Response of baby corn (Zea mays L.) to nitrogen management and seed priming with GA$_3$

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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 significantly taller plant under SPAD based nitrogen management with 75 kg N/ha basal followed by N top dressing at SPAD value at <45 (each time @ 20kg N/ha) and dry matter production at tasselling stage were found to improved significantly under SPAD based nitrogen management compared to blanket split of 150 kg N/ha with 3 splits (½ basal ¼ at 25 DAS + ¼ at 45 DAS) nitrogen application. The cob weight and baby corn weight increased with higher dose of nitrogen application and in blanket splits of N management with higher dose of application produced higher than lower rate of blanket application and also higher level of N application under both the N management strategies registered significantly higher yield of baby corn over lower level N of application. However, total fodder yield maximum with SPAD based N management due to growth attributes like plant height improved significantly. It should be noted that though net return (Rs.154970) was maximum with the treatment higher dose of blanket application, but B: C ratio was estimate to be highest with SPAD based N application. Seed priming with GA$_3$ did not show significant effect on growth and yield of baby corn. Economics of baby corn production with seed priming also remained unfavorable.

Key words: Maize, GA$_3$, 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 maize plant, harvested at silk emergence before fertilization (Galinit, 1985). It is dehusked young ear of the female inflorescence of maize plant, harvested at silk emergence before fertilization (Pandey et al., 2000). Young cobs are handpicked when the silks 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 works on fertility management are 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 (Solaimalai et al., 2001). It is hypothesized that application of nitrogen at different timings of crop growth along with seed priming with plant growth regulator would improve the yield and quality of baby corn. The objectives of study are: (1) To generate a comparative understanding of the effect of blanket split and SPAD based N management on growth and productivity of baby corn. (2) To establish the effect of seed priming with GA3 on growth and productivity of baby corn.

Materials and Methods

A field experiment was conducted during summer season of 2012 at the agricultural farm of the Institute of Agriculture (23°39' N latitude, 87°42' E longitude and an elevation of 58.9 m above mean sea level). 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-1), available phosphorus (36.5 kg P ha-1) and available potassium (142.5 kg K ha-1) status. The experiment was carried out in split plot design with eight treatments. Each treatment replicated thrice and the different treatments viz. N1: Blanket split application of 100 kg N/ha with 3 splits (½ basal ¼ at 25 DAS + ¼ at 45 DAS), N2: Blanket split application of 150 kg N/ha with 3 splits (½ basal ¼ at 25 DAS + ¼ 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 @ 20kg 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 @ 20kg N/ha) in main plots and subplot treatments consisted of no priming of seeds and seed priming with GA$_3$ @ 250 ppm (Rood et al., 1990). The crop was sown in March 14, 2012 and the cobs were harvested 1-2 days after emergence of silks 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 crops 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 tasselling stage (57 DAS). The detasseling operation was done on a daily basis since start of tassel emergence till tassels from all the plants are removed. This was done as a standard practice in baby corn which increases the amount of radiation available for the leaf photosynthesis and reduces intra plant competition between leaves and the tassel for the nutrients (Hunter, 1980). 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 cob (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.

These data collected on various parameters of the crops were subjected to statistical analysis by applying the procedure given by Gomez and Gomez (1984). The standard error of mean (S.Em±) was calculated for each items of study and critical difference (CD) at 5% level of significance was also worked out for comparing the treatment means, wherever “F” test was found significant.

**Results and Discussion**

Data presented in Table-1 reveal that N management treatments proved to improve the growth and productivity of baby corn but where seed priming with GA3 was not found to be effective significantly.

**Effect on growth:** It was found that different N management treatments showed significant effect on plant height of maize at knee high stage but not at tasselling stage. At knee high stage plant height of N management of blanket split and SPAD based N management remained at par. Under blanket split, different N rates did not result significant effect on plant height. However, higher rate of basal N application caused significantly taller plant under SPAD based N management. This might be due to the fact that SPAD based N management treatment received one top-dressing of urea at 3 week after sowing prior to recording the plant height while treatment with blanket N management received urea top dressing only after recording the plant height at knee height stage. At tasselling stage though N management treatment N4 (i.e. SPAD based management treatment with 75 kg/ha basal) recorded the tallest plant but remained statistically at par with pant height of all other N management treatment. These results confirm the earlier finding of Muthukumar et al. (2005) and Bindhani et al. (2007). At both the growth stages the effect of seed priming with GA3 remained insignificant and comparatively higher plant height was recorded when there was no seed priming with GA3.

At knee high stage, effect of different N- management treatment on dry matter accumulation remained insignificant. At tasselling stage dry matter accumulation under N management treatment with blanket split and SPAD based management was found to be differ significant, the later being superior. Under blanket split N management different rate of N application did not result significant effect on dry matter production. However, higher rate of basal N application caused significantly more dry matter production under SPAD based N management. Higher basal dose of N might have stimulated better growth of summer maize as it could be noted from taller growth of plant at early stage and relatively higher dry matter accumulation at knee high stage.

At knee-high stage, though there was almost similar record of dry matter accumulation under both the treatments, but at tasselling stage dry matter production under the treatment of seed priming with GA3 was found to comparably higher than no priming though it was not significant. It seemed that significant effect of seed priming with GA3 at seedling stage on shoot length had not been persisted till reproductive stage i.e. tasselling stage. Lecat et al. (1992) and Rood et al. (1990) also found increased shoot length of maize under seed priming with GA3.

**Effect on yield:** Contrast analysis showed that 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 (t/ha) under blanket split N application, but not showed under SPAD based N management. The highest marketable baby corn production (1.52 t/ha) was recorded with N2 followed by N4 (1.43 t/ha), N3 (1.23 t/ha) and N1 (1.10 t/ha). Accordingly contrast analysis revealed that mean effect of the N management strategies, i.e., 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 had resulted significant effect. The production of baby corn at higher level of N application (150 kg N/ha) with three blanket splits (½ basal + ¼ 25 DAS + ¼ 45 DAS) was 14% more than that recorded at 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 the agreement with findings of Muthukumar (2007) who reported that split nitrogen application of N as ½ basal + ¼ 25 DAS + ¼ 45 DAS produced higher cob yield.

With a critical study of the observation on growth and yield parameters, it could be observed that though SPAD based N management increased dry matter production significantly over blanket split N application, but that 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 registered higher production of young cob as well as marketable baby corn yield (t/ha). Observation on average SPAD value showed that at knee high stage average SPAD value was more than 45 under all the treatments and more with SPAD based N management which might have
Ef ect on economics: The contrast tested for blanket split N application vs SPAD based N management was found to be non significant in case of net return. However, higher rate of N application proved to be significantly more remunerative both under blanket split and SPAD based N management, the highest net return (Rs.154970) was recorded with N2 i.e. blanket split application of 150 kg N/ha. This was due to highest yield of baby corn and fodder under the treatment. The contrasts analysis showed that benefit cost ratio (B: C ratio) for two different N management strategies remained at par. 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. It should be noted that though net return was maximum with the treatment N2, but B: C ratio was estimated to be highest (4.53) with the treatment N4 (i.e. 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 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 kg N ha\(^{-1}\) gave 29.2% higher net return over 100 kg N ha\(^{-1}\) in baby corn production. Between seed priming and no priming, the former recorded higher total cost of production and lower net return leading to lower benefit cost ratio 4.15 as against 4.30 in case of no seed priming. This was so because of higher cost of GA\(_3\) which had incurred more cost for seed priming.

Thus, it can be conclude 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 GA\(_3\) was not found to be effective significantly.
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References


