.8 kg ha^{-1}). A total rainfall of 466.1 mm was received in 29 rainy days during the crop growth period.

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The distribution of rainfall was uniform and sufficient for better crop growth. The experiment was laid out in a randomized block design (factorial concept) with three replications. The treatments consists of three nitrogen levels (60, 90 and 120 kg N ha^{-1}) and three types of corn (baby corn, sweet corn and popcorn) as intercrops in *Pongamia* and one control treatment (sole *Pongamia* without maize and with no nitrogen).

RESULTS AND DISCUSSION

Application of 120 kg N ha^{-1} recorded maximum plant height and dry matter production at harvest which was significantly superior to both 60 and 90 kg N ha^{-1} at harvest (Table 1). Similar results of increase in plant height with increasing nitrogen levels have been reported by Muniswamy *et al.* (2007), Suryavanshi *et al.* (2008) and Ashok Kumar (2009). Whereas, leaf area index tended to increase with increased levels of nitrogen from 60 to 120 kg N ha^{-1}, with significant disparity between any two successive levels. Further, early silking and maturity was observed in all corns at higher dose of N *i.e.*, 120 kg N ha^{-1} (Table 1). All the yield attributes such as cob length, cob girth, number of cobs $plant^{-1}$, number of rows cob^{-1}, number of kernels cob^{-1} and 100 kernel weight were found maximum at higher level of 120 kg N ha^{-1} when compared to lower doses (Table 2). These results are in conformity with those of Singh *et al.* (2000), Bindhani *et al.* (2007). Whereas, in case of cob weight (with husk) application of nitrogen at 120 kg ha^{-1} recorded significantly heavier cobs compared to 60 kg N ha^{-1} but it was found at par with 90 kg N ha^{-1} (Table 2). Similarly cob yield (with husk) (Table 3) , green fodder yield, kernel yield of popcorn and shelling percentage of popcorn were found significantly higher at 120 kg N ha^{-1} than the other two lower doses of nitrogen. The present investigation confirms the documented evidence of Kar *et al.* (2006), Muniswamy *et al.* (2007) and Suryavanshi *et al.* (2008).

Table 1. Growth parameters of speciality corn as influenced by varying nitrogen levels and types of corn

Treatments	Plant height (cm)	Leaf area index	Dry matter production (kg ha-1)	Days to 50 per cent silking	Days to maturity
Nitrogen levels (kg ha-1)					
60	163.3	1.74	6061.0	58.1	77.8
90	171.7	2.42	6746.1	57.2	77.2
120	183.3	2.91	7413.0	56.3	76.0
S.Em±	3.53	0.05	123.07	0.35	0.33
CD(p = 0.05)	10.61	0.16	369.03	1.05	1.03
Types of corn					
Baby corn	137.7	2.09	6645.1	44.7	44.7
Sweet corn	200.2	2.49	7070.2	59.8	83.2
Popcorn	180.8	2.49	6504.8	67.0	103.1
S.Em±	3.53	0.05	123.07	0.35	0.33
CD(p = 0.05)	10.61	0.16	369.03	1.05	1.03
N x C Interaction					
S.Em±	6.13	0.09	213.18	0.60	0.59
CD(P = 0.05)	NS	0.28	NS	NS	NS

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The different types of corn were found significantly different from each other regarding growth parameters such as plant height, days to 50 per cent silking and days to maturity. Whereas, in case of leaf area index, sweet corn and popcorn were found on par with each other at harvest. Similarly regarding dry matter accumulation at harvest, baby corn and sweet corn were found on par with each other (Table 1). Regarding the effect of types of corn on yield and yield attributes, all the three types of corn were found significantly different from each other in cob length, cob girth, cob weight (with husk), green cob yield as well as green fodder/stover yield (Table 2). Genotypic differences in yield are in conformity with the findings of Huseyin *et al.* (2003) and Ashok (2006). Whereas, sweet corn and popcorn were comparable with each in number of cobs plant^{-1} but found significantly different from baby corn. Application of nitrogen at 120 kg ha^{-1} recorded maximum kernel yield (2656.3 kg ha-1) when compared to remaining lower doses of nitrogen in case of popcorn (Table 4).

Table.2. Influence of nitrogen levels on yield attributes and yield of specialty corn.

Treatments	Cob length (cm)	Cob girth (cm)	Number of cobs plant-1	Cob weight with husk (g cob-1)	Number of kernel rows cob-1	Number of kernels row-1	100 seed weight (g)	Cob yield (with husk) (kg ha-1)	Green fodder/stover yield (kg ha-1)
Nitrogen levels (kg ha-1)									
60	11.58	8.92	1.32	61.3	11.6	30.6	12.1	4294	7082
90	12.77	9.11	1.44	63.3	12.8	32.3	12.3	4852	7487
120	13.86	9.87	1.59	68.0	14.5	35.3	13.0	5366	8082
S.Em±	0.24	0.19	0.03	1.69	-	-	-	70.3	157.3
CD (P =0.05)	0.73	0.59	0.10	5.07	-	-	-	210.9	471.7
Types of corn									
Baby corn	7.10	4.26	2.13	17.2	-	-	-	4109	10817
Sweet corn	16.52	13.59	1.10	113.4	12.7	33.0	11.5	7010	8453
Popcorn	14.60	10.05	1.12	62.0	13.3	32.4	13.4	3393	3380
S.Em±	0.24	0.19	0.03	1.69	-	-	-	70.3	157.3
CD (P= 0.05)	0.73	0.59	0.10	5.07	-	-	-	210.9	471.7
N x T Interaction									
S.Em±	0.42	0.34	0.06	2.92	-	-	-	121.8	272.5
CD (P= 0.05)	1.26	1.03	NS	NS	-	-	-	365.4	NS

Table.3. Cob yield (with husk) (kg ha^{-1}) of specialty corn as influenced by varying nitrogen levels and types of corn and their interaction

Nitrogen levels (kg ha^{-1})	Types of corn			
	Baby corn	Sweet corn	Popcorn	Mean
60	3387	6381	3114	4294
90	4264	7093	3200	4852
120	4675	7557	3867	5366
Mean	4109	7010	3393	
	S.Em±		CD (p = 0.05)	
Nitrogen levels (kg ha^{-1})	70.3		210.9	
Types of corn	70.3		210.9	
N x T	121.8		365.4	

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The interaction effect between types of corn and levels of nitrogen for cob yield indicated that baby corn gave significantly higher cob yield under the application of 120 kg N ha^{-1} (4675.5 kg ha^{-1}) over remaining two lower doses of nitrogen. Sweet corn & popcorn also recorded higher cob yields at 120 kg N ha-1(7557.2 & 3867.1 kg ha^{-1}) which were significantly superior to both 60 kg and 90 kg N ha^{-1} (Table 3) . The results suggest that in speciality corn (three types), application of 120 kg N ha^{-1} is required to achieve maximum cob yield.

Table.4. Kernel yield (kg ha^{-1}) and Shelling percentage of popcorn as influenced by varying nitrogen levels

Treatment	Kernel yield (kg ha^{-1})	Shelling percentage
60	1994	39.7
90	2268	40.2
120	2656	40.9

CONCLUSION

Overall, present findings clearly showed that Speciality corn types can be grown successfully in the alleys of six year old *Pongamia* plantation with nutrient supplementation in sandy loam soils of Southern Telangana region of Andhra Pradesh and application of 120 kg N ha^{-1} was found to be better in terms of growth and yield of speciality corn.

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