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Effect of rate of nitrogen and time of application on yield and economics of babycorn (*Zea mays*)

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ABSTRACT

A field experiment was conducted during rainy season (*kharif)* of 1996, 1997 and 1998 to study the effect of dose and time of N application on yield, yield attributes and monetary returns of babycorn (*Zea mays* L.). Results showed that increased N doses favourably affected the yield attributes, yield and monetary returns. Application 120 kg N/ha gave significantly higher yield (21.9 and 7.9) and more net return (Rs/ha 7272, 27.3% and 2690, 8.6%) compared with 60 and 90 kg/ha respectively. Benefit : cost ratio was also the highest at 120 kg/ha N. Different N schedules also influenced the babycorn yield, yield attributes and economic returns. The highest improvement in yield attributes and babycorn yield were recorded with the application of N in 2 equal splits at sowing and knee-high stages. This N schedule also provided the highest values of net return and benefit : cost ratio.

Key words: Nitrogen, Schedules, Dose, Economics, Babycorn, Maize

A babycorn is dehusked maize ear, harvested within 2-3 days of silking, i.e. prior to fertilization (Pandey *et al.,* 1998). Babycorn cultivation provides tremendous avenues for diversification, value addition and revenue generation. After successful venture in many south-east Asian countries, it is gaining fast popularity in Indian market too, particularly in metropolitan cities. Good quality and higher green-fodder yield from its cultivation adds enormously to total economic returns besides higher profit per unit area compared with grain maize. Babycorn is used in a variety of traditional and continental dishes besides being canned. It has high nutritive value comparable to many vegetables (Paroda, 1994). Babycorn, being a relatively new introduction in our country, requires the development of suitable production technology in realizing higher babycorn yield and monetary returns before it could be popularized among maize growers. Keeping this fact in view the present investigation was undertaken to find out the N requirement and best application schedule for higher babycorn yield and economic returns.

MATERIALS AND METHODS

A field experiment was carried out for three consecutive rainy (*kharif*) seasons of 1996, 1997 and 1998 at Experimental Farm, Hawalbagh of Vivekananda Parvatiya Krishi Anusandhan Sansthan (ICAR), Almora, located at 29° 36' N latitude and 79° 40' E longitude, and 1,250 m above mean sea level. Fifteen treatments, comprising the combinations of 3 N doses (60,90 and 120 kg/ha) and 5 N schedules (all at sowing, all at knee-high stage, i.e. 25 DAS 1/2 at sowing + 1/2 at knee-high stage, 3/4 at sowing + 1/4 at knee-high stage and 1/4 at sowing + 3/4 at knee-high stage) were laid out in factorial randomized block design with 3 replications. The soil of experimental site was loamy sand in texture, acidic in reaction (pH 6.1), low in available N (176 kg/ha $KMnO_4$ method), medium in available P (18.3 kg/ha, ammonium fluoride-HCl method), and available K (268 kg/ha, 1 N ammonium acetate method). Double top-cross early hybrid 'VL Makka 42', recommended for babycorn production, was sown in rows 50 cm apart using 37 kg/ha seed rate on 24 and 29 June and July 2 during 1996 1997 and 1998 respectively.

A common dose of 60 kg phosphorus and 40 kg potassium per hectare was applied at the time of sowing at all N doses. The required amount of N, P and K was supplied though urea, single superphosphate and muriate of potash respectively, Nitrogen application at knee-high stage was made 25 days after sowing. Crop was thinned 7 days after maize emergence and final plant population was maintained at 1.33 lakh plants/ha by keeping plant-to-plant distance 15 cm. Weeds were controlled by pre-emergence application (next day of sowing) of atrazine @ 1.25 kg/ha followed by earthing up the crop 25 days after sowing. Green cobs were removed the next day (1997) and third day (1998) of silk emergence, counted and weighed. Thereafter freshly harvested green cobs were dehusked and babycorn yield (net plot size of 4.50 m^2) was recorded. Ten babycorns, representing the bulk yield from each replication, were chosen at random for recording the average length, girth and weight of babycorn. Length of babycorn was measured from base to tip of babycorn, whereas girth was recorded at middle of the babycorn. After measuring the plant height 70=days after sowing, crop was harvested and green-fodder yield was regularly watched after 40 days of sowing. During entire babycorn, growing season of 1996,1997 and 1998, crop received 408.0, 409.0 and 47.0 mm total rainfall in 29, 38 42 rainy days respectively. The weekly mean range of maximum and minimum temperatures during 1996, 1997 and 1998 crop seasons was 28.1-31.0°C, 27.6-30.3°C and 27.4-30.8°C, and 19.3-21.0°C, 19.7-22.2°C, and 19.2-21.8°C, respectively. Economic returns were calculated based on the price of babycorn (Rs 25/kg for 1996 and 1997 and Rs 30/kg for 1998), and green-fodder yield) (Rs 30/q) for all the years.

RESULTS AND DISCUSSION

Effect of N dose

Pooled data on plant height and yield attributes are presented in Table 1, and the data on yield, green-fodder yield and

Table 1. Plant height and babycorn yield attributes as influenced by N dose and schedule (pooled data of 3 years)

Treatment	Plant hight (cm)	Babycorn initiation (days)	Harvest period (days)	Green-cob weight (g)	Baby-corn weight (g)	Green-cob :baby-corn weight ratio	Barren-ness (%)	Baby-corn/ (lakh/ha)	Boby-corn plant	Baby-corn length (cm)	Baby-corn girth (cm)
N dose (kg/ha)											
60	228.1	46.3	15.0	23.2	5.0	4.1	13.5	2.27	1.96	6.48	3.71
90	235.7	46.0	17.0	25.2	5.0	4.4	10.2	2.60	2.17	6.53	3.82
120	238.7	45.8	19.0	25.8	5.2	4.5	7.9	2.81	2.33	6.56	3.82
CD (P = 0.05)	8.5	NS	2.4	1.4	NS	NS	-	0.16	0.18	NS	NS
N schedule											
All at sowing	234.2	46.2	16.3	25.6	5.1	4.4	11.3	2.42	2.06	6.46	3.79
All at KHS	230.1	46.0	18.0	22.9	5.0	4.1	10.3	2.66	2.23	6.56	3.79
½ at sowing + ½ at KHS	237.2	45.9	17.0	25.3	5.0	4.4	10.1	2.63	2.23	6.57	3.82
$^3/_4$ at sowing + ¼ at KHS	234.8	46.1	16.3	25.9	5.1	4.5	10.7	2.50	2.10	6.45	3.75
¼ at sowing + $^3/_4$ at KHS	234.4	46.1	17.3	23.8	4.9	4,2	10.2	2.58	2.13	6.48	3.76
CD (P = 0.05)	NS	NS	NS	1.2	NS	NS	-	0.11	0.10	NS	NS

KHS = Knee-high stage (25 DAS)

economic returns in Table 2. The N applied in higher dose produced taller plants (Table), but non-significant differences were observed between 60 and 90 days and between 90 and 120 kg/ha. At increased N doses, length of babycorn harvesting period got extended and harvesting period at higher N dose was attributed to continued initiation of babycorn owing to availability of N energy source. Mall (1983) also reported significant increase in fresh weight of individual green cob due to increase in N doses up to 90 kg/ha. Fresh weight of babycorn was not significantly influenced due to N doses; the 120 kg N dose produced heavier babycorn compared with 60 or 90 kg N doses. Higher doses of nitrogen produced the green cob possessing more husk weight compared with the babycorn weight as reflected by green cob: babycorn weight ratio. Plant barrenness was reduced markedly from 13.5 to 7.9% with increase in N doses from 60 to 120 kg/ha. Thakur *et al.* (1997) recorded more number and weight of green cobs and lesser number of barren plants at increased N doses

The number of babycorns/plant on hectare basis was highest at 120 kg/ha. Length or girth of babycorn was also maximum at 120 kg/ha N. Vedepetch and Bandista (1984) aslo reported similar findings. Application of 120 kg N produced the highest babycorn yield (1,573 kg/ha N), which was directly related to superior yield attributes at this N dose compared with other two N doses. Green-fodder yield was also the highest at 120 kg N/ha, but the

Table 2. Babycorn yield and economic returns as influenced by N dose and schedule (pooled data of 3 years)

Treatment	Babycorn yield (kg/ha)	Green-fodder yield (q/ha)	Cost of N application (Rs/ha)	Total cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)
N dose (kg/ha)						
60	1,290	211	522	13,840	40,432	26,592
90	1,458	222	768	14,086	45,168	31,174
120	1,573	227	1,013	14,331	48,287	33,864
CD (%)	108	NS				5,623
N schedule						
All at sowing	1,382	222	735	14,053	43,128	29,057
All KHS	1,492	200	735	14,053	45,318	31,265
1/2 at sowing + 1/2 at KHS	1,493	228	790	14,108	46,310	32,202
3/4 at sowing + 1/4 at KHS	1,410	229	790	14,108	44,162	30,053
1/4 at sowing + 3/4 at KHS	1,419	223	790	14,108	44,243	30,135
CD (P=0.05)	NS	21.6				NS

KHS = Knee high stage (25 DAS)

differences were non-significant among N doses. Various parameters of economic returns, viz. gross return, net return and benefit : cost ratio (Table 2) showed considerable differences in their values due to applications of N doses. The highest gross return (Rs 48,287/ha), net return (Rs 33,956/ha) and benefit : cost ratio (3.37) were obtained at 120 kg N/ha. The net return at 120 kg N/ha was Rs 72,72 and Rs. 26, 90/ha more over 60 and 90 kg/ha, respectively.

Effect of time of N application

Plant height was not significantly affected due to different N schedules; however higher plant height was recorded with the application of N in 2 equal splits at sowing and knee-high stages, whereas full N applied at knee-high stage produced the shortest plants (Table 1). Application of N in higher proportion at sowing compared with that at knee-high stage reduced the length of babycorn harvesting period. However, the reverse was true when more quantity of N was applied at knee-high stage compared with that at sowing. Different N schedules caused significant differences in fresh weight of individual green cob. Full N applied at knee-high stage or in 2 splits (1/4 at sowing + 3/4 at knee-high stage) produced green cobs possessing significantly lower fresh weight compared with other N schedules. The highest percentage of barren plants (11.3%) was recorded on application of full N at sowing, resulting in the production of the lowest number of babycorns per plant (2.66 lakh/ha) with the application of full N at knee-high stage, which however was an a with the treatments; receiving N in 2 splits (1/2 at sowing +1/2 at knee-high stage 2.63 lakh/ha) or 1/4 sowing + 3/4 at knee-high stage (2.58 lakh/ha). Full N applied at knee high stage or in 2 equal splits at sowing and knee-high stage produced similar number of babycorns/plant (2.23), which were significantly more than at all other N schedules except N applied 1/4 at sowing + 3/4 at knee - high stage. Length or girth of babycorn was not influenced significantly due to different N scheduled, but the highest values for both parameters were recorded with the application of N in 2 equal splits at sowing and knee-high stage.

Various N schedules could not bring about significant differences in babycorn yield. However, N applied in 2 equal splits at sowing and knee-high stage or full N at knee-high stage produced 5.1 to 8.0% more babycorn yield compared with all other N scheduled (Table 2). The significantly lowest green-fodder yield was recorded when full N was applied at knee-high stage compared with all other N schedules. Values of different economic parameters were also varied due to N schedules. The highest gross return (Rs 46,310/ha), net return (Rs 32,202/ha) and benefit : cost ratio (3.28) were recorded when N was applied in 2 equal splits at sowing and knee-high stage. Full N at knee-high stage was also found promising for higher monetary returns.

It can be concluded that for higher babycorn yield and monetary returns from early hybrid 'VL Makka 42', N may be applied @ 120 kg/ha in 2 equal splits at sowing and knee-high stage.

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