The Effects of Varying Nitrogen Doses on Yield And Some Yield Components of Black Cumin (*Nigella Sativa* L.)

Rüveyde Tuncturk, Murat Tuncturk, Vahdettin Ciftci

Yuzuncu Yil University, Faculty of Agriculture, Department of Field Crops, Van, Turkey.

**ABSTRACT**

This study was carried out to determine the effects of different nitrogen doses (0, 20, 40, 60 and 80 kg ha\(^{-1}\)) on the yield and some yield components of black cumin (*Nigella sativa* L.) in Van ecological conditions in 2006 and 2007. Field trials were designed by Completely Randomized Block Design with three replications at the experimental fields of Agricultural Faculty of Yuzuncu Yil University. In the study, plant height (cm), the number of branch (branch plant\(^{-1}\)), the number of capsule (capsule plant\(^{-1}\)), the number of seeds in the capsule (seed capsule\(^{-1}\)), thousand-seed weight (g) and seed yield (kg ha\(^{-1}\)) were determined. In conclusion, the effects of nitrogen doses on the yield and some yield components were statistically significant except for thousand-seed weight and the number of seeds in the capsule. Plant height, the number of branch, the number of capsule and seed yield increased by increasing nitrogen doses. According to the results, the highest values were obtained in seed yield (575 kg ha\(^{-1}\)), the number of capsule (7.5 capsule plant\(^{-1}\)) and the number of branch (4.51 branch plant\(^{-1}\)) from 60 kg N ha\(^{-1}\) application.

**Key words:** Black cumin, medicinal plants, nitrogen, seed, yield

**Introduction**

Black cumin (*Nigella sativa* L.), belonging to the family Ranunculaceae, has remarkable aromatic properties and medicinal value. *Nigella sativa* L., an indispensable constituent of medicinal and food formulations for centuries, has widely been cultivated throughout the South Europe, Syria, Egypt, Saudi Arabia, Turkey, Iran and Pakistan [1]. The Black cumin is generally short-lived annual, typical of disturbed soils or natural communities of semiarid areas, with a dominance of therophytes.

Black cumin is extensively used in traditional medicine, for healing various respiratory and gastrointestinal diseases in the various countries, particularly in Turkey. Whole seeds or their extracts have antidiabetic, antihistaminic, antihypertensive, anti-inflammatory, antimicrobial, antitumor, galactagogue and insect repellent effects [2]. Another use of black cumin seeds is as seasoning for foodstuffs like bread and pickles, especially widespread among Turkish people [7]. Therefore, black cumin appears to be of potential multi-purpose crops for possible interest.

It is well accepted that adequate use of chemical fertilizer improve yield and quality of aromatic plants. Nitrogen is used in crop cultivation to enable full exploitation of the genetic potential of the crop.

**Corresponding Author**

Rüveyde Tuncturk, Yuzuncu Yil University, Faculty of Agriculture, Department of Field Crops, Van, Turkey

E-mail: ruveydetuncturk@yyu.edu.tr; Tel: +90 (432) 225 1848
Climatic values for experimental area in the research years were 424.1 - 349.4 mm rainfall and 10.0 – 9.5 °C mean temperature, respectively. Seed sowings, in the ratio of 15 kg/ha, by hand were realized in both experimental years.

Field trials were designed according to Completely Randomized Block Design with three replications. As factorial, five different nitrogen doses [Control (0 kg ha⁻¹), 20 kg ha⁻¹, 40 kg ha⁻¹, 60 kg ha⁻¹ and 80 kg ha⁻¹] in ammonium sulphate (21 % N) form were applied to plots. Each plot was also fertilized with 40 kg P₂O₅. Seeds were sown by hand in April 15, 2006 and April 20, 2007 in the experimental years. Each plot sizes were 3 x 2 = 6 m² and row spacing was 25 cm in 8 rows. Area harvested was 2.4 m² and plants were harvested by hand when seeds were ripened. All the necessary cultural practices were applied to the plots during vegetation period.

In the study, some agricultural traits such as plant height (cm), the number of branches (branches plant⁻¹), the number of capsule (capsule plant⁻¹), the number of seeds in the capsule (seed capsule⁻¹), thousand-seed weight (g) and seed yield (kg ha⁻¹) were investigated.

The data obtained from agricultural traits were subjected to variance analyses and the average values were compared by Duncan Multiple Range Test [5].

Results And Discussion

Overall statistical analyses showed that there were significant differences between the years for plant height, the number of branch, the number of capsule and seed yield except for the number of seeds in the capsule and thousand-seed weight. All the traits investigated in this study were positively affected by varying nitrogen doses except for the thousand-seed weight.

There were significant differences between the plant height values of black cumin in the experimental years. Average plant height values varied in the intervals of 30.7-34.9 cm and 28.3-30.9 cm in 2006 and 2007, respectively (Table 1). Higher plant height values were measured in the first year. These differences in the average plant height values could be explained by the different rainfall regimes in the years. Increasing nitrogen doses increased plant height of black cumin in both experimental years. According to two year average values, the highest plant height (32.9 cm) was measured in 80 kg N ha⁻¹, and the lowest plant height (29.5 cm) was obtained from control plots. It is the phenomenon that nitrogen promotes vegetative development and increases plant height in plants. Plant height of black cumin in different studies varied in a wide range from 27.9 cm to 95.1 cm [4,3,6,14]. As known, plant height is a trait which related to plant genotype and easily affected by ecological variations in growing conditions and cultural applications. So, differences in plant height among the different ecological and soil conditions with different seed populations could be expected.

The effect of varying nitrogen doses on the number of branches of black cumin was significant in experimental years and their averages. The number of branches increased by increasing nitrogen doses up to 60 kg ha⁻¹, there was a slight decrease in further nitrogen doses (Table 1). According to two-year averages the number of branches varied from 3.18 to 4.51 branches plant⁻¹ and the highest value (4.51 branches plant⁻¹) was obtained from 60 kg ha⁻¹ nitrogen dose. In the study, increased nitrogen doses were supposed to encourage vegetative development and branch formulations. Özgüven and Şekeroğlu [14] reported that the highest the number of branches was obtained form higher nitrogen doses (90 kg N ha⁻¹). Branches values determined in the present study are in harmony with the researchers’ findings.

Varying nitrogen doses significantly affected the number of capsules of black cumin. As the highest the number of capsules (7.5 capsules plant⁻¹) was determined in 60 kg N ha⁻¹ nitrogen doses, the lowest value (5.5 capsules plant⁻¹) was obtained from control plots in two-year averages (Table 1). The number of capsules is directly affected the number of branches in black cumin. In different studies, researchers found that the number of capsules for black cumin were in the range of 5.75-6.00 [12], 3.60-6.10 [6] and 5.82-9.10 [13]. Our findings are in harmony with the researchers’ results. The number of branches directly affects the number of capsules. In optimum growing conditions plants can produce more fruitful branches. In the present study, the number of branches increased by increasing nitrogen doses and they produced more capsules. However, some slight decrease in the number of capsules occurred in higher nitrogen doses than 80 kg N ha⁻¹ like branches number. Özgüven and Şekeroğlu [14] reported that increasing nitrogen levels increased the number of capsules in black cumin.

The effect of increasing nitrogen doses on the number of seeds in the capsule for black cumin was significant in 2006, but there were no significant differences in the second experimental year and average of the years. The highest number of seeds in the capsule (55.1 seed capsule⁻¹) was recorded in 60 kg N ha⁻¹ nitrogen application, while the lowest value was found in the control in two-year averages. Increasing nitrogen doses also affected the number of seeds in the capsule positively, but this effect was solely significant in the first year. Our results are in company with Özel and Demirlek [15] findings, while it was lower than that of Tonçer and Kızıl [18]’s results.
Table 1: Average values of some yield components in black cumin.

<table>
<thead>
<tr>
<th>Nitrogen doses kg ha(^{-1})</th>
<th>Plant height (cm)</th>
<th>The number of branch (branch plant(^{-1}))</th>
<th>The number of capsule (capsule plant(^{-1}))</th>
<th>The number of seeds in the capsule (seed capsule(^{-1}))</th>
<th>Thousand-seed weight (g)</th>
<th>Seed yield (kg ha(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>30.7 c</td>
<td>28.3 b</td>
<td>29.5 c</td>
<td>2.93 c</td>
<td>3.43 b</td>
<td>3.18 b</td>
</tr>
<tr>
<td>20</td>
<td>31.9 bc</td>
<td>30.6 ab</td>
<td>31.3 b</td>
<td>3.33 bc</td>
<td>3.80 ab</td>
<td>3.56 b</td>
</tr>
<tr>
<td>40</td>
<td>33.7 ab</td>
<td>32.7 ab</td>
<td>33.2 a</td>
<td>4.16 a</td>
<td>4.50 ab</td>
<td>4.33 a</td>
</tr>
<tr>
<td>60</td>
<td>35.5 ab</td>
<td>32.9 ab</td>
<td>34.7 a</td>
<td>4.16 a</td>
<td>4.86 ab</td>
<td>4.51 a</td>
</tr>
<tr>
<td>80</td>
<td>34.9 A</td>
<td>30.9 a</td>
<td>32.9 a</td>
<td>4.00 ab</td>
<td>5.00 a</td>
<td>4.50 a</td>
</tr>
<tr>
<td>Nitrogen mean</td>
<td>32.9 A</td>
<td>29.6 B</td>
<td>31.6 B</td>
<td>3.72 B</td>
<td>3.72 B</td>
<td>3.72 B</td>
</tr>
<tr>
<td>LSD (%5)</td>
<td>2.31</td>
<td>2.32</td>
<td>1.43</td>
<td>0.67</td>
<td>1.19</td>
<td>0.60</td>
</tr>
</tbody>
</table>

*There were no significant differences between the mean values shown the same letters in 5 % probability level.

The effect of varying nitrogen doses on the thousand-seed weight of black cumin was not significant in the experimental years. As the lowest thousand-seed weight (2.20 g) was found in 80 kg N ha\(^{-1}\) nitrogen dose, the highest value (2.31 g) was determined in 20 kg N ha\(^{-1}\) nitrogen application (Table 1). Özgüven and Şeкерoğlu [14] stated that there were no statistical differences among the different nitrogen doses in black cumin. In different studies, thousand seed weight of black cumin were reported as 3.50 g [4], 2.15 g [3], 2.15 g [14]. Thousand seed weight is affected by a wide range of factors such as variety, growing conditions, climatic factors and soil properties.

There were significant differences between the seed yields values of black cumin in the experimental years. Average seed yield values varied in the intervals of 493-555 kg ha\(^{-1}\) and 527-594 kg ha\(^{-1}\) in 2006 and 2007, respectively (Table 1). Higher seed yields were determined in the second year. These differences in the average seed yield values could be explained by the different rainfall regimes and temperature variation in the years.

Yield components such as the number of branches and capsules affects directly seed yield in the field crops [6,14]. In the present study, the highest values were noted in the number of branches and capsules of black cumin cultivated in 60 kg N ha\(^{-1}\) doses. Thus, higher seed yields (575 kg ha\(^{-1}\)) were obtained from in 60 kg N ha\(^{-1}\) application. In the present study, seed yields increased by increasing nitrogen doses. However; some slight decrease in the seed yields occurred in higher nitrogen doses than 80 kg N ha\(^{-1}\) like in branches number and the number of capsule. Researchers study in nitrogen fertilization in crops states that nitrogen application increases seed yield, but higher doses have negative effects on the seed yield [14,9,8]. Availability of chemical fertilizers is affected by soil humidity in dry seasons and arid conditions [10].

**Conclusions:**

In the present study, the effects of varying nitrogen doses on yield and yield components of black cumin in Van ecological conditions located in Eastern Anatolia of Turkey in 2006 and 2007, were studied. According to the data obtained from a two-year study, varying nitrogen doses affected the yield and yield components of black cumin. The highest seed yield was obtained from 60 kg N ha\(^{-1}\) application. Excessive fertilizer applications had negative effects on the seed yield. As a result, nitrogen fertilization considerably affected yield and yield components of black cumin in both experimental years.

**References**


