International Journal of Plant & Soil Science

34(20): 283-288, 2022; Article no.IJPSS.88183
ISSN: 2320-7035

Response of Baby Corn (*Zea mays* L.) to Levels of Nitrogen and Detasseling

O. Vamshi [a*] and S. C. Sahoo [a]

[a] *Department of Agronomy, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar – 751003, Odisha, India.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2022/v34i2031153

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/88183

Original Research Article

Received 07 April 2022
Accepted 14 June 2022
Published 17 June 2022

ABSTRACT

A field experiment was conducted during rabi season of 2020-21 to study the effect of levels of nitrogen and detasseling on yield and economics of baby corn. The experiment was laid out in split plot design with three replications comprising of six main plot treatments (0, 40, 80, 120, 160 and 200 kg N ha^{-1}) and two sub plot treatments (with tassel and without tassel). Application of 160 kg N ha^{-1} produced 2.22 cobs $plant^{-1}$, which was statistically similar with application of 200 kg N ha^{-1} (2.44). Application of 160 kg N ha^{-1} produced optimum weight (9.23 g cob^{-1}) of dehusked baby corn. Detasseled plots produced in higher number of cobs plant $^{-1}$(1.69) and heavier dehusked cobs (8.63 g) than the plants having tassel. The optimum yield of baby corn (2072 kg ha^{-1}) was obtained with application of 160 kg N ha^{-1}. Detasseling resulted in 8.4 per cent higher production of dehusked baby corn as compared with plots having tassel. But, the plots with tassel produced 10.3 per cent higher yield of green fodder as compared to the crop without tassel. The highest net return of Rs 155144 ha^{-1} was obtained from the treatment receiving 160 kg N ha^{-1}. Detasseled plots gave 9.97 per cent higher net profit than the plots with tassel.

Keywords: Baby corn; nitrogen; detasseling; yield; economics.

**Corresponding author: E-mail: vamshioddula2@gmail.com;*

1. INTRODUCTION

Baby corn (*Zea mays* L.) is a type of maize in which immature cobs are harvested just after emergence of silk. Baby corn is consumed as a vegetable due to its appealing flavour and crispiness. Baby corn is a high value crop, where quality is more important than the quantity of production [1]. Baby corn cultivation has a dual advantage as vegetable and green fodder. As a short duration crop, it can be comfortably accommodated in intensive cropping system [2]. Yield of baby corn is influenced by several factors including nutrient management. Among the nutrients, nitrogen plays a crucial role in deciding the productivity of both baby corn and green fodder. Asaduzzaman et al. [3] obtained the highest yield (2.1 t ha^{-1}) of dehusked baby corn with application of 160 kg nitrogen per hectare. As baby corn is harvested before fertilization, the tassel has insignificant contribution towards final production. Rather, tassel diverts some of the plant nutrients to the unproductive male inflorescence thereby minimizing flow of nutrients to the cob. Hence, detasseling can enhance the yield by diverting plant nutrients to the young ears. Moreira et al. [4] recorded more number of heavier ears in detasseled plants as compared with the crop with tassels. Carvalaho et al. [5] also reported higher baby corn yield with removal of tassels. With this backdrop, an experiment was conducted to study the effect of levels of nitrogen and detasseling on yield and economics of baby corn cultivation.

2. MATERIALS AND METHODS

The field experimentation was taken up at the Research Farm of Department of Agronomy, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar during rabi season of 2020-21. The soil was sandy loam in texture with pH value of 5.6. The experiment was conducted in a split plot design with three replications having six main plots (0, 40, 80, 120, 160, 200 kg N ha^{-1}) and two sub plots (with tassel and without tassel). Farm yard manure was applied @ 5 t ha^{-1} at the time of final ploughing. The seeds were sown at a spacing of 40 cm x 20 cm. Basal application of 60 kg P_2O_5 and 60 kg K_2O per hectare was done at the time of sowing. As per treatment requirement, 50 per cent of nitrogen was applied as basal fertilizer and the rest was top dressed at three weeks after sowing. The tassels were removed manually just after emergence in the treatment without tassel.

3. RESULTS AND DISCUSSION

3.1 Yield Attributes

3.1.1 Cob length

The length of cob either with or without husk was significantly influenced by different levels of nitrogen and tassel removal. The longest cobs with husk (21.84 cm) was obtained with application of 200 kg N ha^{-1}, which was significantly more than the length of cob (19.98 cm) with application of 160 kg N ha^{-1} (Table 2). There was enhancement of husked cob length by 9.3 per cent when 200 kg N ha^{-1} when compared with application of 160 kg N ha^{-1}. Application of 80 kg N ha^{-1} resulted in average cob length of 17.57 cm, which was statistically superior over the plots receiving 40 kg N ha^{-1} and 0 kg N ha^{-1}. Obviously, application of no nitrogen resulted in lowest cob length with husk (15.35 cm), but it was statistically at par with 40 application of N kg ha^{-1}(15.98 cm). The length and girth of the dehusked baby corn were in raising trend with increase in nitrogen level up to 120 kg N ha^{-1}. This was in confirmation with the results obtained by the Muniswamy et al. [6].

Removal of tassel had significant effect on length of cob with husk (Table 2). The plot having plants without tassel produced longest cobs (18.59 cm), which was 4.4 per cent longer than the plots accommodating plants with tassel. There was no interaction effect of nitrogen level and detasseling on length of cob with husk.

The treatment N_6 (200 kg N ha^{-1}) produced the longest dehusked baby corn (9.15 cm), which was statistically comparable with N_5 (160 kg N ha^{-1}) but significantly higher than the baby corn produced in all other treatments (Table 2). The length of dehusked baby corn with application of 120 kg N ha^{-1} was 8.51 cm, which was statistically comparable with the cobs obtained with application of 80 kg N ha^{-1}(8.41 cm). The length of dehusked cob at a nitrogen level of 80 kg ha^{-1} was 15.05 per cent higher than that obtained with application of nitrogen level of 40 kg Nha^{-1}. The lowest cob length of 7.1 cm was recorded at a nitrogen level of 0 kg ha^{-1}, which was statistically at par with the length of cob obtained by application of 40 kg N ha^{-1} (7.31 cm).

Detasseling had immensely contributed to the length of dehusked baby cob (Table 2). The length of dehusked baby corn in detasseled plants was 3.09 per cent more than the length of

dehusked baby corn obtained from the plants with tassel. As per Mangaser [7], there was significant increase in cob length (8.29 cm) of young corn in detasseled plants. There was no interaction effect of nitrogen level and detasseling on length of cob without husk.

3.1.2 Cob girth

The cob girth after before or after dehusking was remarkably influenced by different doses of nitrogen application (Table 2). The maximum cob girth with husk was found in treatment N_6 receiving 200 kg N ha^{-1}, which was statistically at par with treatments of N_5 (160 kg N ha^{-1}) and N_4 (120 kg N ha^{-1}). The lowest value of cob girth with husk (7.45 cm) was recorded with zero nitrogen application. Similar trend was observed regarding effect of nitrogen level on length of dehusked baby corn. The maximum girth of dehusked cob (4.90 cm) was found in the treatment receiving 200 kg N ha^{-1}, which was statistically at par with treatments receiving either 160 kg N ha^{-1} or 120 kg N ha^{-1} (Table 2). The lowest value of cob girth without husk (3.47 cm) was recorded with no nitrogen application.

Detasseling improved the cob girth either with or without husk. Removal of tassels produced maximum girth of baby corn with husk (8.37 cm) and without husk (4.34 cm), which were more than the girth of baby corn obtained from the tasseled plants. On an average, the girth of dehusked baby corn was 51.5 per cent of the girth of baby corn having husk cover. There was no interaction effect of nitrogen level and detasseling on girth of cob with or without husk.

Duration of a crop plays an important role for efficient utilization of land in a cropping system by accommodating succeeding crop in time. The plants switch over to reproductive phase with the influence of inherent genetic characters, environmental factors and agronomic management practices. Application of nitrogen influenced the process of plant growth and hence influenced flower initiation in the plant. The process of physiological activities was accelerated due to enhanced rate of nitrogen application as evidenced from earliness in emergence of silk. Number of days required for 50 per cent silking was in the range of 55.8 to 61.2. Application of 200 kg N ha^{-1} minimized the no. of days required for 50 per cent silking to 55.8, which was lowest among all other nitrogen level. Similar findings were reported by Wasnik et al. [8], who recorded minimum days taken for tasseling and silking with application of 250 kg N ha^{-1}. Application of 160 kg N ha^{-1} or 120 kg N ha^{-1} required 56.5 days for silking. Absence of nitrogen in the treatment receiving no nitrogen slowed down the plant growth process, which was reflected in maximum no. of days (61.2) required for 50 per cent silking.

The process of physiological activities has direct bearing on yield attributing characters such as number and weight of baby corn. Production of diversified quantity of photosynthetic due to varied dose of nitrogen was reflected in differential value of weight and no. of baby corn. Enhancement in nitrogen level promoted formation of axillary cobs that has increased the cob count per plant and per hectare. There was significant increase in no. of baby corn per plant up to 160 kg N ha^{-1}. Maximum no. of cobs per plant (2.44) was recorded with application of 200 kg N ha^{-1}, which was statistically at par with the crop receiving 160 kg N ha^{-1} (2.22). Providing no nitrogen to the crop resulted a meager number (0.83) of cobs per plant, indicating production of more barren plants in absence of nitrogen application. There was 194 per cent increase in no. of cobs per plant with provision of 200 kg N ha^{-1}as compared with no nitrogen application. Assaduzzaman et al. [3] also reported enhancement in number of ears per plant with increase in quantity of nitrogen application. Detasseling produced higher no. of cobs per plant than the plants with tassel (Table 1). There was production of 8.33 per cent more number of baby corn per plant from the detasseled plants than plants with tassel.

There was enhancement in total cob count per hectare with increase in nitrogen level. Per hectare cob count was the highest (295.15 thousand ha^{-1}) with application of 200 kg N ha^{-1}, which was statistically at par with the treatment receiving 160 kg N ha^{-1} (268.8 thousand ha^{-1}). The cob count was minimum (101.25 thousand ha^{-1}) in the plots not receiving any nitrogen from external sources. Detasseling had conspicuous influence on the number of cobs produced per hectare. The plots with detasseled plants produced 8.26 per cent more cobs per hectare than the plots with undisturbed tassels (Table 1).

Effect of various nitrogen levels and detasseling was conspicuously visible on the weight of dehusked baby corn. The weight of dehusked baby corn increased linearly with increase in nitrogen level and attained the highest value of 10.94 g cob^{-1} with application of 200 kg N ha^{-1}.

Mehta et al. [9] also obtained heaviest cobs with application of as high as 275 kg N ha^{-1}. The crop receiving 160 kg N ha^{-1} produced dehusked baby corn with weight of 9.23 g cob^{-1}, which was superior over application of 0, 40, 80 or 120 kg N ha^{-1}. The lowest cob weight of 6.85 gram per cob was recorded with application of 0 kg N ha^{-1}. Application of 200 kg N ha^{-1} resulted in 59.7 per cent heavier baby corn production as compared with the plots receiving no nitrogen. The weight of the dehusked baby cob increased with removal of tassel. The dehusked cob weight (8.63 g cob^{-1}) obtained from the plants without tassel was 6.8 per cent higher than the dehusked cob weight (8.08 g) of the plants with tassel. Diversion of plant nutrients to the female flower in the detasseled plots might have contributed for increase in weight of baby corn. Besides, absence of apical dominance in detasseled plants might be the reason for better growth of baby cob. Moreira et al. [4] also obtained more number of heavier baby corn from the detasseled plants as compared with plants with tassel.

3.2 Baby Corn Yield

Yield of baby corn is determined by various yield attributing parameters such as number of baby corn per plant and weight of individual baby corn. Variation in levels of nitrogen and detasseling had substantial effect on baby corn yield. The baby corn yield without husk was the maximum (2073 kg ha^{-1}) with application of 200 kg N ha^{-1}, which was comparable with the yield obtained with application of 160 kg N ha^{-1} (2072 kg ha^{-1}). Assaduzzaman et al. [3] also obtained maximum baby corn yield with application of 160 kg N ha^{-1}. The lowest yield of dehusked baby cob (461.1 kg ha^{-1}) was attained in the plots receiving zero nitrogen, which was at par with the yield recorded by application of 40 kg N ha^{-1} (Table 1). The highest level of nitrogen application (200 kg N ha^{-1}) produced 349.7 per cent more dehusked baby corn than the control plot receiving no nitrogen. Removal of tassel resulted in higher baby corn production due to enhanced flow of nutrients to the female flowers. Detasseled plots yielded 1393 kg ha^{-1} baby corn, which was 8.4 per cent higher than the field having intact tassels. It may be due to 6.8 per cent heavier cobs and 8.3 per cent more no. of cobs per hectare obtained from detasseled plots than the plots with tassel. Sahoo and Panda [10] observed that removal of tassel enhanced the yield of baby corn by 7.4 per cent as compared with the crop having tassel. Caravalaho et al. [5] also reported higher yield of baby corn from the detasseled crop.

3.3 Economics

The net profit is the most important factor for deciding adoption of any crop. Various levels of nitrogen along with detasseling had varied result with respect to net profit. Increase in level of nitrogen enhanced the yield, which ultimately added to the net profit. The highest net return of Rs 155144 ha^{-1} was obtained from the crop receiving 160 kg N ha^{-1}, which was closely followed by net return received by application of 200 kg N ha^{-1}. Earlier, Roy et al. [11] obtained maximum net return of Rs 1,46,135 per hectare

Table 1. Effect of nitrogen level and detasseling on yield and yield attributes of baby corn

Treatments	No. of cobs per plant	No. of cobs ('000 ha^{-1})	Dehusked cob weight (g)	Dehusked Baby corn yield (kg ha^{-1})	Green Fodder yield (t ha^{-1})	Net Profit (Rs ha^{-1})
N (kg ha-1)						
0	0.83	101.25	6.85	461	12.43	1132
40	1.02	124.26	7.00	683	13.58	21185
80	1.41	171.65	7.90	1093	18.89	61700
120	1.83	221.88	8.18	1652	20.18	116036
160	2.22	268.80	9.23	2072	24.88	155144
200	2.44	295.15	10.94	2073	27.45	154135
SE(m) +	0.123	15.279	0.235	72.1	1.910	
CD (0.05)	0.389	48.142	0.739	227.0	6.017	
Detasseling						
With tassel	1.56	189.35	8.08	1285	20.53	80859
Without tassel	1.69	204.99	8.63	1393	18.61	88918
SE(m) +	0.024	3.960	0.112	10.3	0.140	
CD (0.05)	0.074	12.203	0.344	31.6	0.431	

Table 2. Effect of nitrogen level and detasseling on length and girth of baby corn

Treatments	Cob with husk		Cob without husk	
	Length (cm)	Girth (cm)	Length (cm)	Girth (cm)
N (kg ha^{-1})				
0	15.35	7.45	7.10	3.47
40	15.98	7.57	7.31	3.58
80	17.57	8.14	8.41	4.15
120	18.49	8.72	8.51	4.70
160	19.98	8.87	8.82	4.86
200	21.84	9.04	9.15	4.90
SE(m) ±	0.532	0.202	0.195	0.162
CD (0.05)	1.677	0.636	0.615	0.511
Detasseling				
With tassel	17.81	8.23	8.09	4.21
Without tassel	18.59	8.37	8.34	4.34
SE(m) ±	0.076	0.038	0.025	0.027
CD (0.05)	0.235	0.118	0.077	0.084

with application of 120 kg N ha^{-1}. There was minimum net return of Rs 1132 per hectare obtained in the treatment receiving no nitrogen. Additional labour requirement for detasseling operation enhanced the cost of cultivation in detasseled plots, but the yield augmentation nullified the effect. Detasseled plots gave the highest net return of Rs 88918 ha^{-1}, which was 9.97 per cent more than the net profit obtained from the plots with tassel due to more yield of baby corn. These results obtained are in accordance to Sammauria et al. [12].

4. CONCLUSION

Application of 160 kg N ha^{-1} provided maximum net profit. Detasseling also resulted in the maximum net profit. From the results of this experiment, it can be inferred that application of 160 kg N ha^{-1} along with detasseling may be advocated to obtain optimum yield and maximum profit from baby corn production.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/88183