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Response of nigella (*Nigella sativa* L) variety NRCSS AN 1 to different agro-techniques

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Abstract

A field study was conducted during the winter seasons of 2002-2003 and 2003-2004 to study the response of nigella (*Nigella sativa* L.) variety NRCSS AN-1 to different agro-techniques under semi-arid conditions. The yield attributes viz. number of capsules/plant, number of seeds/capsule and 1000 seed weight were significantly high when crop was sown on 15 October followed by 1 October sowing. Significantly higher seed yield of 8.84 q/ha was recorded when crop was sown on 15 October. The seed yield of 7.86 q/ha was significantly higher with row spacing of 30 cm. The plant height and number of branches/plant were more at seed rate of 7 and 8 kg/ha and were noticed significantly high as compared to seed rate treatment of 9 kg/ha. However, the seed yield attributes and seed yield (8.24 q/ha) were significantly high at seed rate of 8 kg/ha. The fertilizer dose of 50 kg N, 25 kg P_2O_5 and 20 kg K_2O /ha was found optimum and produced higher seed yield of 7.87 q/ha. The days to 50% flowering was not affected considerably with different treatments. The essential oil content increased significantly when crop was sown at wider spacing of 40 cm and with application of fertilizer dose of 50 kg N, 25 kg P_2O_5 and 20 kg K_2O /ha.

Keywords: *Nigella sativa*, spacing, sowing time, fertilizer, seed rate, agro-techniques

Nigella (*Nigella sativa* L.) popularly known as kalongi is an important seed spice crop of India. The dried seeds of nigella are the commercial product being used in food. The seeds contain 0.5 to 1.4% essential oil which has demand in the pharmaceutical and perfume industry (Malhotra, 2004). The nigella producing countries other than India are Pakistan, Sri Lanka, Bangladesh, Nepal, Egypt and Iraq. In India it is cultivated commercially in Madhya Pradesh, Bihar, Punjab and Assam. It has also been noticed to occur wild in these areas. The other states where its cultivation has been taken up on small scale are Uttar Pradesh, Rajasthan, Tamil Nadu and West Bengal. It is expected to be grown in an area of about 16000 ha with production of 6250 tonnes (Malhotra and Vijay, 2004). Because of non-availability of improved varieties, most of the farmers grow local varieties. Recently, a variety NRCSS-AN-1 has been recommended for release for commercial cultivation. Since meager information is available for nigella varieties with relation to sowing dates, seed rate, spacing and fertilizer levels under semi-arid conditions, the yield levels obtained at farmer's level is low.

The experiment was conducted at experimental farm and laboratory of National

Research Centre on Seed Spices, Ajmer during rabi (winter season) of 2002-2003 and 2003-2004. The experimental soil had sand 68 %, silt 16%, clay 16%, soil pH 8.04, Soil EC 0.076 dSm-1, organic carbon 0.23% (low), available N 178.5 kg ha^{-1} (low), P_2O_5 12 kg ha^{-1} (medium), K_2O 85 kg ha^{-1} (low), Ca 214.7 kg ha^{-1} (high), Mg 258 kg ha^{-1} (medium) and S 27 kg ha^{-1} (medium). The trial was laid out in randomized block design with three replications. The variety NRCSS AN-1 of nigella was included in the study with four sowing dates (16 September, 1 October, 15 October, 1 November) three row spacing (20, 30 and 40 cm) keeping 15 cm plant to plant spacing, three seed rates (7, 8 and 9 kg/ha), and three fertilizer levels (N_{40}, $Pz_{20}K_{15}$, $N_{50}P_{25}K_{20}$ and $N_{60}P_{30}K_z$ kg/ha). The observations were recorded on plant height, number of primary branches/plant, days of 50% flowering, number of capsules/plant, number of seeds/capsule, 1000 seed weight(g), seed yield (q/ha) and essential oil content. The organic manure @10 t/ha was uniformly applied in whole experimental area during field preparation. Fifty per cent of nitrogen and full dose of phosphorus and potash were applied at sowing time and remaining dose of N was applied 30 days after sowing. The essential oil content was estimated by hydro-distillation in Clevenger glass unit.

The results of growth parameters, yield and yield attributing characters are presented in Table 1 and were influenced considerably by different agrotechniques. The highest plant height was recorded when crop was sown on 1 October followed by 15 October sowing date and least was observed when crop was sown on November 1st. Number of primary branches plant were significantly higher on 1st October sowing that was on par with 15th October sowing. The variety NRCSS AN-1 took about 72 days to reach at 50% flowering when sowing was done on 16 September followed by 74 days at 1 October sowing. The number of capsules/plant, number of seeds/ capsule and 1000 seed weight were significantly high when crop was sown on 15 October followed by 1 October sowing. These above characters contributed significantly in achieving high seed yield of 8.84 q/ha as compared to low seed yield levels of 5.10 q/ha and 5.25 q/ha from early and late sowing dates. It indicates that suitable sowing time of nigella variety NRCSS AN-1 is found to be 15 October. Luchon & Sarat (2003) reported mid October to mid November, the best time for production of nigella seed under Assam agro-climatic conditions where as in the present studies sowing on 15 October was found suitable for semi-arid conditions of Rajasthan. However no definite trend for increase in essential oil content was noticed with respect to different sowing dates.

The plant growth and yield attributes were significantly influenced by different row spacing treatments. The plant height and number of primary branches increased significantly with broader row spacing (40 cm), but owing to plant competition at closer row spacing plant growth was affected significantly. In the similar way, the seed yield attributes, number of capsules/plant, number of seeds/capsule, 1000 seed weight increased significantly at wider spacing of 40 cm but there was reduction in seed yield, may be due to reduced plant population. The seed yield (7.86 q/ha) was significantly higher with medium row spacing of 30 cm when compared with other two row spacing treatments, because of adequate plant population and also due to less competition between the plants for light, water and nutrients. Thus the row spacing of 30 cm is the suitable spacing for getting higher seed yields. Das *et al.* (1992) reported that 20-25 cm x 5-6 cm was optimum in the northern parts of West Bengal. There was noticed non-significant difference for days to 50% flowering, whereas the high essential oil content of 0.54% was recorded at row spacing of 40 cm.

The different seed rates affected the seed yield of nigella. The crop sown with seed rate of 7 kg/ha resulted in significantly less seed yield probably, because of low plant population in the per unit area. Consequently with

Table 1. Response of nigella (var. NRCSS AN 1) to agro-techniques and fertilizer levels (Pooled data of 2 years)

Treatments	Plant height (cm)	Primary branches/ plant	Days of 50% flowering	Number of capsules /plant	Number of seeds /capsule	1000 seed weight (g)	Seed yield q/ha	Essential content oil (%)
Shwoing dates								
16 September	42.32	7.2	72.44	29.22	48.24	2.88	5.1	0.41
1 October	47.2	8.16	74.26	32.32	76.36	4.03	8.36	0.4
15 October	44.36	7.9	78.6	34.82	79.4	4.85	8.84	0.26
1 November	36.7	6.42	82.2	22.74	52.56	3.14	5.25	0.44
CD (P=0.05)	2.48	0.28	3.03	2.24	4.28	0.42	0.64	0.12
Row spacing (cm)								
20	38.24	6.42	75.62	30.2	66.82	3.68	6.86	0.18
30	42.42	7.64	76.6	32.48	72.64	4.06	7.86	0.22
40	44.82	7.84	76.2	33.3	70.28	3.82	7.2	0.54
CD (P=0.05)	2.2	0.18	N.S	0.89	1.82	0.82	0.46	0.13
Seed rate (Kg ha $^{-1}$)								
Indian dill ‘NRCSS-AD-2’								
7 kg	44.34	7.8	72.4	36.23	62.22	4.35	6.82	0.4
8 kg	43.22	7.62	73.46	34.46	68.6	4.62	8.24	0.4
9 kg	1.8	0.16	N.S.	1.1	2.82	0.16	0.71	0.12
Fertilizer levels (kg /ha)								
Indian dill 'NRCSS-AD-2'								
$N_{40}P_{20}K_{15}$	44	7.62	75.66	28.2	64.2	4.25	7.04	0.29
$N_{50}P_{25}K_{20}$	47.2	7.74	74.42	30.8	60.24	4.2	7.87	0.25
$N_{60}P_{30}K_{25}$	48.1	7.9	73.2	29.34	61.4	3.8	7.94	0.42
CD (P=0.05)	2.16	0.12	N.S.	1.64	1.84	0.28	0.22	0.10

enhancement of seed rate to 8 kg/ha the seed yield also increased significantly as compared to one higher and lower seed rate treatments. The plant height and number of branches/ plant were more at seed rate of 7 and 8 kg/ha and were noticed significantly high as compared to seed treatment of 9 kg/ha. Similarly for seed yield attributes viz. number of capsules/plant, number of seeds/capsules and test weight the values were high at seed rate of 8 kg/ha and were significantly low at higher seed rate of 9 kg/ha. The gain in seed yield (8.24 q/ha) was noticed at 8 kg/ha seed rate because of the relatively optimum plant density in comparison to low seed rate and high seed rate treatments. In a study by Singh et al (2002), seed rate of 10 kg/ha resulted the highest mean seed yield and number of seeds per capsule.

The plant growth and yield attributes were found significantly influenced by different fertilizer doses. The growth parameters viz. plant height and number of primary branches and yield attributes viz. number of seeds/ capsule, seed yield and essential oil content increased significantly with increase in fertilizer doses to 50 kg N, 25 kg P_2O_5 and 20 kg K_2O and 60 kg N, 30 kg P_2O_5, 25 kg K_2O / ha. The test weight did not exhibited any increase with increasing level of fertilizer up to 60 kg N, 30 kg P_2O_5, 25 kg K_2O /ha conspicuously for days to 50% flowering also. The essential oil content increased significantly with increase in fertilizer dose up to 60 kg N, 30 kg P_2O_5 and 25 kg K_2O /ha. The character days to 50% flowering remained unaffected. There was increasing trend in nigella seed yield with increase in fertilizer doses, the higher seed yield of 7.87 q/ha and 7.94 q/ha was recorded when 50 kg N, 25 kg P_2O_5 and 20 kg K_2O and 60 kg N, 30 kg P_2O_5, 25 kg K_2O /ha respectively were applied. Nataraja et al (2003) reported that application of 50:40:30 kg N:P:K/ha gave maximum yield under Bangalore conditions.

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