EFFECT OF VERY HIGH LEVELS OF NITROGEN AND PHOSPOURS FERTILIZERS, PINCHING, AND SEED RATE SOWING ON GROWTH, SEED YIELD AND COMPONENTES OF *Nigella sativa* L. 2- SEED COMPENENTS

Yousif H. Hammo
Hort. Dept., College of Agriculture, Dohuk Univ., Iraq

ABSTRACT

This field experiment was conducted during the season 2005-2006 in Singar - Mosul city to investigate the effects of very high level (320 N, 300 P_2O_5) kg ha^{-1}, and high level (280 N, 260 P_2O_5) kg ha^{-1} of nitrogen and phosphorus fertilizer, pinch and with out pinch, and plant seed rate sowing 0.6, 0.8, 1.0, 1.2 g/10m^2 was done by hand within 3, 4, 5, 6 rows respectively in (10)m^2 plot size on seed components of *Nigella sativa* L. The experiment was laid out in randomized complete block design with three replications. The results include the following. Very high levels of nitrogen and phosphorus caused a significant increase in fixed oil, volatile oil, protein, and phosphorus; in contrast carbohydrate was significantly decreased, while humidity and ash cannot be affected with this factor. Pinching nigella plants causes a significantly increasing in fixed oil, ash, and carbohydrate of seeds while volatile oil, protein, and phosphorus were decreased significantly when compared with non pinched plants. Increased seed rate sowing from 0.8 to 1.2 g/10m^2 caused significant increasing in fixed oil when compared with 0.6 g/10m^2 while decreased seed rate sowing 0.6, 0.8 g/10m^2 caused significant increases in volatile oil and ash when compared with 1.0, 1.2 g/10m^2. Protein also Increased significantly from 20.67 to 24.40 with decreased seed rate sowing from 1.2 to 0.8 g/10m^2.while medium rate cause significant increase in phosphorus when compared with lowest and highest rate, the lowest rate of see rate give the highest percentage of carbohydrate when compared with other .

INTRODUCTION

Nigella (*Nigella sativa* L.) is an annual herbaceous plant belonging to the family Ranunculacea. It is grown in Mediterranean region and widely cultivated throughout South Europe, Syria, Egypt, Saudi Arabia, Iraq, Iran, India and Turkey (Al-Dagawi, 1996). Mature seeds are consumed for edible purposes as seasoning for vegetables, legumes and different types of baked products (Atta, 2003). Also its seeds are used in folk medicine as a natural stimulant of immunity, anti-allergic, asthma, treatment of neurological and skin diseases, anti-inflammatory cough, analgesic, diuretic, anti-diabetic, (Al-Dagawi , 1996; Tierra, 2002). Nitrogen which is a major component of proteins, hormones, chlorophyll, vitamins and enzymes is a major factor in stem and leaf growth. Also phosphorus is necessary for photosynthesis, protein formation and almost all aspects of growth and metabolism in plants. It is essential for flower and fruit formation. (Wikipedia, 2007). Ahmed (1997) found that fertilize *Nigella sativa* plants with triple calcium super phosphate (48, 96, 142) P_2O_5 ha^{-1} caused a significant increase in fixed and volatile percentage and decrease carbohydrate content of the herb of nigella. Hammo and

Al-Atrakchii (2006) on *Nigella sativa* found that increase

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fertilizer levels of nitrogen and phosphorus to 240 kg N and 220 kg P_2O_5 ha^{-1} causes significant increases in seeds contains of volatile oil, phosphorus except total carbohydrate which decreased in the first season and phosphorus and humidity in the second season. Hand pinching (the removal of the apical bud of the main shoot) is a common floricultural practice (Ecke and Matkin, 1976) designed to encourage auxiliary shoot development and increasing flower number for display purposes (Love, 1975; Larson, 1980). Al-khatony (2003) on *nigella sativa* obtained that protein, and phosphorus decreased significantly when pinched while total carbohydrate and ash increased. Seed rate is the key factor determining effecting the yield and yield components. Toncer and Kizil (2004) found that sowing Nigella plant with seed rate (10, 20, 30, 40 & 50) kg ha^{-1} under semi arid conditions in Diyarbakir significantly affected plant height, number of branch per plant, number of capsule per plant, seed yield per plant and seed yield but did not affected essential oil and fatty oil rate. Naghdi *et al.* (2000) obtained that planting space and seasonal variation have significant effect on quality and rows of 50 cm apart quantity yield of thyme plant when cultivated in rows of 50 cm apart with inter row spacing of 15, 30, and 45cm, maximum yields of dry and wet herbage, volatile oil and thymol were obtained in 15 cm. Because of the high response of nigella plant to high level of nitrogen and phosphorus (240 N kg, 220 kg P_2O_5 ha^{-1}) as shown in previous study (Hammo and Al-Atrakchii (2006) this study were done to clarify the influence of very high levels of fertilizers, seed rate sowing, and pinching on vegetative growth and seed yield of it.

MATERIALS AND METHODS

The field experiment was conducted during the season 2005-2006 in Singar / Mosul city to investigate the effects of some agricultural factors on vegetative growth and seed yield of *Nigella sativa* L. Seeds of *Nigella sativa* were obtained from the herbal market in Mosul, Iraq. The crop was sowed at 10 October 2005 in seed rate Sowing 0.6, 0.8, 1.0, 1.2 g/plot (10 m^2 area) by hand within 3, 4, 5, 6 rows for each seed rate respectively, pinch and with out pinch plants were fertilized with two levels of nitrogen and phosphorus fertilizer very high level (320 N, 300 P_2O_5) kg ha^{-1}, and high level (280 N, 260 P_2O_5) kg ha^{-1}. All plants received 60 kg ha^{-1} potassium fertilizers as potassium sulfate. Weeds were controlled by hand and all agriculture practices were done as needed. Harvesting was done on 15 June 2005 manually by pulling the dry plants out of the soil. Fixed oil percentage in seeds was calculated after extraction with Soxhlet Extraction Method (A O A C, 1980), volatile oil was determined by Modified Clevenger Method which described by Ranganna (1985)، Protein determine with MicroKjeldahl Method (A O A C, 1980) while phosphorus determine by Matt (1975) by use of Spectrophotometer which was also used to determine the total carbohydrate (Herbert *et al.* 1971). Humidity percentage determine by toloin which named Immiscible solvent distillation method which described by Ranganna (1985) . Ash percentage was determines with methods describe by Ranganna (1985).All

data obtained were analyzed and compared statistically at a significance level of 5%, by using SAS program (SAS, 1989-1996).

RESULTS AND DISCUSSION

Fixed oil percentage: Data presented in table (1) appear that very high level of fertilizer (320 N, 300 P_2O_5)kg ha^{-1} lead to significantly increased in fixed oil percentage when compared with high level of fertilizer (280 N, 260 P_2O_5)kg ha^{-1} and the percentage reached 41.52%, 40.79%, respectively. This may be refer to nitrogen which plant require in large amounts and its role in almost all plant metabolic processes so its effect on promotes rapid growth, increases leaf size and quality, hastens crop maturity, and promotes fruit and seed development. Or may be related to phosphorus which aids in root development, flower initiation, and seed and fruit development (Tucker, 1999; Uchida, 2000). Pinching causes significantly increased in this character 41.65% when compared with non pinching 40.66%, these results are in agreement with those which found by Cavins (2003), and Abdullah (2006). Although 0.8 g/10m^2 of seed rate sowing hadn't any difference in fixed oil percentage 41.49% when compared with 1.2, 1.0g/10m^2 41.70%, 41.20 respectively they differ significantly with the rate 0.6 g/10m^2 . These results are in agreement with Hammo and Al-Atrakchii (2006) and the reason may be related to increase the exposure area to sun shin so increasing dry speed which turns effect on

Table (1): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on fixed oil percentage of *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/10m^2				Fertilizer × pinch	Fertilizer effect
		1.2	1.0	0.8	0.6		
Very High	Pinch	40.98d-f	42.73ab	42.24bc	43.53a	42.37a	41.52a
	Without	40.72e-g	41.74b-e	40.19f-h	40.06f-h	40.68b	
High	Pinch	41.64c-e	39.60h	41.55c-e	40.95d-f	40.94b	40.79b
	Without	40.11f-h	41.90b-d	40.84d-g	39.75gh	40.65b	
Fertilizer × Seed rate sowing	Very High	40.85cd	42.23a	41.21bc	41.79ab	Pinch effect	
	High	40.88cd	40.75cd	41.20bc	40.35d		
Pinch × Seed rate sowing	Pinch	41.31b	41.16bc	41.89ab	42.24a	41.65 a	
	Without	40.41d	41.82ab	40.52cd	39.91d	40.66 b	
Seed rate sowing		40.86b	41.49a	41.20ab	41.07ab		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

the elements absorption then decreases fixed oil percentage. All dual and triple interaction between factors levels have a significant influence on this character and the highest percentage 43.53% cm obtained in pinching plants fertilized with very high level of nitrogen and phosphorus and sowing at seed rate 1.2 g/10m^2

while the lowest 39.60% for pinched plant fertilized with high level and sowing at 0.8 g/10m^2.

Volatile oil percentage: very high level of fertilizer in table (2) showed significant increased in volatile oil percentage 0.923% when compared with high level 0.856%. The reason may be refer to nitrate and phosphate availability which promote some metabolic processes such as cell division, cell enlargement and causes lateral root formation, elongation, promotes aerial vegetative growth, increases the top/root ratio, essential for fruit and seed formation so affects both yield and quality characteristics of vegetable production (Bates and Lynch, 1996; George, 2000; Okeno, 2002), also very high Phosphorus is important in plant bioenergetics as a component of ATP during photosynthesis Since ATP can be used for the biosynthesis of many plant bimolecular, also its use to modify the activity of various enzymes by phosphorylation. Pinching caused significant decrease in volatile percentage 0.879% when compared with non pinching 0.900%. Low seed rate 0.6, 0.8 g/10m^2 showed significant increased in volatile oil percentage 0.913%, 0.911% respectively when compared with 1.0, 1.2 g/10m^2 0.868%, 0.865%, respectively These results are in agreement with Hammo and Al-Atrakchii (2006) and the reason may be relate to Intra-specific competition which created as a result of high seed rate sowing so effect vegetetive growth which turns effect oil percentage and other character (Kızıl, 2002). All dual and triple interaction have significant influence on this character and the highest percentage 0.960% obtained in non pinching plants fertilized with very high level of nitrogen and phosphorus and sowing at seed rate o.8 g/10m^2 while the lowest 0.820% for pinched plant fertilized with high level and sowing at 1.2 g/10m^2 rate.

Table(2): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on volatile oil percentage of *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/10m^2				Fertilizer × pinch	Fertilizer effect
		1.2	1.0	0.8	0.6		
Very High	Pinch	0.940ab	0.933ab	0.893b-d	0.883b-e	0.913a	0.923a
	Without	0.957a	0.960a	0.907a-c	0.910a-c	0.933a	
High	Pinch	0.870c-f	0.863c-f	0.827ef	0.820f	0.845b	0.856b
	Without	0.887b-d	0.887b-d	0.847d-f	0.847d-f	0.867b	
Fertilizer × Seed rate sowing	Very High	0.948a	0.947a	0.900b	0.897b	Pinch effect	
	High	0.878b	0.875b	0.837c	0.833c		
Pinch × Seed rate sowing	Pinch	0.905ab	0.898a-c	0.860cd	0.852d	0.879b	
	Without	0.922a	0.923a	0.877b-d	0.878b-d	0.900a	
Seed rate sowing		0.913a	0.911a	0.868b	0.865b		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

Protein percentage: Very high level of nitrogen and phosphorus demonstrate significant effect on protein percentage in seeds as shown in table (3) when compared with high level and the values for the two levels reached 23.49%, 20.07% respectively. these results are in agreement with El-Gamassy *et al.* (1980) how found that increasing nitrogen and phosphorus fertilizer to (714 calcium nitrite, 714 potassium super phosphate) kg ha^{-1} cause an increases in nitrogen, phosphorus, and oil percentage in leaves of *Majorana hortensis*. The reason may be refer to increase absorption and accumulation of nitrogen in plant tissue then seeds as a result to roots and vegetative strong growth (Al-Khfagi, 1986). Pinching cause significantly decreased in this character 20.02% when compared with non pinching 23.55% and the result may be relate to significant effect of pinch in increased the number of lateral shoot development as shown in part one of this study which is stimulated and promoted by hand pinching then increased the competition between seeds (Asiah *et al.* 1992; Phetpradap *et al.* 1994). Decreased seed rate sowing from 1.2 to 0.8 g/$10m^2$ caused significant increased in protein percentages from 20.67% to 24.40% then decreased suddenly to 18.83% when sowing at seed rate 0.6 g/$10m^2$. This may be due to increase the exposure area to sun shin so increase dry speed of soil surface which turns affect elements absorption then decrease protein percentage. Kızıl (2002) reported that high seed rate created higher interplant competition. All dual and third interaction between the levels of factors had a significant influences on this character and the highest percentage 28.25% obtained in non pinching plants fertilized with very high level of nitrogen and phosphorus and sowing at seed rate o.8 g/$10m^2$ while the lowest 17.00% for pinched plant fertilized with high level and sowing at 1.0, and 1.2 g/$10m^2$ rate.

Table(3): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on protein percentage *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/$10m^2$				Fertilizer × pinch	Fertilizer effect
		1.2	1.0	0.8	0.6		
Very High	Pinch	18.25 ef	26.71 ab	23.89 c	21.06 d	22.48 b	23.49 a
	Without	19.92 de	28.25 a	26.25 ab	23.63 c	24.51 a	
High	Pinch	17.00 f	18.65 ef	17.58 f	17.00 f	17.56 c	20.07 b
	Without	20.17 de	24.00 c	25.17 bc	21.00 d	22.58 b	
Fertilizer × Seed rate sowing	Very High	19.08 d	27.48 a	25.07 b	22.34 c	pinch effect	
	High	18.58 d	21.32 c	21.38 c	19.00 d		
Pinch × Seed rate sowing	Pinch	17.63 e	22.68 b	20.74 c	19.03 d	20.02 b	
	Without	20.04 cd	26.13 a	25.71 a	22.31 b	23.55 a	
Seed rate sowing		18.83 d	24.40 a	23.22 b	20.67 c		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

Phosphorus percentage: Very high level of nitrogen and phosphorus showed significant effect on phosphorus percentage in seeds as shown in table (4) when compared with high level and the values for the two levels reach 0.622%, 0.577% respectively. These results are in agreement with those reported by Hanafy (1984) on *Coriandrum sativum* how found that increasing phosphorus fertilizer lead to increase in phosphorus and decreased in carbohydrate content. Pinching cause significantly decreased in this character 0.536% when compared with non pinching 0.663 (Previously mentioned reasons in previous character). Third seed rate sowing caused significant increased in phosphorus percentages 0.628% when compared with the lowest 0.6 g/10m^2 and highest 1.2 g/10m^2 seed rate sowing 0.561% and 0.598% respictivly. (Previously mentioned reasons in previous character). All interaction between the levels of studied factors have a significant influence on this characters and the highest percentage 0.743% obtained in non pinching fertilized with very high level of nitrogen and phosphorus and sowing at seed rate 0.8 g/10m^2 while the lowest 0.476% for pinched plant fertilized with high level and sowing at 0.8 g/10m^2 rate.

Table (4): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on phosphorus *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/10m^2 1.2	1.0	0.8	0.6	Fertilizer × pinch	Fertilizer effect
Very High	Pinch	0.556 e-g	0.552 e-g	0.574 ef	0.571 ef	0.563 c	0.622 a
	Without	0.691 bc	0.743 a	0.719 ab	0.569 ef	0.681 b	
High	Pinch	0.504 hi	0.476 i	0.532 f-h	0.524 gh	0.509 d	0.577 b
	Without	0.640 d	0.672 cd	0.687 bc	0.581 e	0.645 a	
Fertilizer × Seed rate sowing	Very High	0.623 ab	0.648 a	0.646 b	0.570 c	pinch effect	
	High	0.572 c	0.574 c	0.610 b	0.552 c		
Pinch × Seed rate sowing	Pinch	0.530 de	0.514 e	0.553 cd	0.54 cd	0.536 b	
	Without	0.666 b	0.707 a	0.703 a	0.575 c	0.663 a	
Seed rate sowing		0.598 b	0.611 ab	0.628 a	0.561 c		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

Total carbohydrate percentage: Very high level of nitrogen and phosphorus indicate significant decreased in total carbohydrate percentage 25.49% as shown in table (5) when compared with high level 28.65%. These results are in agreement with Hanafy (1984) and Hammo and Al-Atrakchii (2006). This may be revert to the role of phosphorus in carbohydrate metabolism to product ATP unit which use in create turpentine compound so cause increase in oil and decrease in carbohydrate (Goodwin and Mercer, 1985; kamel *et al*. 1989). Pinching cause significantly increased in this character 28.50% when compared with non pinched 25.64%. All seed rate sowing haven't any significant

increased in this character 28.06%, 26.42%, 27.92% for 0.6, 1.0, 1.2 g/10m^2 respectively except 0.8 g/10m^2 which decreased significantly when compared and reach 25.89%. All interaction have significant influence on this character and the highest percentage 31.71% obtained in pinching plants fertilized with high level of nitrogen and phosphorus and sowing at seed rate 0.8 g/10m^2 while the lowest 21.16% for non pinched plant fertilized with very high level and sowing at 0.8 g/10m^2 .

Humidity percentage: Data in table (6) demonstrate that very high and high levels of nitrogen and phosphorus fertilizer, pinch, with out pinch, all seed rate sowing, and all dual and third interaction between these factors haven't any significant effect on this character. The means of data ranged between (4.63 - 4.93) % these results are in agreement with (Hanafy, 1984; AL-Kaisey *et al.* 1999).

Ash percentage: Although very high and high levels of nitrogen and phosphorus fertilizer had no any significant effect on ash percentage as shown in table (7). Pinching cause significantly increased in this character 4.87% when compared with

Table (5): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on total carbohydrate percentage of *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/10m^2				Fertilizer × pinch	Fertilizer effect
		1.2	1.0	0.8	0.6		
Very High	Pinch	27.23 b-e	25.21 ef	27.69 a-e	26.13 c-f	26.57 b	25.49 b
	Without	27.30 b-e	21.16 g	22.46 fg	26.77 b-e	24.42 c	
High	Pinch	30.26 a-c	31.71 a	30.75 ab	29.03 a-e	30.44 a	28.65 a
	Without	27.45 b-e	25.47 d-f	24.77 e-g	29.74 a-d	26.86 b	
Fertilizer × Seed rate sowing	Very High	27.27 ab	23.19 c	25.07 bc	26.45 ab	pinch effect	
	High	28.84 a	28.59 a	27.76 ab	29.39 a		
Pinch × Seed rate sowing	Pinch	28.75 b	28.46 a	29.22 a	27.58 a	28.50 a	
	Without	27.38 a	23.32 b	23.62 b	28.26 a	25.64 b	
Seed rate sowing		28.06 a	25.89 b	26.42 ab	27.92 a		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

non pinching 4.68%. While ash percentage for plants sowing at seed rate 0.8 g/10m^2 didn't significantly superiors 4.95%, when compared with 0.6 g/10m^2 4.83 it is superior on high rate sowing seed 1.0 g/10m^2, and 1.2 g/10m^2 4.67%. All interaction between the levels of factors have a significant influence on this characters and the highest percentage 5.17% obtained in pinching plants fertilized with high level of nitrogen and phosphorus and sowing at seed rate 0.8 g/10m^2 while the lowest 4.43% for non pinched plant fertilized with high level and sowing at 1.2 g/10m^2 rate.

Table (6): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on humidity percentage of *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/10m^2				Fertilizer × pinch	Fertilizer effect
		1.2	1.0	0.8	0.6		
Very High	Pinch	4.84 a	4.76 a	4.74 a	4.75 a	4.77 a	4.74 a
	Without	4.66 a	4.67 a	4.74 a	4.77 a	4.71 a	
High	Pinch	4.63 a	4.65 a	4.78 a	4.67 a	4.68 a	4.70 a
	Without	4.66 a	4.63 a	4.67 a	4.93 a	4.72 a	
Fertilizer × Seed rate sowing	Very High	4.72 a	4.72 a	4.74 a	4.76 a	pinch effect	
	High	4.65 a	4.64 a	4.73 a	4.80 a		
Pinch × Seed rate sowing	Pinch	4.73 a	4.71 a	4.76 a	4.71 a	4.73 a	
	Without	4.66 a	4.65 a	4.70 a	4.85 a	4.72 a	
Seed rate sowing		4.70 a	4.68 a	4.73 a	4.78 a		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

Table (7): Effect of very high levels of nitrogen and phosphorus fertilization, pinching, and Seed rate sowing on ash percentage of *Nigella sativa* L. seeds.

Fertilizer Levels	Pinch	Seed sowing rate g/10m^2				Fertilizer × pinch	Fertilizer effect
		1.2	1.0	0.8	0.6		
Very High	Pinch	4.99 ab	4.77 a-e	4.99 ab	4.96 a-c	4.93 a	4.84 a
	Without	4.86 a-d	4.98 a-c	4.56 c-e	4.61 b-e	4.75 ab	
High	Pinch	4.85 a-d	5.17 a	4.60 b-e	4.68 b-e	4.82 a	4.72 a
	Without	4.61 b-e	4.87 a-d	4.52 de	4.43 e	4.61 b	
Fertilizer × Seed rate sowing	Very High	4.92 ab	4.87 ab	4.77 a-c	4.78 a-c	pinch effect	
	High	4.73 bc	5.02 a	4.56 c	4.56 c		
Pinch × Seed rate sowing	Pinch	4.92 ab	4.97 a	4.79 ab	4.82 a	4.87 a	
	Without	4.73 ab	4.92 a	4.54 b	4.52 b	4.68 b	
Seed rate sowing		4.83 ab	4.95 a	4.67 b	4.67 b		

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.

تأثير المستويات العالية جداً من السماد النتروجيني والفوسفاتي والقرط ونسبة البذور المزروعة في النمو الخضري وحاصل البذور ومكوناتها لنبات حبة البركة (*Nigella Sativa* L.) 2- مكونات البذور

يوسف حسين حمو

قسم البستنة / كلية الزراعة / جامعة دهوك / العراق

الخلاصة

أجريت هذه الدراسة خلال الموسم ٢٠٠٥-٢٠٠٦ في سنجار-الموصل. وذلك بهدف دراسة تأثير كل من المستوى العالي جدا (N ٣٢٠ و P_2O_5 ٣٠٠) كغم/هكتار والمستوى العالي (N٢٨٠ و P_2O_5 ٢٦٠) كغم/هكتار للتسميد النيتروجيني والفوسفاتي، القرط، بدون قرط، إضافة إلى نسبة البذور المزروعة في وحدة المساحة ٠.٦و ٠.٨ و ١.٠و ١.٢ غم/١٠م^2 والتي تزرع نثرا باليد في ٣ و ٤ و٥ و٦ صفوف على التوالي ولكل وحدة تجريبية مساحتها (١٠) م^2 والتداخل بينهما في مكونات البذور لنبات حبة البركة. نفذت التجربة باستخدام تصميم القطاعات العشوائية الكاملة(RCBD) وبثلاث مكررات وتضمنت النتائج مايلي. أدى التسميد النيتروجيني والفوسفاتي العالي جدا إلى زيادة معنوية في النسبة المئوية للزيت الثابت، الزيت الطيار، البروتين، والفسفور في حين قلت النسبة المئوية للكربوهيدرات الكلية معنويا ولم تتأثر نسبة الرطوبة والرماد بهذا العامل. وفي الوقت زادت فيه نسب كل من الزيت الثابت، الكربوهيدرات الكلية، والرماد معنويا كنتيجة لإجراء عملية القرط قلت النسب المئوية لكل من الزيت الطيار، البروتين، والفسفور.وأدى زيادة نسبة البذور المزروعة من ٠.٨ إلى ١.٢ إلى زيادة النسبة المئوية للزيت الثابت مقارنه بالنسبة ٠.٦ كما أدت النسب الواطئة ٠.٦و ٠.٨ إلى زيادة نسبة الزيت الطيار والرماد عند مقارنتها بالنسب العالية ١.٠ و ١.٢ كما زادت نسبة البروتين معنويا من ٢٠.٦٧-٢٤.٤٠ وذلك بتقليل نسبة البذور المزروعة من ١.٢ إلى ٠.٨ وادت النسب المتوسطة إلى زيادة معنوية في الفسفور عند مقارنتها بالنسب الواطئة والعالية واعطت النسبة الواطئة للبذور أعلى نسبة من الكربوهيدرات الكلية عند مقارنتها مع النسب الأخرى.

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