

Nitrogen management and seed priming with GA3 in baby corn, *Zea mays* L

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ABSTRACT

The experiment was carried out during summer season of 2012 in split plot design and replicated three times. Plant height at knee high stage only increased markedly due to higher rate of basal nitrogen application resulting in significantly taller plants under SPAD based nitrogen management with 75 kg N/ha basal dose followed by N top dressing at SPAD value <45 (each time @ 20 kg N/ha) and dry matter production at tasselling stage were found to be improved significantly under SPAD based nitrogen management compared to blanket split of 150 kg N/ha with 3 splits ($\frac{1}{2}$ basal, $\frac{1}{4}$ at 25 DAS and $\frac{1}{4}$ at 45 DAS) nitrogen application. The cob weight and baby corn weight increased with higher dose of nitrogen application. In blanket splits of N management with higher dose of application produced higher than lower rate of blanket application. Higher level of N application under both the N management strategies registered significantly higher yield of baby corn over lower level of N application. However total fodder yield was maximum with SPAD based N management due to growth attributes like plant height was improved significantly. Though net return (Rs 154970) was maximum with the treatment of higher dose of blanket application yet B:C ratio was estimated to be highest with SPAD based N application. Seed priming with GA3 did not show significant effect on growth and yield of baby corn. Economics of baby corn production with seed priming also remained unfavorable.

Keyword: Maize; GA3; nitrogen management; seed priming; net return; yield

INTRODUCTION

Baby corn a novel utilization of maize is used as a vegetable in many Asian countries. It is used as an ingredient in the preparation of many food items. It refers to whole entirely edible corn of immature cob

harvested just before fertilization at the silk emergence stage (Galinat 1985). It is dehusked young ear of the female inflorescence of maize plant harvested at silk emergence before fertilization (Pandey et al 2000, Kapoor 2002). Young cobs were handpicked when the silk length was

about 2-4 cm. The criteria for marketable yield were 4.5-10 cm length and 0.7-1.7 cm diameter of dehusked cobs having a regular row arrangement (Bar-Zur and Saadi 1990).

Most of the work on fertility management is on corn production where the crop requires high dose of fertilizers application (Luikhan et al 2003, Muthukumar et al 2005, Bindhani et al 2007). Growth regulators are proved to improve effective partitioning and translocation of accumulates from source to sink in the field crops (Solamani et al 2001). It is hypothesized that application of nitrogen at different timings of crop growth along with seed priming with plant growth regulators would improve the yield and quality of baby corn.

MATERIAL and METHODS

A Field experiment was conducted during summer season of 2012 at the agricultural farm of the Institute of Agriculture (Palli Siksha Bhavana), Visva-Bharati, Sriniketan, West Bengal (23°39' N latitude, 87°42' E longitude and an elevation of 58.9 m amsl). The soil was sandy loam in texture (52.4% sand, 26.9% silt and 21.0% clay), neutral in reaction (pH 6.2) low in organic carbon (0.22%), available nitrogen (212.0 kg N/ha), available phosphorous (36.5 kg P/ha) and available potassium (142.5 kg K/ha). The experiment was carried out in split plot design with eight

treatments. Each treatment was replicated thrice and the different treatments viz N1: blanket split application of 100 kg N/ha with 3 splits ($\frac{1}{2}$ basal, $\frac{1}{4}$ at 25 DAS and $\frac{1}{4}$ at 45 DAS), N2: blanket split application of 150 kg N/ha with 3 splits ($\frac{1}{2}$ basal, $\frac{1}{4}$ at 25 DAS and $\frac{1}{4}$ at 45 DAS), N3: SPAD based N management with 50 kg N/ha basal followed by N top dressing at SPAD value at <45 (each time @ 20 kg N/ha), N4: SPAD based N management with 75 kg N/ha basal followed by N top dressing at SPAD value at <45 (each time @ 20 kg N/ha) in main plots and sub-plot treatments consisted of no priming of seeds and seed priming with GA3 @ 250 ppm.

The crop was sown on 14 March 2012 and the cobs were harvested 1-2 days after emergence of silk on alternate days. Nitrogen fertilizer was applied as per treatments. The basal dose of nitrogenous fertilizer urea was applied as per treatments. The sources of fertilizers were single super phosphate for P and muriate of potash for K. Half dose of potassium and full dose of phosphorus were applied along with basal dose of nitrogen by placement in seed rows just before sowing of seeds. The remaining half of potassium was applied by band placement along the rows of crop at knee high stage. Four irrigations were given during the growing period of the crop. The irrigations were given at seedling (12 DAS), knee high (27 DAS) and at tasseling stage (57 DAS). The detasseling operation was done on a daily basis since start of tassel

emergence till tassels from all the plants were removed. The immature cobs were harvested at 2–3 days of silk emergence stage and marketed as fresh @ Rs 100/kg after dehusking.

The crop was harvested as green fodder after the completion of picking and sold @ Rs 120/100 kg. The crop was evaluated in terms of plant height, dry matter accumulation, dehusked cobs (baby corn) and green fodder yields as well as nutrient status after harvest of baby corn. The economics of baby corn production was also worked out by calculating the operational costs, gross returns, net returns and benefit:cost ratio.

RESULTS and DISCUSSION

It was found that different nitrogen management treatments showed significant effect on plant height of maize at knee high stage but not at tasselling stage. Under blanket split different nitrogen rates did not result into significant effect on plant height. However higher rate of basal nitrogen application caused significantly taller plants under SPAD based nitrogen management. At tasselling stage though nitrogen management treatment N4 (ie SPAD based management treatment with 75 kg/ha basal) recorded the tallest plants yet remained statistically at par with plant height of all other N management treatment (Table1). These results confirm the earlier finding of Muthukumar et al (2005) and Bindhani et al (2007).

At knee high stage the effect of different nitrogen management treatments on dry matter accumulation remained insignificant (Tables 1). At tasselling stage dry matter accumulation like per plant dry matter production was significantly improved under SPAD based N management over its blanket split application. Higher rate of nitrogen application was also proved to be better under SPAD based nitrogen management than others. There was no significant difference between mean effects of blanket split and SPAD based N management while higher rate of basal N application registered significant increase in young cob yield (tons/ha) under blanket split N application but did not show under SPAD based N management. The two N management strategies remained at par with their mean effects on marketable baby corn production. The highest production (1.52 tons/ha) was recorded with N2 followed by N4 (1.43 tons/ha), N3 (1.23 tons/ha) and N1 (1.10 tons/ha). Accordingly contrast analysis revealed that mean effect of the N management strategies viz blanket split and SPAD based N application had no significant difference though SPAD based N management showed slight increase in baby corn yield; higher levels of N application irrespective of N management criteria resulted into significant effect. The production of baby corn at higher level of N application (150 kg N/ha) with three blanket splits ($\frac{1}{2}$ basal, $\frac{1}{4}$ 25 DAS and $\frac{1}{4}$ 45 DAS) was 14 per cent more than that recorded in SPAD based N management

with higher level of basal N (75 kg N/ha) with topdressing N based on SPAD value (<45) receiving a total application of 128 kg N/ha though the yields were statistically at par. The result was in agreement with findings of Muthukumar (2005) who reported that split nitrogen application of N ($\frac{1}{2}$ basal, $\frac{1}{4}$ 25 DAS and $\frac{1}{4}$ 45 DAS) produced higher cob yield.

It could be observed that though SPAD based N management increased dry matter production significantly over blanket split N application the superiority was not expressed in terms of yields of young cob and baby corn. On the other hand it was 3 splits N application @ 150 kg/ha that registered higher production of both young cob as well as marketable baby corn in terms of yield (tons/ha). The yields of total fodder showed non-significant effect of N management treatment. However in terms of whole plant fodder it was obtained maximum at N4 closely followed by N2. In terms of whole plant fodder yields SPAD based N management recorded higher production though not significant statistically over blanket N application and higher rate of N application increased the production irrespective of N management approaches (Table 1). This trend was in good agreement with that of dry matter production. The goodness of SPAD based N management had been pronounced more in vegetative growth reflecting on fodder yield but not on reproductive growth. Similar results were also reported by Thakur et al (1998) and Thakur (2000).

The seed priming treatment maintained at par baby corn yield with that of non-primed seeds. Higher rate of N application proved to be significantly more remunerative both under blanket split and SPAD based N management. The net return of Rs 154970 was recorded with N2 ie blanket split application of 150 kg N/ha. This could be due to highest yield of baby corn and fodder under the treatment. The B:C ratio was improved significantly with higher rate of N application under blanket split N application but the increment was not significant under SPAD based N management. Though gross return and net return were maximum with the treatment N2 the B:C ratio was estimated to be highest (4.53) with the treatment N4 (application of 75 kg N/ ha at basal followed by SPAD based N application with total application of 128 kg/ha) followed by N2 (4.52). This was due to lower cost of N incurred under the treatment N4. It was an indicative of economic potentiality of SPAD based N management in baby corn cultivation. Thakur (2000) reported that 150 N kg/ ha gave 29.2 per cent higher net return over 100 N kg/ha in baby corn production. Between seed priming and no priming the former recorded higher total cost of production and lower gross as well as net return leading to lower benefit/cost ratio of 4.15 as against 4.30 in case of no seed priming. This was so because of higher cost of GA3 which incurred more cost for seed priming.

Table1. Effect of the nitrogen management and seed priming with GA3 on plant height, dry matter accumulation, young cob, marketable baby corn, green fodder, net return, benefit:cost ratio in baby corn

N-management	Plant height (cm) at		Dry matter accumulation (g/plant) at		Young cobs (tons/ha)	Marketable baby corn (tons/ha)	Green fodder yield (tons/ha)	Net return (Rs/ha)	B:C Ratio
	Tasselling		Tasselling						
	Knee-high		Knee-high						
N1	87.3	157.0	4.87	40.88	5.03	1.10	28.26	113098	3.79
N2	86.3	156.3	5.58	49.03	7.88	1.52	32.10	154970	4.52
N3	79.5	156.6	3.92	49.12	6.04	1.23	29.21	125954	4.06
N4	95.8	169.1	4.92	70.65	6.85	1.43	32.16	147152	4.53
SEm(±)	1.7	4.0	0.72	2.78	0.33	0.03	1.72	4811	0.15
LSD _{0.05}	6.0	NS	NS	9.62	1.15	0.1	NS	16649	0.52
Contrasts									
(N1, N2) vs (N3, N4)	NS	NS	NS	*	NS	NS	NS	NS	NS
N1 vs N2	NS	NS	NS	NS	*	*	NS	*	*
N3 vs N4	*	NS	NS	*	NS	*	NS	*	NS
Seed priming									
No priming	88.7	161.2	4.9	48.48	6.45	1.30	29.83	133124	4.30
Seed priming	85.7	158.3	4.8	56.35	6.45	1.35	31.03	137462	4.15
SEm (±)	1.7	3.4	0.29	2.96	0.33	0.08	1.11	9030	0.15
LSD _{0.05}	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Significant at p= 0.05, NS= Non significant
N1: 100 kg N/ha (3 splits), N2: 150 kg N/ha (3 splits), N3: 50 kg N/ha basal and N topdressing at SPAD value 45, N4: 100 kg N/ha basal and N topdressing at SPAD value 45

CONCLUSION

It can be concluded that N management treatments SPAD based N management with 75 kg N/ha as basal application recorded comparable baby corn yield with that of blanket split N application (150 kg N/ha) with higher factor productivity and favorable economics of production while it saved 22 kg N/ha. Seed priming with GA3 was not found to be effective significantly.

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