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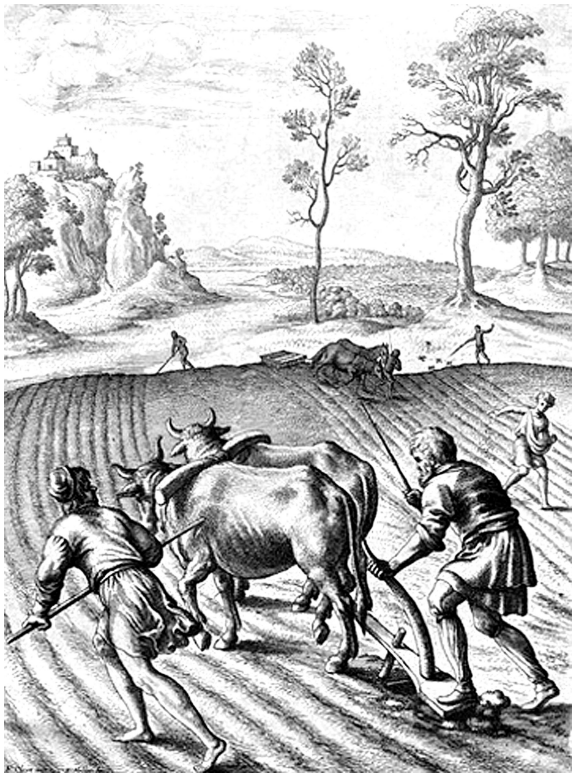

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Plant Growth Regulators and Split Application of Nitrogen Improves the Quality Parameters and Green Cob Yield of Baby Corn (*Zea mays* L.)

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Abstract: A field experiment was conducted at the Eastern Block farm, Tamil Nadu Agricultural University, Coimbatore, to find out the effect of different plant growth regulators and split application of nitrogen on the productivity and some of the quality parameters of baby corn. The field trial was laid out in split plot design with three replications. Three growth regulating substances namely Mepiquat chloride at the rate of 200 ppm, NAA at the rate of 40 ppm and Putrescine at the rate of 50 ppm along with water spray as control were taken in main plots and four split application of nitrogen treatments (½ basal+½ at 25 DAS; ½ basal+½ at 45 DAS; ½ basal+¼ at 25 DAS+¼ at 45 DAS and ¼ basal+½ at 25 DAS+¼ at 45 DAS) were taken in sub plots. Higher values of protein content (%) and cob yields (kg ha^{-1}) were registered with Mepiquat chloride at the rate of 200 ppm and these were comparable with NAA at the rate of 40 ppm. With respect to split N application, higher values of starch (%), protein (%) and green cob yields (kg ha^{-1}) were obtained with ½ basal+¼ at 25 DAS+¼ at 45 DAS. Hence, application of plant growth regulators (Mepiquat chloride at the rate of) 200 ppm or NAA at the rate of 40 ppm) along with supply of N in three splits (½ basal+¼ at 25 DAS+¼ at DAS) would boost the green cob yield as well as quality parameters of baby corn.

Key words: Growth regulators, split N application, quality, yield, baby corn

INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal crop in the world next to rice and wheat and has the highest production potential among the cereals. For diversification and value addition of maize an interesting development has been made recently that would boost the growth of food processing industries (Thavaprakaash *et al*., 2005a; Kotch *et al*., 1995). Maize is being grown for vegetable purposes, which is otherwise known as baby corn. It is a small young corn ear harvested at the stage of silk emergence (Thakur *et al*., 1995). Though baby corn is a new crop for India, it has got a huge potential for commercial production since it could yield more remuneration to the farmers apart from earning considerable foreign exchange. There is a potential demand for high quality baby corn in the national and international market (Thavaprakaash *et al*., 2005b). However, little information exists on the production practices that would improve the yield and quality attributes of baby corn. Therefore, it is essential to standardize the agro techniques particularly nitrogen management and growth regulator application, to increase the yield and quality parameters of this vegetable. Split application of nitrogen based on the crop requirement is an essential approach to increase the N use efficiency in crops (Thakur and Sharma, 1999; Kakar *et al*., 1999). Growth regulators are proved to improve effective partitioning and translocation of accumulates from source to sink in the field crops (Solaimalai *et al*., 2001; Senthil *et al*., 2003). It is hypothesized that application of nitrogen at different timings of crop growth along with growth regulator spray would improve the yield and quality of baby corn. Therefore, an experiment was carried out with an objective to study the effect of different plant growth regulators and split application of nitrogen on the yield and quality parameters of baby corn.

MATERIALS AND METHODS

Field experiments were conducted during late *rabi* season of 2002-03 (December-March) at Eastern Block farm, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore. The experimental site was located at 11°N latitude, 77°E longitude and an altitude of 426.7 m above mean sea level. The experimental site had sandy clay loam (*Typic ustropept*) soil type and had low available N (228.5 kg ha^{-1}), medium available P

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(13.2 kg ha^{-1}) and high available K (381.6 kg ha^{-1}). The baby corn composite COBC1 was obtained from the Millet Breeding Station, Tamil Nadu Agricultural University and used as test crop in the experiment. The experiment was laid out in split plot design with three replications.

Plant growth regulator treatments were taken in main plots and split N application treatments were imposed in sub plots (Table 1). Farm Yard Manure was applied basally at the rate of 12.5 t ha^{-1} and spread equally over the entire experimental field. Inorganic fertilizers such as Urea (46%N), Single super phosphate (16% P_2O_5) and Muriate of potash (60% K_2O) were applied for the supply of N, P and K, respectively. Full dose of P and half of the required K were applied basally and the remaining K was applied at 25 DAS. Nitrogen fertilizers were applied to each plot as per the treatment schedule. Growth regulators were sprayed twice at 15 and 30 DAS using a low volume sprayer. All the agronomic practices were carried out uniformly to raise the crop (CPG, 1999). Green cobs were harvested from the net plots immediately after the emergence.

Quality parameters such as starch (%) and vitamin A (mg 100 g^{-1}) contents of fresh corn were estimated by following the procedures given by Hodge and Hofreiter (1962). Similarly, protein (%) and vitamin C (mg 100 g^{-1}) contents were estimated by following the methods given by (Lowry *et al*., 1951; Sadasivam and Manickam *et al*., 1996), respectively. The cobs from the net area of each plot were harvested separately, weighed and recorded as green cob yield (kg ha^{-1}). Data were subjected to statistical analysis (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Quality of baby corn: Among the quality parameters tested, plant growth regulators favorably influenced the protein content of baby corn (Table 1). Higher values of protein (5.44%) contents were obtained from the plants treated with Mepiquat chloride at the rate of 200 ppm and this was comparable with the plants treated with NAA at the rate of 40 ppm (5.38%). This was followed by Putrescine spray at the rate of 50 ppm. The lowest quality parameters were recorded with the water spray (control). Other quality parameters such as starch (%), vitamin A (mg 100 g^{-1}) and vitamin C (mg 100 g^{-1}) contents were not perceptibly influenced by the application of growth regulators.

The increase in quality parameters with application of Mepiquat chloride might be due to the property of growth retardants in enhancing the activity of enzymes (Sivakumar *et al*., 2001). The increase in protein content with Mepiquat chloride spray might be due to the biochemical and physiological nature of the baby corn plants in improving the protein content in response to Mepiquat chloride application. The findings of Jeyakumar and (Thangaraj, 1998; Sivakumar *et al*., 2001) added evidence to the fact that Mepiquat chloride application increases the protein content of the economic produce in field crops. The reason for increase in protein content (%) of baby corn with the application of NAA at the rate of 40 ppm might be ascribed to the fact that the protein content had a high degree of positive relationship with the rate of photosynthesis which was favorably enhanced by NAA application. Similar results of increase in protein content (%) due to NAA application were also reported earlier by Kalarani and Jeyakumar (1998) and (Sivakumar *et al*., 2001).

Application of nitrogen in split doses at different timings had significant influence on starch and protein contents (%) of baby corn. Significantly higher values of starch (8.67%) and protein (5.69%) contents of corn were recorded with the treatment N_3 (½ basal+¼ at 25 DAS+¼ at DAS) over others (Table 1). The treatments N_1 (½ basal+½ at 25 DAS) and N_4 (¼ basal+½ at 25 DAS+¼ at 45 DAS) recorded significantly lower quality parameters when compared to N_3 (½ basal+¼ at

Table 1: Effect of plant growth regulators and split application of nitrogen on quality parameters and yield of baby corn

Treatment	Starch (%)	Protein (%)	Vitamin A (mg 100 g^{-1})	Vitamin C (mg 100 g^{-1})	Cob yield (kg ha^{-1})
Growth regulators					
T_1-Control (water spray)	8.11	5.10	0.145	13.44	7291
T_2-Mepiquot chloride (200 ppm)	7.95	5.44	0.143	13.35	8003
T_3-NAA (40 ppm)	7.92	5.38	0.142	13.39	7872
T_4-Putrescine (50 ppm)	8.06	5.23	0.143	13.41	7569
SED	0.10	0.04	0.002	0.12	112
CD (p = 0.05)	NS	0.10	NS	NS	231
Time of N application					
N_1-½ basal+½ at 25 DAS (control)	7.91	5.26	0.144	13.36	7642
N_2-½ basal+½ at 45 DAS	7.31	4.93	0.143	13.28	7269
N_3-½ basal+¼ at 25 DAS+¼ at 45 DAS	8.67	5.69	0.145	13.51	8122
N_4-¼ basal+½ at 25 DAS+¼ at 45 DAS	8.14	5.33	0.144	13.41	7701
SED	0.14	0.08	0.002	0.20	155
CD (p = 0.05)	0.29	0.16	NS	NS	320

Interaction: Absent; NS: Non Significant

25 DAS+¼ at DAS). Among all the split N application treatments, the lowest values of quality attributes were registered with N_2 (½ basal +½ at 45 DAS). However, the quality parameters such as vitamin A and vitamin C contents (mg 100 g^{-1}) of corn were not affected by split application of nitrogen at different timings.

Increase in protein content due to application of N in three splits as in the treatment N_3 (½ basal +¼ at 25 DAS+¼ at DAS) demonstrates that later application of N leads to increase in protein content of the economic produce. This might be due to higher accumulation of N in the green cobs at later stages of crop growth and increased biochemical reactions at higher N. Increase in protein content (%) of the economic produce with split application of nitrogen was also reported in earlier by Abd-El-Latif and Maatouk (1986) and Gangwar and Niranjan (1991).

Green cob yield: Growth regulator spray had positive influence on green cob yield of baby corn (Table 1). The crop sprayed with Mepiquat chloride at the rate of 200 ppm produced highest green cob yield (8003 kg ha^{-1}) and this was comparable with application of NAA at the rate of 40 ppm (7872 kg ha^{-1}). Putrescine at the rate of 50 ppm spray however, was significantly superior (7569 kg ha^{-1}) over water spray (7291 kg ha^{-1}) (Table 1).

The increase in green cob yield with Mepiquat chloride spray might be due to increased yield attributes, which in turn resulted from effective translocation of photosynthates from source to sink. As a growth retardant, Mepiquat chloride shortened the distance between the source and the sink and thus facilitated effective translocation of assimilates and final cob yield. The increase in cob yield might also be due to increased mobilization of reserve food materials to the developing sink through increase in hydrolyzing and oxidizing enzyme activities (Jayachandran *et al*., 2000; Velu, 2002). Being an auxin compound, NAA promoted vegetative growth by active cell division, cell enlargement and cell elongation and thus helped in improving growth characteristics and also facilitated reproductive growth (Pareek *et al*., 2000).

There was a significant variation in green cob yield with respect to split application of nitrogen at different timings of crop growth. Among the N treatments, N_3 (½ basal+¼ at 25 DAS+¼ at DAS) produced the maximum cob yield of 8122 kg ha^{-1}. The cob yield recorded under the treatments N_4 (¼ basal+½ at 25 DAS+¼ at 45 DAS) and N_1 (½ basal+½ at 25 DAS) were statistically comparable to each other (7701 and 7642 kg ha^{-1}) but significantly superior over N_2 (½ basal+½ at 45 DAS) (Table 1).

Application of nitrogen in three splits might have facilitated continuous and gradual supply of nitrogen to the growing crop and maintain greenness of leaves for longer periods. This in turn improved dry matter accumulation in the developing sink and thereby increased the green cob yield (Misra *et al*., 1994). Application of N in three split doses is conducive for regulating the supply of fertilizer N over almost whole of the active growth phase of the plant (Parthipan, 2000). When a considerable amount of N is applied at or near to anthesis, there is a greater possibility of its accumulation in the sink rather than in other vegetative parts (Nair and Singh, 1974).

CONCLUSIONS

It is concluded that combined application of plant growth regulators (Mepiquat chloride at the rate of 200 ppm or NAA at the rate of 40 ppm) along with supply of N in three splits (½ basal+¼ at 25 DAS+¼ at DAS) would increase the cob yield as well as quality parameters of baby corn.

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