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Research Communication

Agrotechniques to enhance the productivity of niger (*Guizotia abyssinica*) under rainfed conditions

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ABSTRACT

A field experiment was conducted during the rainy (*kharif*) season of 2012 at Dharwad, Karnataka, to study the effect of 3 sowing dates [first fortnight (FN) of July, second FN of July and 1 FN of August], 2 plant geometries (45 cm × 10 cm and 60 cm × 10 cm) and 2 doses of Cycocel spraying (500 ppm and 1,000 ppm at 30 days after sowing) on growth and yield of rainfed niger (*Guizotia abyssinica* Cass.). Sowing of niger in I fortnight of July at a plant geometry of 45 cm × 10 cm with application of cycocel @ 1,000 ppm at 30 DAS significantly enhanced the plant height (123.5 cm), branches (21.2), dry-matter accumulation (61.2 g/plant), number of capitula (59.9/plant), 1,000-seed weight (4.22 g), seed yield (0.675 t/ha), oil yield (275 kg/ha), uptake of major nutrients (42.1, 10.2 and 14.2 kg NPK/ha), net returns (₹17,673/ha) and benefit: cost ratio (2.00).

Key words : Cycocel, Date of sowing, Niger, Plant geometry, Productivity

Niger is one of the important minor rainy season (*kharif*) oilseed crops of India. Generally, it is being cultivated under rainfed situations both as sole and intercrop. Being a minor oil seed crop, it is grown under low or poor management practices leading to lower crop productivity. Among weather factors, temperature is the driving force of the plant development; day-length and vernalization moderate its effect. Consequently, different varieties with different genetic make-up mature at different rates. In spite of cultivation of high-yielding varieties, improved cultural practices and plant-protection measures, favourable weather is must for good harvests (Rao *et al*., 1999). Since niger is sown early during the second fortnight of June and at closer spacing of 30 cm × 10 cm, there will be more of vegetative growth as compared to reproductive growth. Further, the flowering period is coinciding with rains resulting in washing of pollen, thus reducing its seed setting and seed yield. Hence there is a need to check its vegetative growth and divert the photosynthates to sink to get maximum productivity. Being highly branched plant with elastic growth habit, the spacing followed by farmers currently appears to be less which restricts the production of branches and capitula/plant. Hence present study was undertaken to find out the optimum sowing time, plant geometry and dose of Cycocel (growth retardant) for niger.

Therefore, a field experiment was conducted during the rainy season (*kharif*) of 2012 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, (678 m above mean sea-level; 15° 26' N and 75° 07'E), Karnataka involving 12 treatment combinations, viz. 3 dates of sowing [first FN July (10 July), second FN July (26 July), 1 FN of August (14 August 2012)], 2 plant geometries (45 cm × 10 cm, 60 cm × 10 cm) and 2 doses of Cycocel: (500 ppm, 1,000 ppm at 30 days after sowing) in factorial randomized block design with 3 replications. The soil of study site was clay loam with pH 6.5, low in available nitrogen (180 kg/ha), phosphorus (16.6 kg/ha) and high in available potassium (365.3 kg/ha). Niger cv 'DNS 4' was sown on different sowing dates at different plant geometries as per the treatments. Thinning was done at 20 days after sowing to maintain optimum plant population. The crop was fertilized with 20 kg N, 40 kg P_2O_5 and 20 kg K_2O/ha at sowing and received 460.1 mm rains during the entire crop-growing period. The cycocel @ 500 and 1,000 ppm was sprayed to crop at 30 days as per treatments. All the agronomic operations except those under study were kept uniform for all the treatments. The observations were recorded as per the established norms.

The crop of niger sown during first FN July gave significantly the highest grain yield owing to higher plant height, branches/plant, dry-matter accumulation/plant, ca-

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pitula/plant, seed yield/plant, 1,000-seed weight, NPK uptake, net returns, benefit: cost ratio, oil content and oil yield (Table 1) as compared to late sowings. Niger sowing in first fortnight of July was found to be the most suitable which registered 6.67, 9.79; 15.51, 28.57; 1.92, 17.12; 3.39, 20.46; 16.04, 36.40; 8.12, 18.78; 32.21, 50.38; 16.45; 37.36, 62.33; 20.94, 42.53; 6.57, 2.53; and 13.59, 12.60% higher seed yield, branches/plant, capitula/plant, 1,000-seed weight, seed yield/plant, dry-matter accumulation, NPK uptake, net returns, oil content, and oil yield than that sown in second fortnight of July and in first fortnight of August respectively. Thus, dry-matter accumulation, yield characters and seed yield significantly varied due to early sowing on in first fortnight of July over late sowings in second fortnight of July and first fortnight of August. Improvement in these parameters may be attributed to optimum soil moisture coupled with conducive temperatures (28.9°C) and relative humidity (76.4%) that prevailed during crop growth and development for longer period as compared to late-sown crop. The results confirm the findings of Jadhav and Deshmuk (2008) in niger.

Niger crop sown at 45 cm × 10cm plant geometry recorded significantly highest seed yield (2.67%), oil yield (3.4%), N uptake (14.14%), P uptake (7.69%), K uptake (15.38%) and net returns (10.25%) over 60 cm × 10 cm. The highest yield and net returns can be attributed to more number of plants per unit area and higher uptake of N, P and K. While the wider plant geometry (60x10cm) produced significantly more growth and yield parameters/plant, which was mainly due to better availability of growth resources and reduced interplant competition. Plant geometry has no significant effect on oil content. Similar results have been reported by Dharma-Oraoan *et al*. (2010) in niger.

The spraying of Cycocel @ 1,000 ppm at 30 days after sowing reduced the plant height significantly compared to 500 ppm. While branches/plant (8.19%), dry-matter accumulation/plant (5.5%), capitula/plant (4.59%), seed yield/plant (6.13%), 1,000-seed weight (5.64%), N uptake (8.19%), P uptake (5.06%) and K uptake (10.75%) were significantly increased by cycocel spray @ 1,000 ppm over 500 ppm. This resulted in production of the highest seed yield (0.614 t/ha) and realized higher net returns (₹13,920/ha). The improvement in seed yield and yield parameters may be attributed to reduction in plant height which was found to be useful in increasing the efficiency of translocation of food materials towards capitula (Khashid *et al.*, 2010). There was no significant effect of Cycocel

Table 1. Effect of date of sowing, plant geometry and Cycocel on growth, yield, oil content, nutrient uptake and economics of niger

Treatment	Plant height (cm)	Branches/ plant	Dry-matter accumulation at harvest (g/plant)	Capitula/ Plant	Seed yield (g/plant)	1,000-seed weight (g)	Seed yield (t/ha)	Oil content (%)	Oil yield (kg/ha)	Total nutrient uptake (kg/ha)			Net returns ($\times 10^3$ ₹/ha)	Benefit : cost ratio
										N	P	K		
Date of sowing														
First fortnight of July	122.6	21.6	63.6	21.2	3.11	4.19	0.639	40.5	259	39.4	9.2	12.5	16.05	1.91
Second fortnight of July	118.9	18.7	58.8	20.8	2.68	4.05	0.599	38.0	228	29.8	7.9	9.1	13.27	1.75
First fortnight of August	99.4	16.8	53.5	18.1	2.28	3.48	0.582	39.5	230	26.2	7.9	7.7	11.26	1.64
SEm±	0.4	0.4	0.7	0.3	0.05	0.05	0.004	0.2	2	0.7	0.1	0.1	0.17	0.01
CD (P=0.05)	1.2	1.1	2.2	0.9	0.13	0.15	0.011	0.6	5	2.2	0.3	0.4	0.51	0.03
Plant geometry														
45 cm × 10 cm	116.0	17.8	56.0	19.6	2.62	3.80	0.615	39.9	243	33.9	8.4	10.5	14.19	1.81
60 cm × 10 cm	111.2	20.2	61.2	20.4	2.76	4.02	0.599	39.2	235	29.7	7.8	9.1	12.87	1.73
SEm±	0.4	0.6	0.6	0.3	0.04	0.04	0.003	0.1	1	0.6	0.1	0.1	0.14	0.01
CD (P=0.05)	1.0	0.9	1.8	0.7	0.11	0.13	0.009	NS	4	1.8	0.2	0.3	0.41	0.02
Cycocel														
500 ppm	114.8	18.3	57.1	19.6	2.61	3.80	0.600	39.2	235	30.5	7.9	9.3	13.13	1.75
1,000 ppm	112.5	19.8	60.2	20.5	2.77	4.02	0.614	39.5	243	33.0	8.3	10.3	13.92	1.79
SEm±	0.4	0.3	0.6	0.3	0.04	0.04	0.003	0.1	1	0.6	0.1	0.1	0.14	0.01
CD (P=0.05)	1.0	0.9	1.8	0.7	0.11	0.13	0.009	NS	4	1.8	0.2	0.3	0.41	0.02

on oil content of niger. While the oil yield (3.40%) was significantly increased with spraying of Cycocel @ 1,000 ppm owing to higher seed yield than 500 ppm.

Based on these results, it can be concluded that sowing of niger in the first fortnight of July at a plant geometry of 45 cm × 10 cm (1.48 lakh plants/ha) followed by application of Cycocel @ 1,000 ppm 30 days after sowing may be adopted to get higher seed yield, oil yield and net returns.

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