**Original Research Article**

**Yield and Yield Attributes of Black Cumin Under Varied Row Spacing Conditions in Agro-climatic conditions of Bangladesh**

**Abstract**

The present study highlights about yield and Yield Attributes of Black Cumin Under Varied Row Spacing Conditions in Agro-climatic conditions of Bangladesh. Black cumin (*Nigella sativa* L.), is an important spice crop and also has medicinal properties. Various factors are responsible for improving the growth and yield of black cumin per unit area. Among them, sowing methods is an important factor for affecting the growth and yield of black cumin. For successful production of any crop, appropriate sowing density or planting density is very important. The experiment was carried out during November, 2020 to March, 2021 at experimental field of Spices Research Sub-Centre, Bangladesh Agricultural Research institute, Faridpur to study the effect of different row spacing on yield and yield related attributes of black cumin. Experiment was laid at Randomized Complete Block Design with three replications. At 30, 60 and 90 days after sowing, the highest plant height (9.63, 48.11 and 58.49 cm) was achieved from 10 cm x 10 cm spacing. Again, the lowest plant height (8.74, 45.30 and 47.88 cm) was observed at 30 cm x 10 cm. The highest number of branches per plant (8.46), capsules per plant (24.10), seeds per capsule (96.88) was recorded from R3 (30 cm x 10 cm) treatment. The lowest number of branches per plant (7.02), capsules per plant (20.66), seed per capsule (81.89) was recorded from R1 (10 cm x 10 cm) treatment. The maximum 1000 seed weight (2.44 g) was recorded from R2 (20 cm x 10 cm) treatment, whereas the lowest 1000 seed weight (2.22 g) was recorded from R1 (10 cm x 10 cm) treatment. The seed yield was maximum (978.66 kg/ha), when the seeds were sown in 20 cm x 10 cm row spacing, followed by the value of seed yield on 10 cm x 10 cm row spacing (923.83 kg/ha), while the least performance (817.58 kg/ha) was obtained from the 30 cm x 10 cm treatment.

**Key word**: Black cumin, Row spacing, Yield attributes and Yield

**Introduction**

“Black cumin (*Nigella sativa* L.), belongs to the family Ranunculaceae (diploid, 2n=12) and has remarkable aromatic and medicinal properties” [1,2]. “Black cumin seeds as a whole, with their extracted forms and fatty acids and essential oils, have been used as a preventive and therapeutic spice against in many diseases, as well as in cosmetics” [3]. “Today, black cumin seeds are used as herbal medicine in developed countries to treat diseases such as fever, skin diseases, cough, rheumatism, jaundice, headache, paralysis, eczema and loss of appetite” [4]. “Various factors are responsible for improving the growth and yield of black cumin per unit area. Among them, sowing dates and methods are the most important factors for affecting the growth and yield of black cumin. Spacing is an important agronomic practice, which ensures maintenance of optimum crop stand, efficient utilization of natural resources like light, space, water and nutrients by the crop canopy thus higher productivity besides saving of seed and reduction in cost of cultivation. The number of seed per umbrella is affected by environmental condition and field management, and its number varies from 11.3 to 16.8 under varying plant densities” [5]. In Bangladesh farmers sows black cumin mainly broadcast method. Some are aware about line sowing method but they are not maintaining proper distance. So, the experiment is taken to identify the optimum row spacing for black cumin production

**Method and Materials**

The field experiment was conducted at the field of Spices Research Sub-Centre, BARI during November, 2020 – March, 2021. A black cumin promising variety of “BARI Kalozira-1” was used in the study as test, which was reported as disease resistant to common diseases and its life cycle is 135 – 145. The experiment was laid at Randomized Complete Design with 6 replications. The unit plot size was 2.0 m × 1.2 m. Distance between two block was 100 cm and plot to plot distance was 50cm. Treatments were R1 = 10 cm x 10 cm, R2 = 20 cm x 10 cm, R3 = 30 cm x 10 cm of row spacing. Seeds were soaked in water for 24 hours to facilitate germination. Then the seeds were dried and treated by Bavistin (carbendazim) @ 2 g kg-1 of seeds to minimize the primary seed borne diseases (BARI, 2007). Well decomposed cowdung : 5 t/ha, N50, P20, K30, S12, Zn1.5 and B.5. Urea, TSP, MoP and Gypsum, Zinc Sulphate and Boric Acid were applied as sources of N, P, K, S, Zn and B respectively. The entire quantity of phosphorus, potassium, sulphur, zinc and boron should be applied at the time of final land preparation. Urea were top dressed in three equal installments at 10-15 days after germination, 25-30 and 50-55 days after seed sowing. Each top dressing was followed by irrigation. Data was recorded on Plant height, number of branches per plant, number of capsules per plant, number of seeds per capsule, thousand seeds weight and yield.Data was analyzes by using software ‘R’.

**Results and Discussion**

**Plant height**

**Effect of row spacing**

Plant height increased with decreased plant spacing. At 30, 60 and 90 days after sowing, the highest plant height (9.63, 48.11 and 58.49 cm) was achieved from 10 cm x 10 cm spacing. Again, the lowest plant height (8.74, 45.30 and 47.88 cm) was observed at 30 cm x 10 cm. The variation in plant height as influenced by spacing was perhaps due to proper utilization of nutrient, moisture and light (Figure 1). “It was observed that plant height was increased by decreasing plant spacing an antagonistic relationship was found between vegetative growth and plant spacing” [6]. Planting of crop in late October or early November with 25-30 cm row spacing were better conditions for low incidence of root rot in nigella.

**Figure 1. Effect of row spacing on plant height at different days after sowing of black cumin. Vertical bar represents LSD at 5% level of probability**

**Number of branches per plant**

There were significant differences in number of branches per plant, this was found out to be due to different row spacing. The lowest number of branches per plant (7.02) was recorded from R1 (10 cm x 10 cm) treatment and the highest (8.46) from R3 (30 cm x 10 cm) treatment which is statistically similar to R2 (20 cm x 10 cm row spacing) (Table 1).

“Attributed the increments in vegetative characteristics to less competition among plants for the environmental conditions necessary for building up more metabolites and producing more lateral branches at wider spaces” [7].

**Number of capsules per plant**

The data pertaining to the number of capsules per plant revealed that it was highest (24.10) at R3 (30 cm x 10 cm) treatment, which was followed by R2 (20 cm x 10 cm), while it was lowest at R1 (10 cm x 10 cm) treatment shown in the Table 1. “It was found that number of seed umbel-1 had an increasing trend with decreases in plant densities in *Cuminum carvi”* [8].

**Table 1. Effect of row spacing on number of branches per plant, number of leaves per plant and number of capsules per plant**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Row Spacing** | **Number of branches /plant** | **Number of capsules****/plant** | **Seeds per capsule** | **1000 seed weight (g)** |
| R1 (10 cm x 10 cm) | 7.02 | 20.66 | 81.89 | 2.22 |
| R2 (20 cm x 10 cm) | 8.47 | 22.94 | 94.22 | 2.44 |
| R3 (30 cm x 10 cm) | 8.45 | 24.10 | 96.88 | 2.41 |
| LSD(0.05) | 0.60 | 1.12 | 3.71 | 0.03 |
| LSD(0.01) | 0.82 | 1.53 | 5.14 | 0.05 |
| CV% | 9.05 | 5.91 | 4.91 | 1.80 |
| Level of Sig. | \*\* | \*\* | \*\* | \*\* |

 **\*\*=1% level of significance**

**Seeds per capsule**

The influence of different row spacing within seed of each capsule resulted variation. It was observed that the highest seeds per capsule (96.88) was obtained from R3 (30 cm x 10 cm) treatment which is statistically similar to R2 (20 cm x 10 cm) treatment and the lowest seed per capsule (81.89) from R1 (10 cm x 10 cm) treatment (Table 1).

**Thousand seed weight**

1000 seed weight of black cumin was influenced by different levels of row spacing. It was observed that higher spacing gave maximum yield. The maximum 1000 seed weight (2.44 g) was recorded from R2 (20 cm x 10 cm) treatment, whereas the lowest 1000 seed weight (2.22 g) was recorded from R1 (10 cm x 10 cm) treatment (Table 1).

**Yield attribute**

Yieldattribute was influenced by different levels of spacing. The seed yield was maximum (978.66 kg/ha), when the seeds were sown in 20 cm x 10 cm followed by the value of seed yield on 10 cm x 10 cm row spacing (923.83 kg/ha), shown in the Figure 2. The least performance (817.58 kg/ha) was obtained from the 10 cm x 10 cm treatment. “Because seed set depends on providing the adequate nutrients and environmental conditions while developed vegetative to reproductive stage, increased plant densities result in limited availability of nutrients, light and water so the numbers of reproductive units decrease; at total yield decreases. Row spacing were significantly affected plant height, number of branches, number of capsules, thousand seed weight, seed yield, essential oil yield and fatty oil yield” [9]. And also, correlation between seed yield and number of capsules per plant, number of seed per capsule, thousand seed weight and seed yield per plant was found significantly important.

**Figure 2. Effect of row spacing on yield of black cumin. Vertical bar represents LSD at 5% level of probability**

“Results from another investigation also showed that planting of crop in late October or early November with 25-30 cm row spacing were better conditions for low incidence of root rot in nigella” [10]. “It was found that sowing of black cumin providing 20 cm × 15 cm plant spacing was recorded to be more suitable practice for getting higher amount and quality of seed yield of black cumin” [11].

**Conclusion**

Among various cultural management practice row spacing is an important one for crop production. Here, the seed yield was maximum (978.66 kg/ha) when the seeds were sown in 20 cm x 10 cm followed by the value of seed yield on 10 cm x 10 cm row spacing (923.83 kg/ha). The least performance (817.58 kg/ha) was obtained from the 30 cm x 10 cm treatment. From above result it was concluded that maintaining row spacing of 20 x 10 cm is more favorable for black cumin production in Faridpur region of Bangladesh than 10 cm x 10 cm and 30 x 10 cm row spacing.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

**References**

Abdel-Aziez, SM, Eweda WE, Girgis MGZ, Ghany, BFA. Improving the productivity and quality of black cumin (*Nigella sativa* L.) by using Azotobacter as N2 biofertilizer. *Annual Agricultural Science*.2014; 5995-108

Raina H, Soni G, Jauhari N, Sharma N, Bharadvaja N. Phytochemical importance of medicinal plants as a potential source of anticancer agents. *Turkish Journal of Botany.* 2014; 38 1027-1035.

Barut M, Cavdar AS, Tans LS, Karaman, Şengül. Yield and quality traits of black cumin (*Nigella sativa* L.) genotypes in response to the different sowing dates. *Turkish Journal of Agriculture - Food Science and Technology.* 2023; 11(12) 2276–2287.

Haque M, Singh R, Nadeem A, Rasool S, Wani JA, Khan A, Ashafaq M, Makeen HA, Zehra U. *Nigella sativa*: A promise for industrial and agricultural economic growth, Black Seeds (*Nigella Sativa*). *Black Seeds (Nigella Sativa) Pharmacological and Therapeutic Applications.* 2022; 22 439-460.

Kafi, M. Basil- Production and Processing. Ferdowsi University Mashhad Publication. Mashhad, Iran. 2003; pp. 195.

Gamal AA, [Mousa](https://www.researchgate.net/scientific-contributions/G-Mousa-2235448334?_sg%5B0%5D=ojAD_Xk0g41kULFlmvqwKNEmz9eioDxpCJdvBLKetXCHr_gtfCqwRZzkS4hWjS3XfZQiNBY.tSlhP7f0yknh5TsSEv2XLw8BJNs-ZJRZL5jH1DxauX1mb-TGgvQq5rIwQ9Pv0p5TnqENsk-RxcjjTCsB3D9-Zw&_sg%5B1%5D=_Njg6FyjkoFGQLVegr4lFleXbL6cQtea-ja0VDDNZHKrZiTCCOGPbveZIQX_78GHvqd1e14._1doBXJXFzoITt6LqhrfwA7FvldGbw75bSaLk2j3iJbhlfcA-7JMK6vLIpSDwWsjiXIBBf9Yv36CFxEFEHVrXA&_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlSGVhZGVyIn19) G, Gad MM, Sabah AM. Comparative Study on Black Cumin (*Nigella sativa* L.) Plants, Grown Under Different Plant Spacing and Fertilization treatments. *Journal of Agricultural Sciences.* 2012; 43 1-15.

Kandeel YR, Nofal EA, Menesi FA, Reda KA, Taher MN, Zaki ZT. Effect of some cultural practices on growth and chemical composition of *Foeniculum vulgare*, *Mill*. Proc. 5th Arabian Horticulture Conference, March 24-28, Ismailia, Egypt. 2001; pp. 61-72.

Sedigheh S, Rahnavard A, Ashrafi ZY. Study importance of sowing date and plant density effect on black cumin (*Cuminum carvi*) Yield. *Botany Research International .*2009;2(2) 94-98.

Kizil, Suleyman, and Toncer, O. Effect of raw spacing on seed yield, yield components, fatty oil and essential oil of Nigella sativa L. Crop Res. 2005. 30(1); 107 - 112.

Y. K. Sharma and S. S. Meena. (2024). Effect of planting time and plant spacing on root rot of nigella (Nigella sativa L.). *International Journal of Seed Spices*. 2024. *2*(1); 77-78.

Sarkar, Md. Imran, Khaleda Khatun, Tahmina Mostarin, Md. Murshedul Alam, Most Jakia Siddika, Md. Arif Hosen Saddam, Niloy Banik, and Md. Abdus Samad.“Effect of Macronutrients Combination with Plant Spacing on the Growth and Yield of Black Cumin (*Nigella Sativa* L.)”. *European Journal of Nutrition & Food Safety*. 2022.14 (8);15-27.