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EFFECT OF SEED RATE AND PLANTING DATES ON VEGETATIVE GROWTH AND CHEMICAL COMPOSITION OF PEAS.

Amen, E.S.A.; M.H. Tolba and H.M. Ghobary
Horticulture Institute Agriculture Research Center, Giza, Egypt.

ABSTRACT

This study was carried out at the Experimental Station, Paramoon Station, Mansoura Horticulture Institute during the two successive seasons of 1999 and 2000. The objective of this study was to study the effect of different plant density and planting dates on vegetative growth and chemical composition of peas (*Pisum sativum*, L.) cv. Master B.

I- Vegetative growth:

Planting growing peas at 15th October significantly increased plant height (cm), plant fresh weight (g.), plant dry weight (g.), No. of leaves per plant, stem diameter (cm) and leaf area per plant (cm^2) in both seasons.

The amount of seeds 50 kg/fed the lowest plant density (50 Kg/fed). Data showed increased for plant height (cm), fresh weight per plant (g.), dry weight per plant (g.), stem diameter (cm) and leaf area per plant (cm^2) in both seasons.

The medium plant density exerted a medium effect on all growth parameters in both seasons except for No. of leaves per plant in the second seasons only which was similar to that of the lowest plant density.

Growing peas on 15th October with 50 kg/fed increased plant fresh weight (g.), plant dry weight (g.), number of leaves per plant, number of branches per plant, stem diameter (cm) and leaf area per plant (cm^2) than the other treatments in both seasons. An exception in this treatment is that plant height decreased than other treatments. It is also clear that at the same planting date (October 15th) with 75 kg/fed.

II- Chemical composition of leaves:

Sowing peas on the October 15th increased leaf content of total nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O) in both seasons.

Planting growing peas during October 15th gave the highest contents in the leaves of chlorophyll a, b and total chlorophyll with a significant differences than November 15th and December 15th in both seasons.

Growing peas at 50 kg/fed increased nitrogen, phosphorus, potassium, chlorophyll a, b and total chlorophyll in leaves than growing at 60 kg/fed in both seasons.

INTRODUCTION

Pea (*Pisum sativum* L.) is one of the most popular vegetative legume crop in Egypt. It is mainly grown for green pods, dry seeds and in turn improving soil fertility. The cultivated area devoted to green pods of peas reached 250000 fed which produced a total production of 120000 tons according to the statistical Year Book of Ministry of Agriculture, Egypt (1998).

Abd El-Rahman *et al.* (1980 b) found that delaying planting date of lentil to December decreased number of branches. Kang – Youngkil *et al.* (1998) found that, plant height, diameter and node number of main stems decreased with delay in sowing. Silim *et al.* (1985) indicted that sowing date in

September led to increasing dry matter and photosynthetic area of pea. El-Sharkawy *et al.* (1990) illustrated that planting pea on 20 October or 20 November significantly increased plant height and fresh weight of vegetative growth. The available review of literature as for plant density on vegetative growth of peas plants is very few. On Pea plants, Behairy (1965) observed that increasing plant population cv. Little Marvel increased plant height. El-Bakry (1966) reported that wide spacing increased vegetative growth i.e. number of leaves, number of shoots per plant of peas. El-Sharkawy *et al.* (1990) illustrated that planting date on 20 September or 20 October significantly increased phosphorus content in the leave of peas plant. Goma (1964) found that increasing distance between plants increased the absolute amounts of nitrogen in the different parts of cow pea plants i.e. leaves and branches.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of the Paramoon Station, Mansoura Hort. Inst. During 1999 and 2000 seasons.
Experiments were carried to study the effect of plant density and planting dates on vegetative growth and chemical composition of peas (*Pisum sativum*, L.) cv. Master B.
Each experiment included 9 treatments which were three planting dates and three seed rate. The following treatment were studied.

Seed rate:

- The first seed rate 50 kg/fed.
- The second seed rate 60 kg/fed.
- The third seed rate 75 kg/fed.

Planting date:

- October 15th .
- November 15th.
- December 15th.

All other cultural practices received i.e. irrigation, fertilization (all plots received 200 kg $(NH4)_2 SO_4$ + 200 kg super phosphate and 50 kg K_2SO/fed). Pest control as recommended by Egyptian Ministry of Agriculture Program. A mechanical and chemical analysis of experimental soil conducted at Mansoura Center of soil according to the methods of Black (1965) and Page (1982). The chemical and mechanical analyses of the soil are tabulated in Table (1).

Experimental design:

Treatments were arranged in the field using the split plot design with three replicates. The main plots were assigned to planting dates whereas the sub plots devoted for the seed rate.

Experimental procedures:

Sex plants of each plot were randomly taken at 55 days after sowing to measure the following characters:

Table (1): Mechanical and chemical analysis of the experiment soil.

Soil properties	1999	2000
Coarse sand %	1.01	1.15
Fine sand %	26.80	26.70
Silt %	25.20	25.00
Clay %	46.00	47.00
$CaCO_3$ %	2.90	2.80
Organic matter %	1.80	2.00
Total nitrogen %	0.16	0.14
Available phosphorus ppm	9.00	7.00
Exchangeable potassium ppm	210.0	203.0

A- Vegetative growth:

1. Plant height (cm)
2. Stem diameter (cm)
3. Number of branches/plant
4. Number of leaves/plant
5. Fresh weight of vegetative parts/plant (g.)
6. Dry weight of vegetative parts/plant (g.)

The data were obtained after drying vegetative parts in an electrical oven at 70°C up to constant weight.

7. Leaf area per plant in cm^2 calculated as a relation between area unit and fresh weight of leaves (Koller, 1972) using the following equation:

$$\text{Leaf area} = \frac{\text{disk area x no. of disks}}{\text{Fresh weight of disks}} \times \text{F.W. of leaves}$$

B- Chemical composition of vegetative growth:

At 55 days after sowing, samples of leaves were taken (fourth leaf) to determine the following measurements.

1. Total nitrogen as described by Jackson (1967).
2. Phosphorus as indicated by Olsen and Sommers (1982).
3. Potassium according to Jackson (1967).
4. Chlorophyll contents were determined. Disk samples from the fourth upper leaf were obtained and both chlorophyll were determined as described by Mackinny (1941).

Statistical analysis:

The obtained data were subjected to statistical analysis using technique of the split plot design according to Snedecor and Cochran (1968). The treatment means were compared using Duncan's Multiple Range Test as published by Duncan (1955).

RESULTS AND DISCUSSION

Green parts of peas plant had been found to be affected by many factors among these factors planting dates and plant density. They are of great importance and exert great effects on vegetative growth, chemical composition flowering, quality, yield and yield component. Many research worker in different countries investigated these two factors under Egyptian conditions and particularly at Dakahlia Governorate. Therefore, the results could be presented in the following orders:

A- Vegetative Growth:

1- Effect of planting date on vegetative growth:

The effect of planting date in 1999 and 2000 on growth parameters are shown in Tables (2 and 3). Growing peas at 15 October significantly increased plant height (cm), plant fresh weight (g.), plant dry weight (g.), number of leaves/plant, stem diameter (cm) and leaf area (cm^2) per plant in both seasons. These results are in agreement with those of El-Sharkawy *et al.* (1990) and Srivastava (1991 b).

It is evident from the above results that peas plants developed better vegetative growth during October in both seasons than in the planting date 15th November or 15th December.

Table 2: Effect of planting date on vegetative growth during 1999/2000 seasons.

Planting date	Plant height (cm)		Fresh weight (g.)		Dry weight (g.)	
	1999	2000	1999	2000	1999	2000
Oct. 15th	56.12A	53.00A	35.63A	33.90A	9.18A	9.00A
Nov. 15th	50.00B	49.16B	30.98B	29.12B	8.26B	8.11B
Dec. 15th	48.43C	45.38C	28.19C	27.14C	7.58C	7.40C

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

Table 3: Effect of planting date on vegetative growth during 1999/2000 seasons.

Planting date	No. of leaves/ plant		No. of branches/plant		Stem diameter (cm)		Leaf area (cm^2)	
	1999	2000	1999	2000	1999	2000	1999	2000
Oct. 15th	23.20A	20.9A	2.00A	1.9A	0.305A	0.300A	1050A	1090A
Nov. 15th	20.18B	19.3B	1.8B	1.6B	0.290AB	0.286A	982B	940B
Dec. 15th	18.40C	17.9A	1.6C	1.5C	0.260B	0.255B	770C	760C

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

2- Effect of seed rate on vegetative growth:

The effect of planting density in 1999 and 2000 on growth parameters are shown in Tables (4 and 5). Growing peas as 50 kg/fed increased plant height (cm), fresh weight (g.) per plant, dry weight (g.)/plant, number of leaves/plant, number of branches/plant, stem diameter (cm) and leaf area (cm^2) per plant in both seasons. The medium plant density (60 Kg seed) exerted a medium effect on all growth parameters in both seasons except number of leaves per plant in the second season only.

Table 4: Effect of planting density on vegetative growth during 1999 and 2000 seasons.

Plant density Kg/fed	Plant height (cm)		Fresh weight (g.)		Dry weight (g.)	
	1999	2000	1999	2000	1999	2000
50	55.4A	53.2A	37.2A	36.9A	9.3A	9.1A
60	51.9B	50.8B	34.8B	33.2B	8.8B	8.9B
75	49.8C	47.9C	30.4C	29.8C	8.6C	8.4C

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

Table 5: Effect of planting density on vegetative growth during 1999 and 2000 seasons.

Plant density Kg/fed	No. of leaves/ plant		No. of branches/plant		Stem diameter (cm)		Leaf area (cm^2)	
	1999	2000	1999	2000	1999	2000	1999	2000
50	22.3A	20.4A	2.6A	1.9A	0.320A	1000A	980A	970A
60	21.5B	20.2A	1.8B	1.7B	0.270B	0.265B	940B	920B
75	18.6C	17.9B	1.6C	1.5C	0.260C	0.250C	876C	860C

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

These results are expected since the greatest plant density (75 kg/fed) seemed to make the plants crowded and shading each other. Therefore, tends to be lower than those the lowest density or medium density.
These results are in agreement with those obtained by Behiry (1965). Siomon (1970), Edje *et al.* (1975) and Mahatany (1980).

It is also clear that the effect of lowest plant density 50 kg/fed on increasing fresh weight (g.) per plant, dry weight (g.) per plant, number of leaves per plant, stem diameter (cm) and leaf area (cm^2) per plant may be attributed to the availability of light, water and nutrients under lower density of plants per area.

Similar results were found be El-Deib (1982), Bakry *et al.* (1984) and Morsy (1986).

3- Effect of interaction between plant density and planting date on vegetative growth:

The effect of interaction between plant density and planting dates on growth in 1999 and 2000 is shown in Tables (6 and 7). It is evident from Tables 6 and 7 that growing peas on 15th October planting date with 50 kg/fed increased plant fresh weight (g.), plant dry weight (g.), number of leaves/plant, number of branches/plant, stem diameter (cm) and leaf area/plant (cm^2) than other treatments in both seasons.

It is clear that at the same planting date 15th October with 50 kg/fed, plant height increased its also clear that within each planting date there is clear increase thease characters plant height by decreasing plant density in both seasons (Nov. 15th or Dec. 15th) tended to give lower vegetative growth measurements in both seasons. These results are in accordance with separate effect of planting date and planting density. Similar results were found by Akinola and Oxejola (1994), Hussein *et al.* (1994) and Hammam (1995).

Table 6: Effect of interaction between plant density and planting dates on growth under 1999/2000 seasons.

Plant date	Seed rate kg/fed	Plant height (cm)		Fresh weight (g.)		Dry weight (g.)	
		1999	2000	1999	2000	1999	2000
Oct.15th	50	55.1A	54.2A	42.4A	41.1A	10.2A	9.7A
	60	46.6C	45.9C	37.3B	35.2BC	9.2B	9.0B
	75	40.6C	37.0D	35.2BC	30.0C	8.6C	8.2C
Nov.15th	50	53.0B	51.4B	36.1B	36.0B	9.4B	9.2AB
	60	40.4C	38.8CD	34.2BC	32.9C	8.7C	8.3C
	75	38.2D	36.4E	31.0D	29.0D	8.4CD	8.1D
Dec.15th	50	39.0C	38.0CD	32.0CD	31.0CD	8.3D	8.2C
	60	37.0D	36.0EF	30.0D	29.0D	7.7E	7.5DE
	75	38.1E	35.4F	27.0E	26.0E	7.9F	7.2E

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

Table 7: Effect of interaction between planting dates and plant density on vegetative growth during 1999 and 2000 seasons.

Plant date	Seed rate Kg/fed	No. of leaves/ plant		No. of branches/plant		Stem diameter (cm)		Leaf area (cm^2)	
		1999	2000	1999	2000	1999	2000	1999	2000
Oct.15th	50	24.16A	23.12A	2.90A	1.15A	0.36A	0.35A	1158A	1140A
	60	23.36AB	20.14AB	2.5B	1.8B	0.29C	0.28C	1063C	1038B
	75	20.98CD	19.17BC	1.7C	1.6C	0.27DEF	0.26DE	966D	955CD
Nov.15th	50	22.9BC	21.4AB	1.9B	1.8B	0.33B	0.32B	1040BC	999BC
	60	21.5CD	20.6AB	1.7C	1.7BC	0.28CDE	0.27D	998CD	990CD
	75	18.6E	16.2C	1.6DE	1.5D	0.27EF	0.26EF	903E	893D
Dec.15th	50	19.4DC	19.2BC	1.7CD	1.6BC	0.28B	0.27DE	827F	820E
	60	15.5E	18.01BC	1.6CD	1.5CD	0.26D	0.26EF	756E	745E
	75	17.2E	6.2C	1.5E	1.45D	0.25EF	0.24F	740E	730E

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

B- Chemical Composition of Leaves:

1- Effect of planting date on chemical composition of leaves:

The effects of planting date in 1999 and 2000 on chemical composition of leaves are presented in Tables (8 and 9).

It is clear from the data that growing peas on October 15th increased leaf content of total nitrogen percent. Phosphorus percent as P_2O_5 and potassium percent as K_2O in both seasons. However, the different planting date had a little effect on potassium content in the leaves.

Table 8: Effect of planting dates on chemical composition of leaves during 1999 and 2000 seasons.

Planting date	Nitrogen %		Phosphorus %		Potassium %	
	1999	2000	1999	2000	1999	2000
Oct. 15th	3.326A	3.14A	0.540A	0.512A	2.150A	2.000A
Nov. 15th	3.200B	3.121A	0.480A	0.444B	2.000AB	1.920AB
Dec. 15th	2.604C	2.503B	0.426B	0.404C	1.920B	1.840B

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

Table 9: Effect of planting dates on chemical composition of leaves during 1999 and 2000 seasons.

Planting date	Chlorophyll a		Chlorophyll b		Total a + b	
	1999	2000	1999	2000	1999	2000
Oct. 15th	1.120A	1.00A	0.941A	0.890A	2.1A	1.90A
Nov. 15th	0.916B	0.890B	0.790B	0.740B	1.7B	1.60B
Dec. 15th	0.883B	0.780B	0.750B	0.740B	1.62B	1.60B

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

For nitrogen, where significantly differences between different planting date on leaf content of nitrogen of the first season only, but on the where second season insignificant between the first and second planting dates, but the third planting date give the lowest leafs content of nitrogen.

For phosphorus, the planting date had a great effect on leaf content of phosphorus during the first planting date had the medium content of phosphorus and in the second planting date had the lowest content of phosphorus.

These for phosphorus are expected since there was a gradual decrease of temperature from October up to December planting date. This gradual decrease of temperature make a gradual ties up of the phosphorus in the soil and makes the phosphorus unavailable for plants as the temperature decrease.

For nitrogen and potassium content in the leaves over the planting dates, it is observed that the differences are not sharp between the first and the second planting date, but the decrease in the third planting date may be attributed to the shortage of phosphorus in the soil and the decrease of temperature during that time which restricts nitrogen and potassium uptake. These results are in agreement with El-Sharkawy *et al.* (1990), El-Adham *et al.* (1990) and Farag *et al.* (1991).

Growing peas during October 15th planting date gave the highest content in the leaves of chlorophyll a, b and total a + b with a significant differences from growing on November 15th and December 15th planting dates in both seasons. There was no differences in leaf content of chlorophyll during October may be a result of the suitable light intensity and temperature during October for a winter crops.

Light intensity period of exposure and temperature has an effect on chlorophyll synthesis (Hassona, 1983). It is clear from Table 2 that October had the medium temperature that may be suitable to chlorophyll synthesis.

2- Effect of seed rate on chemical composition of leaves:

The effect of plant density in 1999 and 2000 in chemical composition of leaves and presented in Table (10 and 11), growing peas at 50 kg/fed increased nitrogen, phosphorus, potassium, chlorophyll a + b and total chlorophyll in leaves than growing at 60 kg/fed and 75 kg/fed in both seasons phosphorus contain leaves did not affect by growing plants at 50 or 60 kg/fed. It seemed to give similar content. These results are discussed according to the effect of wide spacing, which permits plants to take up nutrients.

Table 10: Effect of seed rate on chemical composition of leaves during 1999 and 2000 seasons.

Seed rate kg/fed	Nitrogen content %		Phosphorus content %		Potassium content %	
	1999	2000	1999	2000	1999	2000
50 kg	3.420A	3.212A	0.530A	0.495A	2.195A	2.019A
60 kg	3.064B	2.992B	0.492A	0.470A	2.077B	2.026B
75 kg	2.720C	2.654C	0.422B	0.390B	1.810C	1.716C

Table 11: Effect of plant density on chemical composition of leaves during 1999 and 2000 seasons.

Seed rate kg/fed	Chlorophyll a		Chlorophyll b		Total chlorophyll a + b	
	1999	2000	1999	2000	1999	2000
50 kg	1.098A	1.042A	0.870A	0.830A	1.969A	1.854A
60 kg	0.966B	0.928B	0.830B	0.800AB	1.800B	1.799B
75 kg	0.894C	0.890C	0.800B	0.788B	1.790C	1.780C

Water and light better than intensive spacing and than accumulate more minerals in the leaves. The increase of chlorophyll a + b and total chlorophyll at 50 kg/fed may be due to the increase of total nitrogen in the leaves in this treatment, since nitrogen is an essential element for chlorophyll synthesis. These results are in harmony with Goma (1964); Mafra *et al.* (1974); Mack (1983); Hassona (1983) and El-Afifi and Darweesh (1990).

3- Effect of interaction between planting dates and seed rate on chemical composition of leaves:

The effects of interaction between planting dates and plant density are presented in Tables (12 and 13). It is evident from Table 12 that growing peas on the 15th of October planting date with 50 kg/fed gave the highest leaf content of total nitrogen, total phosphorus and total potassium percent on both seasons. On the other hand, growing peas at late time and heavy density i.e. 15 of December with 75 kg/fed exhibited the lowest leaf content of nitrogen, phosphorus and potassium.

Also, over the three planting dates the heavy density showed lower content of nitrogen, phosphorus lower content of nitrogen, phosphorus and potassium than the highest or medium density on both seasons.

On the other hand, it is observed that there were no great difference between growing peas on October or November planting date with the height or medium density in accumulating nitrogen, phosphorus and potassium in the leaves.

The results are in agreement with Farag *et al.* (1991) and may be due to the sutable weather and number of plants.

Growing peas on October 15th planting date with 50 kg/fed increased chlorophyll a + b and total chlorophyll in the leaves in both seasons. However, chlorophyll b showed the same increase over the three planting densities.

The lowest content on chlorophyll b and total chlorophyll was found growing peas on December 15th planting date.

Table12: Effect of interaction between seed rate and planting dates on chemical composition of leaves during 1999 and 2000 seasons.

Plant date	Seed rate kg/fed	Nitrogen content %		Phosphorus content %		Potassium content %	
		1999	2000	1999	2000	1999	2000
Oct.15th	50	3.80A	3.74A	0.627A	0.620A	2.32A	2.30A
	60	3.76AB	3.60AB	0.62BC	0.618AB	2.25B	2.20B
	75	2.99D	2.94CD	0.617CD	0.615BC	2.20D	2.18CD
Nov.15th	50	3.75A	3.73A	0.623AB	0.620AB	2.30B	2.27B
	60	3.70BC	3.60BC	0.615CD	0.610BC	2.20BC	2.17B
	75	2.85DE	2.80DE	0.610D	0.600C	2.16E	2.13E
Dec.15th	50	3.70CD	3.68CD	0.618D	0.615C	2.16CD	2.13C
	60	3.68E	3.65E	0.610CD	0.600BC	2.12CD	2.10D
	75	2.80E	2.75E	0.600D	0.594C	2.11E	2.09E

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

Table 13: Effect of interaction between plant density and planting dates on chemical composition of leaves during 1999 and 2000 seasons.

Plant date	Seed rate kg/fed	Chlorophyll a mg/g F.W.		Chlorophyll b Mg/g F.W.		Total chlorophyll a + b	
		1999	2000	1999	2000	1999	2000
Oct.15th	50	1.380A	1.290A	0.973A	0.960A	2.350A	2.400A
	60	1.130B	1.020A	0.920A	0.912A	2.030A	1.900B
	75	0.967CD	0.950B	0.920A	0.900A	1.380C	1.790C
Nov.15th	50	0.980C	0.953C	0.850B	0.830AB	1.830C	1.820C
	60	0.912DE	0.816DE	0.780C	0.730BC	1.690D	1.580D
	75	0.863E	0.845E	0.750C	0.700C	1.580F	1.500D
Dec.15th	50	0.900DE	0.893CD	0.810BC	0.760BC	1.715D	1.650D
	60	0.883E	0.882DE	0.773C	0.730BC	1.660DE	1.600D
	75	0.861E	0.850DE	0.750C	0.700C	1.600EF	1.550D

Means designated by different letters in the same column are significantly different at 5% level according to Duncan's Multiple Range Test.

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تأثير معدل التقاوى ومواعيد الزراعة على النمو الخضرى والتركيب الكيماوى للبسلة ٠

الشبراوى عبد الحميد أمين، محمد حامد طلبه، حامد محمد محمد غبارى
معهد بحوث البساتين – شعبة بحوث الخضر – مركز البحوث الزراعية، مصر ٠

أجرى هذا البحث على نبات البسلة صنف ماستر بى بالمزرعة البحثية بالبرامون – مركز البحوث الزراعية، جمهورية مصر العربية خلال موسمى الشتاء ١٩٩٩، ٢٠٠٠م٠
كان التصميم المستخدم هو القطع المنشقة فى ثلاث مكررات حيث خصصت القطع الرئيسية لدراسة مواعيد الزراعة ١٥ أكتوبر، ١٥ نوفمبر، ١٥ ديسمبر٠ أما القطع الشقية خصصت لدراسة الكثافات النباتية كالتالى:-

- ٥٠ كجم تقاوى/الفدان
- ٦٠ كجم تقاوى/الفدان
- ٧٥ كجم تقاوى/الفدان

أولا: التأثير على صفات النمو الخضرى:

١- أدى استخدام معدل تقاوى ٥٠ كجم/ف (كثافة نباتية) إلى زيادة ارتفاع الساق للنبات والوزن الطازج والجاف وعدد الأوراق وعدد الأفرع وقطر الساق والمساحة الورقية للنبات فى موسمى الزراعة عن المعدلات ٦٠، ٧٥ كجم/ف٠
٢- كان لميعاد الزراعة الأول ١٥ أكتوبر مع معدل التقاوى ٥٠ كجم/ف تأثير على تحسين الوزن الطازج والجاف وعدد الأوراق والأفرع وقطر الساق والمساحة الورقية٠

ثانيا: التأثير على المحتوى الكيماوى للأوراق:

١- أدى استخدام معدل تقاوى ٥٠ كجم/ف إلى زيادة محتوى الأوراق من النيتروجين والفوسفور والبوتاسيوم وكلورفيل أ، ب، أ + ب من استخدام معدلات التقاوى الأعلى ٦٠، ٧٥ كجم/ف التى أدت إلى انخفاض سريع لمحتوى الأوراق فى النيتروجين والفوسفور والبوتاسيوم فى كلا الموسمين٠
٢- تبين من النتائج أن ميعاد الزراعة الأول ١٥ أكتوبر أدى إلى زيادة محتوى الأوراق من النيتروجين والفوسفور والبوتاسيوم فى موسمى الزراعة، بينما لم يتأثر محتوى الأوراق من البوتاسيوم عند الزراعة فى موعدى ١٥ نوفمبر، ١٥ ديسمبر إلى جانب أن ميعاد الزراعة الثالث ١٥ ديسمبر أدى إلى انخفاض محتوى الأوراق من النيتروجين فى كلا الموسمين إلى جانب أن ميعاد الزراعة الأول أدى إلى زيادة تركيز الكلورفيل أ، كلورفيل ب، كلورفيل أ + ب بالأوراق بالمقارنة بميعادى الزراعة الأخرين٠
٣- استخدام معدل التقاوى ٥٠ كجم/ف مع الزراعة فى ميعاد ١٥ أكتوبر أدى إلى زيادة محتوى الأوراق فى كلورفيل أ، ب، أ + ب٠

الخلاصة: الزراعة لمحصول البسلة (ماستر بى) تحت ظروف مزرعة البرامون – محافظة الدقهلية بكمية تقاوى ٥٠ كجم/ف فى ميعاد ١٥ أكتوبر أدت إلى زيادة صفات النمو الخضرى وزيادة محتوى الأوراق فى النيتروجين والفوسفور والبوتاسيوم والكلورفيل٠