Indian Journal of Agronomy 47 (4) : 541–543 (December 2002)

Effect of nitrogen and row spacing on growth, yield and economics of niger (*Guizotia abyssinica*)

BHAGWAN SINGH, A.L. RAJPUT[1] AND RAM ADHAR SINGH

Department of Agronomy, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, Uttar Pradesh 224 229

Received : August 2000

ABSTRACT

A field experiment was conducted during the rainy season of 1998 and 1999 to study the effect of nitrogen and row spacing of niger [*Guizotia abyssinica* (L.f.) Cass.]. Application of 20 to 40 kg N/ha had significant favourable effect on plant height, branches/plant, capitula/plant, test weight and biological yield. Niger seed yield increased significantly with increase in N level up to 40 kg N/ha, but stalk yield and harvest index showed significant increase only up to 20 kg N/ha. The maximum gross returns of Rs 6,771/ha and net returns of Rs 3,408/ha were obtained with the application of 40 kg N/ha which were 9.37 and 61.56% (gross returns) and 13.52 and 65.49% (net returns) higher over 20 and 0 kg N/ha respectively. However, the maximum benefit : cost ratio(1.01) was realized with 40 kg N/ha. Closer row spacing of 15 cm increased significantly almost all the growth and yield attributes as well as seed yield and N uptake over wider row spacings of 30 and 45 cm. Row spacing of 15 cm gave maximum gross returns (Rs 6,462/ha), net returns (Rs 3,447/ha) and benefit : cost ratio (1.14).

Key words : Niger, *Guizotia abyssinica*, Row spacing, Yield, Economics

India is considered to be the chief niger-producing country in the world. Niger crop is generally sown broadcast by the farmers and do not apply any fertilizer to the crop due to lack of information. The crop responds very well to fertilizer application and plant density when sown timely (Trivedi and Ahlawat, 1991). Keeping this in view, the present investigation was undertaken to find out the suitable row spacing and optimum dose of nitrogen for maximum yield of niger under rainfed condition.

MATERIALS AND METHODS

A field experiment was conducted at Agronomy Research Farm, Kumarganj, Faizabad, during the rainy season of 1998 and 1999 in randomized block design with 3 replications. Treatments comprised 3 row spacings (15, 30 and 45 cm) and 3 nitrogen levels (0, 20 and 40 kg/ha). The soil was

Present address : [1]Krishi Gyan Kendra, C.S.A.U.T., Unnac, Uttar Pradesh 508 020

silty loam and slightly alkaline in reaction (pH 8.0), low in organic carbon (0.36%), availabile nitrogen (182.3 kg/ha) and phosphorus (19.5 kg/ha). Sowing was done on 2 and 4 July during 1998 and 1999 respectively. The rainfall of 934 and 1,058 mm was received during 1998 and 1999 respectively.

RESULTS AND DISCUSSION

Nitrogen

Application of nitrogen significantly increased the plant height, branches/plant, capitula/plant, test weight, biological yield and harvest index (Table 1), as well as the seed and stalk yields of niger (Table 2). The soil low in N status was unable to supply the nutrients sufficiently for optimum growth and yield of the crop. Application of N removed this deficiency and increased its contents in plant parts. Thus, N plays a key role in improving the growth and yield attributes of niger. Application of 40 kg N/ha significantly increased seed yield, being 9.35 and 64.66% higher than the yield obtained with 20 kg N/ha and no nitrogen respectively. This increase was mainly due to favourable effects of nitrogen on growth and yield attributes of niger. There was no significant difference between 20 and 40 kg N/ha for harvest index and stalk yield during both the years. Each increment of 20 kg N from 0 to 40 kg/ha increased gross returns, net returns and benefit : cost ratio (Table 2). The maximum gross returns, net returns and benefit : cost ratio (1.01) were recorded with 40 kg N/ha, followed by 20 kg N/ha. The N uptake due to 40 kg N/ha was higher by 6.20 and 60.70% over 20 and no-nitrogen levels respectively. The increase in N uptake with higher nitrogen level was due to increase in biological yield of the crop at the same level of nitrogen. These results confirm the findings of Paikaroy *et al.* (1997).

Spacing

Row spacing significantly influenced the plant height, branches/plant, capitula/plant, test weight, biological yield and harvest

Table 1. Effect of nitrogen levels and row spacing on growth and yield-contributing characters of niger (mean data 2 years)

Treatment	Plant height (cm)	Branches/plant		Capitula/plant	Test weight (g)	Biological yield (q/ha)	Harvest index (%)
		Primary	Secondary				
Nitrogen (kg/ha)							
0	104.4	9.0	20.0	33.0	3.25	17.2	24.3
20	119.5	15.4	40.1	50.9	3.91	21.7	25.2
40	128.2	16.7	47.3	93.2	4.43	23.4	25.4
CD (P=0.05)	4.1	1.0	1.7	2.8	0.15	1.6	0.3
Row spacing (cm)							
15	111.3	9.9	21.6	34.1	3.81	29.0	24.3
30	119.9	15.3	44.6	50.6	3.35	20.4	25.1
45	121.0	16.0	45.2	52.5	3.94	12.9	25.2
CD (P=0.05)	4.1	1.0	1.7	2.8	0.15	1.6	0.3

Table 2. Effect of nitrogen and row spacing on yield, economics and nitrogen uptake of niger

Treatment	Seed yield (q/ha)			Stalk yield (q/ha)			Monetary returns (Rs/ha)*		Benefit : cost ratio*	N uptake by seed (kg/ha)*
	1998	1999	Mean	1998	1999	Mean	Gross	Net		
Nitrogen (kg/ha)										
0	3.39	3.56	3.48	13.40	15.01	14.21	4,151	1,176	0.40	34.1
20	5.18	5.30	5.24	18.51	19.50	19.01	6,191	3,002	0.94	51.6
40	5.71	5.74	5.73	21.01	20.82	20.92	6,771	3,408	1.01	54.8
CD (P=0.05)	0.69	0.67	0.68	0.37	1.30	0.84				6.9
Row spacing (cm)										
15	5.36	5.56	5.46	19.46	20.62	20.04	6,462	3,447	1.14	61.4
30	4.78	4.69	4.74	18.12	18.59	18.36	5,658	2,643	0.88	48.7
45	4.13	4.35	4.24	15.36	16.12	15.74	5,027	2,012	0.67	30.4
CD (P=0.05)	0.69	0.67	0.68	0.37	1.30	0.84				6.9

*Mean data of 2 years

index (Table 1). Growth and yield attributes were significantly higher under 15 cm row spacing, followed by wider spacing of 30 and 45 cm. Row spacing of 15 cm increased the seed yield by 15.19 and 28.78% over 30 and 45 cm spacing respectively (Table 2) and narrow row spacing also increased the stalk yield and thus gave higher gross returns, net returns and benefit : cost ratio. So closer row spacing (15 cm) of niger was found more beneficial for seed production of niger. It was also noted that due to low plant population the seed yield was lower with 30 and 45 cm spacing. Closer spacing (15 cm) resulted in significantly higher N uptake (61.4 kg/ha), followed by wider spacing 30 and 45 cm (48.7 and 30.4 kg/ha) N uptake respectively. Trivedi and Ahlawat (1991) also reported the similar results.

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