Indian J. Hort. 69(4), December 2012: 591-593

Short communication

Essential oil, fatty oil and seed yield of nigella (*Nigella sativa* L.) as influenced by sowing dates and crop geometry

S.S. Meena*, R.S. Mehta, G. Lal, K. Kant, Y.K. Sharma, S.N. Saxena and M.M. Anwer
National Research Centre on Seed Spices, Tabiji, Ajmer 305206, Rajasthan

ABSTRACT

A field experiment was carried out with an object to find out optimum sowing time and crop geometry. Date of sowing significantly affected growth and yield attributes as well as seed yield and quality parameters of nigella. Sowing of nigella on 15th October exhibited the highest plant height at all the growth stages, number of branches per plant, seed yield (8.13 q per ha), 1000-seed weight, seed yield per plant, capsule weight, number of seeds per capsule, number of capsule per plant, fatty oil and essential oil content which were significantly higher over rest of the sowing dates. Crop geometry of 25 cm × 10 cm (row to row and plant to plant) spacing significantly resulted the highest plant height at in all stages. Similarly, number of capsule per plant, number of seeds per capsule, 1000-seed weight, seed yield and essential oil content were also maximum with crop geometry of 25 cm × 10 cm. Therefore, sowing of nigella on 15th October at 25 cm × 10 cm spacing was found better for higher essential oil (0.34%), fatty oil (33.10%) and seed yield 8.13 g/ha.

Key words: *Nigella sativa*, essential oil, fatty oil, crop geometry, date of sowing, seed yield.

Nigella (*Nigella sativa* L.) is a minor and annual herbaceous seed spice crop belonging to the family Ranunculaceae. It is widely cultivated through out South Europe, Syria, Egypt, Saudi Arabia, Iran, Pakistan, India and Turkey (Riaz *et al.*, 6). Mature seeds are consumed for edible and medicinal purposes. The seeds are also used as seasoning for vegetables and different type of baked products (Atta, 2). It has been used as herbal medicine for more than 2000 years. As a seed spice it is also used as food additive and flavour in many countries. The essential oil of nigella have been found to contain about 67 constituents, many of which are capable of inducing beneficial pharmacological effects in humans (Aboutabl *et al.*,1). Its seed contain thymoquinone and monoterpenes having variety of therapeutic effects on digestive disorders, gynecological diseases and respiratory system (Boskkbady and Shahabi, 3). Non monitory input also affect growth and yield of nigella. Time of sowing and crop geometry is an important non monitory input which affects growth performance and yield of crop. Therefore, the present investigation was done with an objective to find out optimum sowing date and crop geometry.

A field experiment was carried out for two consecutive years *i.e.*, 2007-2008 and 2008-09 at the research farm of National Research Centre on Seed Spices, Ajmer. The soil of the experimental area was loamy sand having low organic matter (0.23%), available nitrogen(178.65 kg per ha), phosphorus (12 kg per ha) and sufficient available potassium (165 kg per ha), slightly alkaline with pH (8.04) and EC (0.076 dSm^{-1}). Fifteen treatment combinations comprising of five dates of sowing, *viz.*, Ist October, 15th October, 30th October, 15th November and 30th November and three crop geometry, *viz.*, 20 cm × 10 cm, 25 cm × 10 cm and 30 cm × 10 cm spacings were taken in randomized block design with three replications. The seeds of variety NRCSS-Nigella-1 were sown keeping seed rate of 25 kg per ha. Recommended dose of fertilizer as well as other standard agro-techniques was used for raising good crop. 30 kg nitrogen and 60 kg P_2O_5 per ha were supplied through urea and DAP, respectively. Full dose of phosphorus and half dose of nitrogen were applied as basal at the time of sowing and remaining nitrogen was applied at 30 DAS. In order to ensure healthy growth of nigella, weeds were controlled by manual hand weeding as per need of the crop. Harvesting of the crop was done manually by pulling the dry plants out of the soil and removing the roots. Essential oil content was determined by using Soxhlet apparatus.

In the study, nigella was evaluated for growth parameters, number of capsule per plant, number of seeds per capsule, 1000-seed weight, seed yield (q/ha), essential oil content and fatty oil. Essential oil content of black cumin was done by hydro distillation using Clevenger-type apparatus. Statistical analysis of data was done by using the method of Panse and Shukhatme (5).

Plant height at various growth stages, number of days taken for branching initiation, number of

*Corresponding author's E-mail: ssmnrcss5@yahoo.com

branches per plant, days taken for flower initiation, number of capsule per plant, number of seeds per capsule, capsule weight, seed yield per plant, thousand seed weight, seed yield (q/ ha), fatty oil and essential oil content in nigella were significantly influenced with varying dates of sowing (Tables 1 and 2). Sowing of nigella on 15th October exhibited the highest plant height at 45 DAS (10.52 cm), 90 DAS (46.76 cm) and at harvest (59.47 cm) as well as yield attributes like number of capsules per plant (50.76), number of seeds per capsule (91.67), capsule weight (27.11 mg), seed yield per plant (8.83 g), seed yield (8.13 q per ha), fatty oil (33.10%) and essential oil (0.34%) content. Sowing of seed on 15th October, 30th October and 15th November resulted at par plant height at 40 DAS, number of days taken to flower initiation and capsule weight. The highest growth parameters, yield attributes and seed yield of nigella was recorded by sowing on 15th October which might be due to favourable agro-climatic conditions available during the period which facilitated better germination, crop establishment and less chances of occurrence of diseases and pest which might have occurred in late planting situation. These results are in conformity with those reported by Meena *et al.* (4) in coriander in which they reported that sowing of coriander on 15th October resulted highest yield parameters and seed yield.

Crop geometry affected plant height at various periodical growth stages, days taken for initiation of branching, number of branches per plant, days taken to flower initiation, number of capsule per plant, number of seeds per capsule, capsule weight, seed yield per plant, thousand-seed weight, seed yield (q/ha), fatty oil and essential oil content (Tables 1 & 2). Sowing of nigella at 25 cm × 10 cm spacing resulted in highest plant height at different growth stages like 45 DAS (8.45 cm), 90 DAS (37.52 cm) and at harvest (47.55 cm) as well as yield attributes like number of capsules per plant (35.23), number of seeds per capsule (82.17), capsule weight (23.45 mg), seed yield per plant (5.87 g), seed yield (4.8 q ha^{-1}) and essential oil content. Sowing of nigella at 25 cm × 10 cm exhibited higher growth parameters, yield attributes and seed yield which might be due to availability of optimum space for growth and development of individual plant as compared to closer spacing where severe competition for light, nutrient and water might resulted drastic reduction in seed yield per plant that may not be compensated with higher plant population. Similarly, wider spacing, though may result higher seed yield per plant but on account of less population, the increased yield per plant can not compensate yield loss on account of thin plant population. Similar, results were reported by Singh *et al.* (7) in nigella in which highest seed yield, number of capsules per plant and number of seeds per capsule were obtained under 30 cm row to row spacing. Thus, sowing of nigella on 15th October with 25 × 10 cm spacing is the best for getting higher essential oil, fatty oil and seed yield of nigella.

Table 1. Effect of sowing dates and crop geometry on growth parameters of nigella (pooled data of two years).

Treatment	Plant height (cm)			No. of days taken to branching	No. of branches $plant^{-1}$		No. of days taken to flower initiation
	45 DAS	90 DAS	At harvest		90 DAS	At harvest	
Date of sowing							
1st October	10.40	34.80	50.13	61.11	11.22	11.07	73.33
15th October	10.52	46.76	59.47	65.00	12.04	11.98	75.00
30th October	10.44	40.27	56.27	65.00	11.63	11.53	73.89
15th November	5.10	35.91	42.36	59.44	10.04	10.31	69.00
30th November	5.30	23.83	28.27	60.00	7.48	8.33	70.00
CD (P = 0.05)	0.47	2.53	2.10	1.93	1.13	0.60	2.00
Crop geometry							
Row to row spacing 20 × 10 cm	8.22	35.70	47.16	62.00	10.16	10.36	72.00
Row to row spacing 25 × 10 cm	8.45	37.52	47.55	62.33	10.70	10.84	72.67
Row to row spacing 30 × 10 cm	8.35	35.74	47.19	62.00	10.60	10.73	72.07
CD (P = 0.05)	0.37	1.96	1.63	1.50	0.87	0.46	1.55

Table 2. Effect of sowing dates and crop geometry on yield attributes, seed yields and quality parameters of nigella (pooled data of two years).

Treatment	No. of capsules per plant	No. of seeds per capsule	Capsule weight (mg)	Thousand-seed weight (g)	Seed yield (q/ha)	Fatty oil (%)	Essential oil content (%)
Date of sowing							
1st October	32.07	79.16	25.13	1.86	5.79	29.72	0.32
15th October	50.76	91.67	27.11	2.30	8.13	33.10	0.34
30th October	45.29	83.09	26.71	2.10	5.80	30.43	0.32
15th November	25.42	76.47	17.98	1.86	1.44	29.22	0.29
30th November	12.31	64.69	14.91	1.67	0.96	27.38	0.28
CD (P = 0.05)	4.41	5.92	3.21	0.16	1.25	3.74	0.02
Crop geometry							
Row to row spacing 20 × 10 cm	31.87	75.55	20.99	1.91	4.10	29.12	0.30
Row to row spacing 25 × 10 cm	35.23	82.17	23.45	1.99	4.80	30.87	0.32
Row to row spacing 30 × 10 cm	32.41	79.32	22.67	1.96	4.42	29.92	0.31
CD (P = 0.05)	3.41	4.59	2.49	0.12	0.97	2.90	0.02

REFERENCES

1. Aboutabl, EA, El-Ezzouny, A.A. and Homerschmidt, F.J. 1986. Aroma volatiles of *Nigella sativa* seeds. **In**: *Proc. Inter. Sumpo. Esse. Oils*, *Progress in Essential oil Research*, Holzminden, Neuhaus, Germany, 1 April,1986, pp. 44-45.

2. Atta, M.B. 2003.Some characteristics of Nigella (*Nigella sativa* L.) seed cultivated in Egypt and its lipid profile. *Fd. Chem*. **83**: 63-8.

3. Boskabady, M.H. and Shahabi, M. 1997. Bronchodilatatory and anticholinergic effects of *Nigella sativa* on isolated guinea pig tracheal chains. *Iranian J. Med. Sci*. **22**: 133-6.

4. Meena, S.S., Sen, N.L. and Malhotra, S.K. 2006. Influence of sowing dates, nitrogen and plant growth regulators on growth and yield of coriander (*Coriandrum sativum* L), *J. Spices Arom. Crops*, **15**: 88-92.

5. Panse, V.G. and Sukhatme, P.V. 1985. *Statistical Methods for Agricultural Workers*, (4th Edn.), ICAR Pub., New Delhi.

6. Riaz, M., Syed, M. and Chaudhary, F.M. 1996. Chemistry of the medicinal plants of the genus Nigella. *Hamdard Medicus*, **39**: 40-5.

7. Singh, S.K, Singh, B., Singh, M.B. and Singh, B. 2002. Response of nigella (*Nigella sativa* L.) to seed rate and row spacing. *Prog. Agric*. **2**: 80-84.

Received : March, 2011; Revised : April, 2012;
Accepted : September, 2012