

EFFECT OF SOWING DATES AND PLANTING DISTANCES ON *NIGELLA SATIVA*

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Abstract

Two field trials were conducted during 1996 and 1997 seasons at El Gimeza Research Station Farm, to study the effect of sowing date (Nov. 1st and Nov. 15th), and three planting distances 15,30 and 45cm between plants, on the vegetative growth, nitrogen, phosphorus content of seeds, crude and volatile oil of *Nigella sativa*.

The data showed that the vegetative growth significantly increased at the early sowing date Nov. 1st and at the wider space 45 cm. Seed weight per plant also increased. The data also showed that the seed yield per plot significantly decreased by increasing planting distances.

Nitrogen percentage and phosphorus content of seed significantly increased at the early sowing date. Increasing planting distances, the nitrogen percentage significantly increased, while the opposite was observed for phosphorus.

The crude oil and oil percentage significantly increased at early sowing date, and by increasing planting distance.

INTRODUCTION

Being an over populated country with limited resources, Egypt and similar developing countries have to improve their national economy. Economic integration between available resources seems to be one of the promising approaches in this connection. Consequently medicinal plants are expected to play an important role in such integration.

Nigella sativa, L. (Black cumin) belongs to family Ranunculaceae, its seed are reputed and used by common people for many medicinal purposes such as drug, liurecic, antiasthmatic, dasminative cough, and flavoring agent to bread and spices. (Ferdinand 1977).

There are different approaches in order to increase the yield of the active ingredient of the medicinal plants such as planting distances and sowing date that had proven to enhance plant growth and development.

El-Gengaihi and Abdallah (1978) on anise plant found that early sown plants produced taller plants with higher compound umbles. The oil percentage was not affected, while higher yield of seed and oil were significantly obtained. Khater and Ahmed 1992 on roselle plant found that plant height, number of branches and fruits fresh weight of sepals significantly increased at early sowing date.

Abou El-Fadl (1969) found that plants grown at wide spacing produced a greater number of compound umbrellas with larger diameter than those grown at close spacing. He also stated that spacing had no effect on the height of fennel plants, total yield of fruits and volatile oil content.

El-Gengaihi and Abdallah (1978) on fennel found that wider spacing produced taller plants. The compound umbrellas per plant increased as the distance between plants increased, they also found that the yield of seed per plant was greater in wider spacing. The medium space 30 cm produced more seeds and oil content per acre.

Radwan (1980) on caraway, Radwan 1988 on *Tagets erecta*, and Makarim and Bishr (1988) on hanban found that the dry weight of different parts of the plants increased significantly as plant spacing increased, they also added that the yield of fruits per feddan was higher when the plants were planted at narrow spacing.

Recently Khater and Ahmed 1992 on roselle plant found that there was significant decrease in the vegetative growth by increasing the number of plants per plot.

MATERIALS AND METHODS

This investigation was carried out in the experimental farm of the Agricultural Research Station at El-Gimiza for two successive seasons 1995/1996 and 1996/1997.

This trial was conducted to study the effect of sowing dates and planting distances on the vegetative growth, chemical composition and percentage of oil content in seeds of *Nigella sativa*.

Seeds of black cumin (*Nigella sativa* L.) were obtained from the Medicinal and Aromatic plants Section at Dokki, A.R.C.

A split plots design with three replicates was followed in this experiment, sowing dates were considered as the main plots, whereas planting distances were the sub-plots.

Seeds were sown in the experimental field in two dates, the first was at Nov.

1st and the second at Nov. 15th in the two seasons. Each plot was (3 x 3 m²) and contained 3 rows, 60cm Apart.

The seeds were sown in hills spaced at 15, 30 and 45 cm., resulting in a number of plants corresponding to 18,30 and 60 plants, per plot, respectively.

The growing seedlings were thinned to one plant per hill 45 days after the sowing date.

Each plot was fertilized at the rate of 300 kg ammonium sulphate (20.6% N) and 300 kg calcium super phosphate (15.5% P₂O₅) per Feddan. They were added in two equal batches, the first batch, was applied 45 days after planting and the second was added before the flowering stage, all the plants received the same agricultural practices.

The following data were recorded at the ripening stage as follows:

plant height, number of branches, fresh and dry weight of the aerial parts with fruits, seed weight per plant and plot, nitrogen and phosphorus percentages in seeds, as well as crude and volatile oils percentage in seeds.

The extract of the essential oil was carried out by using soxhlet apparatus according to the method described by Gad *et al.* (1963).

Nitrogen and phosphorus contents in seeds were determined in the Central Laboratory in the Horticultural Institute by using the method described in A.O.A.C. (1980).

The obtained data were statistically analyzed according to Snedecor and Cochran (1972) and the L.S.D. test at 5% was applied to compare between the means.

RESULTS AND DISCUSSION

I. Effect of sowing dates and planting distances on the vegetative growth of *Nigella sativa* plant :

The results obtained on plant characters are shown in Tables 1, 2, 3 and 4. Plant height, number of branches, and dry weight of the plant with fruits per plant, showed significant differences as a result of sowing dates, i.e. the early sowing date nov 1st significantly increased all the characters except the later one.

Concerning the effect of planting distances, the data also indicate that by increasing the distances, the vegetative growth significantly increased.

The interaction between sowing dates and planting distances was statistically significant, and early sowing date and the widest planting space (45 cm) produced the best results.

These results were observed during the two seasons of experimentation.

These results were in agreement with those obtained by Radwan (1980) on caraway plant and Radwan (1988) on *Tagetes erecta*.

It seems therefore that light and nutrients are limiting factors for plant growth. Increasing plant population by reducing the distances between plants decreased light intensity, a matter that would decrease plants competition.

II. Effect of sowing dates and planting distances on seed yield of *Nigella sativa*

II.1. Seed Yield per plant gm.

Data presented in Table 5 revealed that the seed weight significantly decreased at the late sowing date, i.e. the early sowing date produced the high seed yield per plant.

It was also observed that the seed weight/plant significantly increased as planting distances increased.

The interaction between the two factors was statistically significant, and the early sowing date and 45 cm space was the best treatment for obtaining the highest yield of seeds.

These results were observed during the two seasons. It might be concluded that the seed yield increased with the wider space which enabled the plants to receive more light, water and nutrients compared to plants cultivated at narrower spaces.

Table 1. Effect of sowing dates and planting distances on plant height (cm) of *Nigella sativa* L. during 1996 and 1997 seasons.

Planting distance cm	1st Season			2nd Season		
	1st date	2nd date	Mean	1st date	2nd date	Mean
15	87.0	54.0	70.5	74.5	63.7	69.1
30	87.3	64.5	75.9	78.3	66.0	72.2
45	96.5	76.0	86.3	93.0	77.5	85.3
Mean	90.3	64.3		81.9	69.1	

L.S.D. at 0.05 1996 1997
 For date 2.5 4.0
 For space 5.5 6.7

Table 2. Effect of sowing dates and planting distances on branch numbers of *Nigella sativa* L. during 1996 and 1997 seasons.

Planting distance cm	1st Season			2nd Season		
	1st date	2nd date	Mean	1st date	2nd date	Mean
15	10.0	10.2	10.1	11.7	8.5	10.1
30	12.7	11.9	12.3	15.0	11.7	13.4
45	15.0	14.3	14.7	16.0	15.0	15.5
Mean	12.6	12.1		14.2	11.7	

L.S.D. at 0.05 1996 1997
 For date N.S 0.8
 For space 1.2 2.5

Table 3. Effect of sowing dates and planting distances on plant fresh weight with fruits (gm) of *Nigella sativa* L. during 1996 and 1997 seasons.

Planting distance cm	1st Season			2 nd Season		
	1st date	2nd date	Mean	1st date	2nd date	Mean
15	195.0	140.0	167.5	225.0	155.0	190.0
30	270.7	250.7	260.7	416.0	272.0	344.0
45	443.3	395.7	419.5	489.0	492.0	490.5
Mean	303.0	262.1		376.7	306.3	

		1996	1997
L.S.D. at 0.05	For date	27.8	16.3
	For space	27.8	9.7
	For interaction	N.S.	13.7

Table 4. Effect of sowing dates and planting distances on plant dry weight with fruits (gm) of *Nigella sativa* L. during 1996 and 1997 seasons.

Planting distance cm	1st Season			2 nd Season		
	1st date	2nd date	Mean	1st date	2nd date	Mean
15	117.0	84.0	100.5	135.0	93.0	114.0
30	162.4	150.3	156.4	249.6	163.2	206.4
45	266.0	237.3	251.7	293.4	295.2	294.3
Mean	181.8	157.2		226.0	183.8	

		1996	1997
L.S.D. at 0.05	For date	27.8	9.8
	For space	27.8	5.8
	For interaction	N.S.	8.2

تأثير مواعيد ومسافات الزراعة على نبات حبة البركة

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أجرى هذا البحث فى عامين متتاليين ١٩٩٦ ، ١٩٩٧ فى مزرعة محطة بحوث الجميزة - محافظة الغربية لدراسة تأثير مواعيد ومسافات الزراعة على النمو الخضرى ومحصول البذرة ومحتوى البذرة من النيتروجين والفوسفور والمواد الفعالة.

وزرعت البذرة فى مواعدين مختلفين (الأول من نوفمبر و ١٥ من نوفمبر) بثلاثة مسافات زراعة هى (١٥ ، ٣٠ ، ٤٥ سم) بين النبات والآخر على خطوط تبعد عن بعضها ٦٠ سم.

وكان من أهم نتائج البحث مايلى:-

١ - كان لزراعة البذرة فى الميعاد الأول وهو الأول من نوفمبر تأثيراً معنوياً واضحاً على النمو الخضرى وكانت قيمة متوسطات طول النبات وعدد الفروع والوزن الطازج والجاف عالية بالمقارنة بالميعاد الثانى (١٥ نوفمبر).

٢ - بزيادة مسافات الزراعة حدثت زيادة معنوية فى النمو الخضرى.

٣ - بالنسبة لمحصول البذرة فقد كان تأثير الميعاد الأول معنوياً فى زيادة المحصول عن الميعاد

الثانى.

٤ - بزيادة مسافة الزراعة زاد محصول البذرة زيادة معنوية بالنسبة للنبات الواحد فى

حين حدث العكس فى حالة محصول القطعة التجريبية.

٥ - حدثت زيادة معنوية فى محتوى البذرة من النيتروجين والفوسفور فى الموعد الاول .

٦ - عند زيادة مسافة الزراعة زاد محتوى البذرة من النيتروجين زيادة معنوية فى حين

حدث العكس فى حالة محتوى البذرة من الفوسفور .

٧ - تزداد النسبة المئوية للزيت الخام والطيار زيادة معنوية عند زراعة البذرة فى الموعد

المبكر وتزداد أيضا هذه النسب بزيادة مسافات الزراعة.

وننصح بزراعة حبة البركة فى منطقة الجميزة - محافظة الغربية فى الأول من نوفمبر على

مسافة ١٥ سم حيث تعطى محصولاً عالياً من البذرة بالمقارنة بالزراعة على المسافة الواسعة.