

## **EFFECT OF PLANTING DATES, SEED RATE ON FLOWERING, YIELD QUALITY AND YIELD COMPONENTS OF PEAS.**

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### **ABSTRACT**

This study was carried out at the Experimental Farm, El-Barmon station, Mansoura Horticulture Institute during the two successive seasons of 1999/2000 and 2000/2001. The objective of this study was to study the effect of different planting dates and plant densities on flowering, quality, yield and yield components of peas (*Pisum sativum*, L.) CV. Master B. The results were summarised as follows:-

#### **I- Flowering Parameters:**

- 1- Number of flowers per plant at 55 days after sowing increased significantly when peas were planted on Oct. 15<sup>th</sup> planting date than the other planting dates (Nov. 15<sup>th</sup> and Dec. 15<sup>th</sup>).
- 2- Low seed rate (50 Kg/fed) increased number of flowers per plant at 55 days after sowing significantly than medium or high rate (60 or 75 Kg/fed) in both seasons.
- 3- Sowing peas on Oct. 15<sup>th</sup> planting date with 50 Kg/fed increased significantly number of days required for anthesis of the first flower than any other interaction between planting dates and plant density in both seasons.

#### **II- Green Seeds Quality:**

- 1- Cultivating peas during Oct. 15<sup>th</sup> or Nov. 15<sup>th</sup> planting date increased ascorbic acid and total soluble solids (TSS) in green seeds over both seasons. Acidity of green seeds was higher at early and late planting dates.
- 2- Growing peas at rate of 50 Kg/fed increased ascorbic acid and total soluble solids, but decreased acidity in both seasons.
- 3- Ascorbic acid and total soluble solids increased when peas were grown on Oct. 15<sup>th</sup>, but the acidity was the lowest in this treatment in both seasons. However, growing peas on Oct. 15<sup>th</sup> with 50 Kg/fed plants gave the same total soluble solids and acidity content, but lower ascorbic acid in all planting date.

#### **III- Yield and Yield Components:**

- 1- Sowing peas on Oct. 15<sup>th</sup> or Nov. 15<sup>th</sup> planting date were increased significantly the values of number of pods per plants, weight of green pods per plant, average pod weight, pod length, number of green seeds per pod, weight of green seeds per pod, weight of 100 green seeds and total yield of green pods per fed, in both seasons.
- 2- Low seed rate (50 Kg/fed) increased all yield components, but decreased total yield per fed. the highest values of total yield were obtained from the treatment 60 Kg/fed.
- 3- Sowing peas on Oct. 15<sup>th</sup> and/or Nov. 15<sup>th</sup> planting date with 50 Kg/fed. increased number of pods per plant, weight of green pods per plant, single pod weight, pod length, number of green seeds per pod and weight of 100 green seeds. However, 60 Kg/fed during Oct. and Nov. p.d. gave similar values for the mentioned yield components but pod yield/fed was higher. The results indicated that growing peas during October or November with 60 Kg/fed gave the favorable quality and the highest yield/fed.

## INTRODUCTION

The cultivated area devoted to green pods of pea reached 25,000 feddan, which produced a total production of 120,000 tons, according to the statistical yearbook of Ministry of Agric., Egypt (1999). As the result of the continuous rise in Egyptian population, green demands for vegetable has increased and in turn the prices have also increased to a great extent therefore efforts should be directed towards increasing yield of different vegetables including pea production.

Srivastava (1991) demonstrated that number of flowers per plant of pea increased with late sowing date at 19<sup>th</sup> Nov., while early sowing date at 10<sup>th</sup> Oct. led to early flowering mentioned.

Bakry et al. (1984) studied that number of flowers decreased by sowing pea at 3 lines per ridge, whereas increased by sowing plants at 2 lines per ridges. On the other hand, Morsy (1986), demonstrated that wide planting spacing 30 Cm between plants increased number of flowers per plant whereas flower setting not significantly affected by wide spacing of cow pea.

Ferrari et al. (1992) found that sowing date of 15<sup>th</sup> December or 27<sup>th</sup> February had no effect on seed quality, but sowing date of 1<sup>st</sup> February was recommended for peas plants. On the other hand in India, Shukla and Kohli (1992) demonstrated that sowing date of 10 May resulted in the highest TSS content of pea plants, CV. Kalpa, while sowing on 10 June gave the highest protein content CV. Salana.

Murray et al. (1984) pointed out that sowing date from September Until Oct. of peas plants increased seed weight. In Pakistan, Gill and Ahmed (1981) found that the number and weight of green pods per plant and seed yield/acre were significantly affected by sowing date earlier or late of Oct. but the optimum sowing date was in Oct. or peas plant. Silim et al. (1985) indicated that the largest total yield was obtained when sowing date was on 15<sup>th</sup> Nov. on the other hand, in India, Gupta (1986) observed that total of pods/plant increased by sowing peas plants on Nov. Maurya (1988) demonstrated that the highest pod yields was obtained by planting on 1<sup>st</sup> Nov. and 1<sup>st</sup> Dec. of peas plants. On peas plants too, El-Adham et al. (1990) indicated that higher early yield, total yield per feddan, number of green pods/plant, number of seeds per pod and the weight of 100 green seeds was produced by sowing peas on 20<sup>th</sup> Nov. similarly Farag et al. (1991), demonstrated that weight of 100 seeds and total yield/fed. increased by sowing peas plant on first November. Chatterjee et al. (1991) showed that total seed yield and number of pods/plant increased by sowing peas on October. On the other hand, in India, Srivastava (1991). Pointed out that number of pods/plant, Length of pod, number of seeds/100 gm pods and total green pods increased by sowing pea from 22<sup>nd</sup> Oct. to 19<sup>th</sup> Nov. Ferrari et al. (1992) found that total yield/hect are increased from 7.5 to 8.62 ton by sowing on 15<sup>th</sup> Dec. of peas plants CV. Castillo et al. (1994) demonstrated that sowing on November and December had no effect on yield of pea plant.

Shekhar and Sharma (1991) in India, by using 3 row spacing at 40, 50 and 60 Cm a part, the results showed that total yield was not significantly affected by spacing. Heath et al. (1991) observed that using plant density at

70 to 140 plants per m<sup>2</sup> of peas increased crop yield. Czyz (1992) used 50, 75, 100, 125 and 150 germinable seed per m<sup>2</sup>. He found that the highest seed yield about 3.5 t/ha was obtained by using 75 to 100 seeds per m<sup>2</sup> of peas. Singh *et al.* (1993) found that the highest yield (2.9 t/ha and 3.1 t/ha) were obtained at plant 100,000, 500,000 plant/ha of plants. Also in India, Yadav *et al.* (1993), on peas plants, demonstrated that seed yield was highest was 25 Cm between hills. Baswana and Saharm *et al.* (1993) reported that the highest pea pod yield of 6.44 t/ha was obtained from the sowing rate of 100 Kg seeds per hec. At 30 to 40 Cm spacing but insignificant different was obtained from the sowing rate of 75 Kg/hec. at 30 to 40 cm spacing but insignificant different was obtained from the sowing rate of 75 Kg/hec. A 30 to 40 Cm spacing. Borowiecki *et al.* (1993) showed that sowing at 60 to 80 seeds per m<sup>2</sup> increased yield and number of pods per plants of pea. In Nigeria, Akinola and Oxejola (1994) on pigeon pea, by using plant density at 18.5 x 10<sup>3</sup>, 27.8 x 10<sup>3</sup>, 55.5 x 10<sup>3</sup>, 111 x 10<sup>3</sup>, 222 x 10<sup>3</sup> and 444 x 10<sup>3</sup> plants per hec., the results indicated that total yield increased at 27.8 x 10<sup>3</sup> plant per hec. Kang *et al.* (1998) observed that pod number/plant of soybean was greater for Namhaekong (C.V) than for Baegunkong and was not affected by sowing date pod number/plant decreased but pod number/m<sup>2</sup> increased with increasing plant density.

## MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of the El-Paramoon Station, Mansoura Hort. Inst. During 1999/2000 and 200/2001 seasons.

Experiment were carried out to study the effect of planting dates and plant density on flowering, yield and quality of pea (*Pisum sativum*, L.) CV. Master B.

Each experiment included nine treatments, which were the combination of three planting dates and three plant densities. The following treatments were studied:-

All other cultural practices received i.e. irrigation, fertilization (all plots received 200 Kg (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub> + 200 Kg super phosphate and 50 Kg K<sub>2</sub>SO<sub>4</sub>/fed) as a recommended by Egyptian Ministry of Agriculture Program.

### Experimental design:

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

#### A- Planting dates:

Seeds were sown directly in the field at three planting dates as follows in the season of 1999/2000 and 2000/2001 as follows; 1- October 15<sup>th</sup>, 2- November 15<sup>th</sup> 3- December 15<sup>th</sup>

#### B- Plant density:

Each plot consisted of 5.0 ridges (each was 5 meter long and 80 Cm width). Plot area was 20 m<sup>2</sup> to make 1/200 of feddan. 3 seeds were sown per hill. and after full germination, seedlings were thinned at 2 seedlings per hill:

- The first rate (50 Kg/fed.).
- The second rate (60 Kg/fed.).
- The third rate (75 Kg/fed.).

**Flowering characteristics:**

Sex garded plants of each plot at 55 days were randomly chosen and labeled and the following data were recorded:

- a) Flowering time: the period for planting date to the anthesis of the first flower (days).
- b) Number of flowers per plant at 55 days from sowing in all seasons.

**Fruit quality:**

A representative samples of (2 Kg) fresh weight from green pods of each experimental plot was taken by random for determining the following characteristics:

- a) Total soluble solids (TSS %) was determined using hand refractometer.
- b) Vitamin C was determined by using (2,6 d: chloro phenon and phenol method). Titratable acidity in percentage: This determination was made according to A.O.A.C. (1980).

**Yield and yield components:**

All harvested green pods from each plot were used to determine:-

- a) Number of green pods per plant;
- b) Total yield of green pods per plant (g.).
- c) Pod weight (g.);
- d) Seed index; weight of 100 green seeds (g.).
- e) Number of green seeds/pod.
- f) Netting (%):  
$$\frac{\text{Weight of green seeds obtained from 100 pods}}{\text{Total weight of 100 pods}} \times 100$$
- g) Average pod length (Cm):
- h) Fruit yield Kg/feddan.

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 Duncanns Multiple Range Test as Published by Duncan (1955).

## **RESULTS AND DISCUSSION**

### **I- Flowering Parameters:**

#### **1- Effect of planting dates on flowering:**

The effect of planting dates in 1999/2000 and 2000/2001 on flowering parameters are presented in Table 1 number of flowers per plant at 55 days after sowing increased significantly when peas were sown on October 15<sup>th</sup> than planting date (November 15<sup>th</sup> and December 15<sup>th</sup>) in both seasons. However, the plants flowered early by growing it on December. These results are expected since pea a neutral day plant and required certain number of heat units for flowering until harvesting, these requirements are available during the cold winter months (December) in Dakahlia Governorate.

**Table 1: Effect of planting dates on flowering parameters during 1999/2000 and 2000/2001 seasons.**

Planting dates	No. of days required for anthesis of the first flower		No. of flowers/plant at 55 days after sowing	
	1999/2000	2000/2001	1999/2000	2000/2001
October 15 <sup>th</sup>	49.60 A	48.42 A	4.40 A	4.22 A
November 15 <sup>th</sup>	48.50 B	47.53 B	4.20 B	4.00 B
December 15 <sup>th</sup>	47.52 C	46.81 B	3.40 C	3.20 C

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 flowering:**

The effect of plant density in 1999/2000 and 2000/2001 on flowering in Table 2 wide planting density (50 Kg/fed) increased number of flowers per plant at 55 days after sowing significantly than medium or heavy density (60 or 75 Kg/fed) in both seasons. However, the significance was not sharp between light and medium density (50 and 60 Kg/fed). But, the heavy density (75 Kg/fed) gave the lowest number of flowers after 55 days after planting.

**Table 2: Effect of plant density on flowering parameters during 1999/2000 and 2000/2001 seasons.**

Seed rate Kg/fed.	No. of days required for anthesis of the first flower		No. of flowers/plant at 55 days after sowing	
	1999/2000	2000/2001	1999/2000	2000/2001
50	47.30 B	46.50 C	4.92 A	4.83 A
60	48.85 A	47.43 B	4.45 B	4.40 B
75	49.50 A	48.88 A	2.95 C	2.90 C

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

It is also evident from Table 2 that the light and the medium density (50 and 60 Kg/fed) decreased required number of days for anthesis of the first flower in both seasons.

These results may attributed to the availability of light, water and nutrients in the light and medium density which in turn permits the plant to give suitable foliage able to responded to the photo period (Devlin, 1975 and Leopold and Kriedmann, 1975).

These results also are in agreement with Hodgeson and Blackman (1956), Bakry *et al.* (1984) and Morsy (1986).

**3- Effect of interaction between planting dates and seed rate on flowering:**

The effect of planting date and plant density in 1999/2000 and 2000/2001 on flowering in Table 3.

**Table 3: Effect of interaction between planting dates and seed rate on flowering parameters during 1999/2000 and 2000/2001 seasons.**

Planting date	Plant density Kg/fed.	No. of days required for anthesis of the first flower		No. of flowers/plant at 55 days after sowing	
		99/2000	2000/2001	99/2000	2000/2001
October 15 <sup>th</sup>	50	48.66 BC	47.30 CD	5.20 A	5.12 A
	60	50.00 AB	48.30 BC	4.69 B	4.50 B
	75	50.33 A	49.60 A	3.17 E	3.12 E
November 15 <sup>th</sup>	50	47.30 CD	46.50 DE	4.92 B	4.90 B
	60	48.67 BC	47.30 CD	4.60 C	4.50 C
	75	49.66 AB	48.53 AB	3.08 E	3.00 E
December 15 <sup>th</sup>	50	46.00 D	45.60 E	4.60 C	4.40 C
	60	48.62 BC	46.60 DE	3.77 D	3.72 D
	75	48.61 BC	48.30 BC	2.67 F	2.60 F

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

Growing peas on October 15<sup>th</sup> with 50 Kg/fed. increased significantly number of flowers per plant at 55 days after sowing and decreased significantly number of days required for anthesis of the first flower than any other interaction between planting date and plant density in both seasons. However, growing peas at November 15<sup>th</sup> or December 15<sup>th</sup> with 50 Kg/fed gave similar earliness in first flower anthesis to those grown on October at the same density (50 Kg/fed).

These results mean that light planting density had the dominant effect on earliness of all over planting date. It is also clear that planting date November 15<sup>th</sup> and December 15<sup>th</sup> with heavy planting density decreased number of flowers per plant at 55 days after sowing and delayed first flower anthesis when peas grow intensively 75 Kg/fed. The above results had the same trend in both seasons. Therefore, the effect of interaction may be due to the properties of the planting date and wide spacing which were previously discussed under the effect of both planting date and plant density the results are similar to those mentioned by Farag et al. (1991).

## II- Green seeds quality:

### 1- Effect of planting date on peas green seeds quality:

The effect of planting date on peas green seeds quality parameters in 1999/2000 and 2000/2001 are presented in Table 4. Cultivating peas on October 15<sup>th</sup> or November 15<sup>th</sup> increased ascorbic acid and total soluble solids in green seeds over both seasons. But, the late planting date (December 15<sup>th</sup>) decreased ascorbic acid and total soluble solids. Acidity of green seeds had a different trend with planting date. It was stormy with early and late planting date (October 15<sup>th</sup> and December 15<sup>th</sup>). Green seeds acidity was moderate on November 15<sup>th</sup>.

It is also clear that those low planting date accumulated higher rates of nitrogen phosphorus and potassium, which in turn help the plant to show better content of ascorbic acid and total soluble solids. On the other hand,

acidity seems to be more affected by or low temperature of October or December respectively.

In Italy and India the studies indicated that, planting date had an effect on green quality (Ferrari *et al.*, 1992 and Shukla *et al.* 1992), respectively.

**Table 4: Effect of planting date on green seeds quality during 1999/2000 and 2000/2001 seasons.**

Planting date	Ascorbic acid mg/100 g f.w.		Total soluble solids %		Acidity %	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
October 15 <sup>th</sup>	25.500A	24.000A	6.780A	6.650A	1.184 B	1.206 C
November 15 <sup>th</sup>	24.030B	23.106A	6.660A	6.560A	1.263 A	1.280 B
December 15 <sup>th</sup>	21.500C	21.289B	5.970B	5.850B	1.280 A	1.302 A

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 peas green seeds quality:**

The effect of plant density on peas green seeds quality in 1999/2000 and 2000/2001 are presented in Table 5. The results indicated that growing peas as 50 Kg/fed increased ascorbic acid and total soluble solids, but decreased acidity in both seasons. The lowest values of ascorbic acid and total soluble solids resulted from heavy density (75 Kg/fed) but acidity increased significantly in this treatment these results are in accordance with Ferrari *et al.* (1992) and Borowiecki *et al.* (1993).

**Table 5: Effect of seed rate on green seeds quality during 1999/2000 and 2000/2001 seasons.**

Seed rate Kg/fed.	Ascorbic acid mg/100 f.w.		Total soluble solids %		Acidity %	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
50	25.119A	24.800A	6.669A	6.520A	1.220 C	1.240 C
60	23.560B	22.350B	6.380B	6.390A	1.240 B	1.263 B
75	22.340C	21.420B	6.360B	6.150B	1.267 A	1.287 A

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

**3- Effect of the interaction between planting date and seed rate on peas green seeds quality:**

The effect of interaction between planting date and plant density on peas green seeds quality during 1999/2000 and 2000/2001 are presented in Table 6. The interaction between planting date and seed rate indicated that ascorbic acid and total soluble solids increased when peas were planting on October 15<sup>th</sup> with 50 Kg/fed. but the acidity was the lowest in this treatment in both seasons. However, growing peas on October 15<sup>th</sup> with 60 Kg/fed. gave the same total soluble solids and acidity content but lower ascorbic acid in all planting date. The data indicated that 75 Kg/fed gave lower values of ascorbic acid and total soluble solids, but higher values of acidity in both seasons.

**Table 6: Effect of interaction between planting dates and plant green seeds quality during 1999/2000 and 2000/2001 seasons.**

Plant-ing date	Seed rate	Ascorbic acid mg/100 f.w.		Total soluble solids %		Acidity %	
		99/2000	2000/2001	99/2000	2000/2001	99/2000	2000/2001
Oct. 15 <sup>th</sup>	50	26.70A	25.23A	6.96 A	6.89 A	1.150G	1.173 F
	60	25.90BC	24.90BC	6.71 AB	6.72 AB	1.180 F	1.207 E
	75	24.40CD	23.30BCD	6.62 BC	6.37 BC	1.220 E	1.237 D
Nov. 15 <sup>th</sup>	50	25.20AB	24.20AB	6.69 AB	6.70 AB	1.247 D	1.273 C
	60	23.93DE	22.20ABC	6.69 AB	6.58 AB	1.263 C	1.283 C
	75	22.40FG	21.40BC	6.65 BC	6.37 BC	1.260 B	1.287 B
Dec. 15 <sup>th</sup>	50	23.00EF	22.00BC	6.30 CD	5.98 CD	1.260 C	1.283 C
	60	21.35G	20.35CD	5.79 D	5.87 D	1.280 B	1.320 B
	75	20.15H	19.14D	5.78 D	5.71 D	1.300 A	1.325 A

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

### III- Yield and yield components:

#### 1- Effect of planting dates on yield and yield components:

The effect of planting date on yield and yield components during 1999 and 2000 are presented in Tables 7 and 8. Growing peas on October 15<sup>th</sup> or November 15<sup>th</sup> increased significantly. The values of the following yield parameters than growing on December 15<sup>th</sup> in both seasons. These parameters are number of pods per plants. Weight of green pods per plant, single pod weight of 100 green seeds (on October 15<sup>th</sup> only) and total yield of green pods per fed. the highest values of total yield of green pods per fed. were obtained when peas were growing on October 15<sup>th</sup>.

These results are in agreement El-Adham *et al.* (1990), Farag *et al.* (1991), Srivastava (1991) and El-Boari and Radii (1992).

#### 2- Effect of seed rate on yield and yield components:

The effect of planting density on yield and yield components during 1999/2000 and 2000/2001 are presented in Tables 9 and 10. Light density (50 Kg/fed.) increased all yield components and total yield per plant, but decreased total yield per fed. The highest planting rate (75 Kg/fed.) decreased all yield components parameters as well as total yield per plant, but increased total yield per feddan. The highest values of total yield were obtained from the treatment 60 kg/fed. However, the differences between this treatment and the treatment 75 Kg/fed were not significant in the first season only. These results are expected since the combinations is high in heavy density and vice versa.



**Table 7: Effect of planting dates on yield and yield components during 1999/2000 and 2000/2001 seasons.**

Planting date	No. of green pods/plant		Total yield of green pods/plant (g.)		Average green pod weight (g.)		Pod length (cm)	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
Oct. 15 <sup>th</sup>	8.83A	8.70A	34.5 A	33.0 A	3.92 A	3.77 A	6.23 A	6.00 A
Nov. 15 <sup>th</sup>	8.45AB	8.40 B	32.3 A	31.08B	3.70 A	3.62 A	6.09 A	5.80 B
Dec. 15 <sup>th</sup>	8.23 B	8.20 C	29.6 B	29.10B	3.53 B	3.50 B	5.49 B	5.22 C

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

**Table 8: Effect of plant density on yield and yield components during 1999/2000 and 2000/2001 seasons.**

Seed rate Kg/fed.	No. of green pods/plant		Total yield of green pods/plant (g.)		Average green pod weight (g.)		Pod length (cm)	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
50	9.90 A	9.80 A	41.08A	40.94A	4.93 A	4.17 A	6.36 A	6.20 A
60	8.39 B	8.35 B	31.00B	30.34B	3.70 B	3.63 B	5.87 B	5.68 B
75	7.19 C	7.07 C	23.50C	21.91C	3.27 C	3.10 C	5.42 C	5.26 C

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 yield and yield components during 1999/2000 and 2000/2001 seasons.**

Planting date	No. of green seeds/pods		Netting %		Fresh weight of 100 green seeds (g.)		Total yield of green pods/fed.	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
Oct. 15 <sup>th</sup>	5.45 A	5.17A	70.81A	71.02A	49.98A	48.44A	4.88 A	4.63 A
Nov. 15 <sup>th</sup>	5.27 A	5.08 A	70.23A	71.52A	48.10B	46.49B	4.57 A	4.38 B
Dec. 15 <sup>th</sup>	4.30 B	4.71 B	67.24B	68.70B	46.57C	45.39C	4.17 B	4.09 B

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

Effect of plant density on yield can be abstracted in a brief that as planting density increase the values of the following parameters decreases, number of pods per plant, weight of green pods per plant, single pod weight, pod length, number of green seeds per pod, weight of 100 green seeds, but total yield per fed. decreases only by light (Low) or heavy density. These results are similar to those reported Behairy (1965), Eweid *et al.* (1996) and Kang *et al.* (1998).

**Table 10: Effect of seed rate on yield and yield components during 1999/2000 and 2000/2001 seasons.**

Seed rate Kg/fed.	No. of green seeds/pods		Netting %		Fresh weight of 100 green seeds (g.)		Total yield of green pods/fed. (Ton)	
	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001	1999/2000	2000/2001
50	5.45 A	5.20 A	78.80 A	72.44 A	50.68 A	49.40 A	4.72 A	4.63 A
60	5.20 A	5.05 A	70.45 A	69.40 A	47.92 B	46.50 B	4.70 A	4.38 A
75	4.85 B	4.80 B	66.80 B	65.73 B	46.05 C	44.32 C	4.19 B	4.10 B

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

**3- Effect of the interaction between planting dates and seed rate on yield and yield components:**

The effect of interaction between planting dates and seed rate on yield and yield components during 1999/2000 and 2000/2001 are presented in Tables 11 and 12, it is peas on October 15<sup>th</sup> and November 15<sup>th</sup> with 50 kg (fed.) that yield components increased significantly than those of December 15<sup>th</sup>. But, for total yield (ton/fed.) of green pods of plants grown during October and November increased significantly with seed rate of (60 and 75 Kg/fed) than with 50 Kg/fed. In all planting date, there are a gradual increase in yield components by decreasing planting rate. But, for total yield of green pods (g/plant) there is a gradual decrease by increasing plant density.

It is also observed that 50 Kg/fed. had the highest values of total yield (ton/fed.) of green pods over all planting date. The best planting date and planting density in favour of total green pod yield was obtained when peas were grown on October 15<sup>th</sup> with 50 Kg/fed.

The effect of planting date and planting density on yield components can be summarized as follows; number of pods per plant, weight of green pods per plant, single pod weight, pod length, number of green seeds per pod and weight of 100 green seeds increased when peas grown during October 15<sup>th</sup> or November 15<sup>th</sup> with 50 Kg/fed.

However, 60 Kg/fed. during October and November gave similar values for the mentioned yield components. The results indicated that growing peas during October or November with 50 Kg/fed. or 60 Kg/fed. gave the favorable quality and the highest yield.

These results also are in agreement with Ferrari *et al.* (1992) and Akinola *et al.* (1994) and could be referred to the strouy vegetable growth and accumulation of minerals in plant foliage under these condition.

Therefore, the study recommends to cultivate peas under Dakahlia Governorat a condition at October 15<sup>th</sup> or November 15<sup>th</sup> with planting density 50 Kg/fed. of CV. Mester B.

Table 11: Effect of interaction between planting dates and plant density on yield and yield components.

Planting dates	Seed rate Kg/fed.	No. Of green pods/plant			Total yield of green pods/plant (g.)			Average green pods weight (g.)			Pod length (cm)		
		1999/ 2000	2000/ 2001	1999/ 2000/ 2001	1999/ 2000	2000/ 2001	1999/ 2000/ 2001	1999/ 2000	2000/ 2001	1999/ 2000/ 2001	1999/ 2000	2000/ 2001	1999/ 2000/ 2001
		October 15 <sup>th</sup>	50	10.20 A	10.10 A	44.80 A	43.42 A	4.40 A	4.30 A	6.87 A	6.77 A	6.00 BC	6.17 BC
	60	8.63 C	8.60 C	33.67 D	32.70 C	3.90 B	3.80 BC	6.17 BC	6.00 BC	5.43 DE	5.70 CDE	5.43 DE	
	75	7.40 D	7.17 E	25.13 G	22.92 E	3.40 DE	3.20 DE	5.70 CDE	5.43 DE	5.43 DE	5.43 DE	5.43 DE	
November 15 <sup>th</sup>	50	9.80 AB	9.80 B	42.15 B	41.15 A	4.30 A	4.20 A	6.53 AB	6.43 AB	5.77 CD	6.07 BCD	5.77 CD	
	60	8.33 C	8.30 D	30.80 E	29.85 D	3.70 C	3.60 C	6.07 BCD	5.77 CD	5.33 DE	5.50 EF	5.33 DE	
	75	7.27 DE	7.17 E	23.97 G	22.22 E	3.30 E	3.10 E	5.50 EF	5.33 DE	5.40 DE	5.67 DE	5.40 DE	
December 15 <sup>th</sup>	50	9.70 B	9.50 B	38.80 C	38.26 B	4.00 B	4.00 AB	5.67 DE	5.40 DE	5.28 E	5.37 EF	5.28 E	
	60	8.20 C	8.10 D	28.70 F	28.46 D	3.50 D	3.50 CD	5.37 EF	5.28 E	5.07 F	5.07 F	5.07 F	
	75	6.90 E	6.80 F	21.39 H	20.58 E	3.10 F	3.00 E	5.07 F	5.07 F	5.07 F	5.07 F	5.07 F	

Table 12: Effect of interaction between planting dates and plant density on yield and yield components.

Planting dates	Seed rate Kg/fed.	No. of green seeds/pods			Netting %			F.w. of 100 green seeds/g.			Total yield of green pods/fed./ton.		
		1999/ 2000	2000/ 2001	1999/ 2000/ 2001	1999/ 2000	2000/ 2001	1999/ 2000/ 2001	1999/ 2000	2000/ 2001	1999/ 2000/ 2001	1999/ 2000	2000/ 2001	1999/ 2000/ 2001
		October 15 <sup>th</sup>	50	5.77 A	5.40 A	77.50 A	77.26 A	52.80 A	51.67 DE	4.97 A	4.80 A	4.70 B	4.70 B
	60	5.50 AB	5.30 AB	71.5 ABC	71.0 ABC	49.47 BC	48.26 A	4.77 B	4.70 B	4.58 BC	4.58 BC	4.50 BC	
	75	5.06 BCD	4.90 ABCD	69.08 CD	68.26 CD	47.6 DDE	45.38 B	4.77 B	4.71 B	4.59 BC	4.59 BC	4.50 BC	
November 15 <sup>th</sup>	50	5.55 AB	5.25 ABC	74.90 AB	73.06 AB	49.87 AB	49.23 F	4.77 B	4.71 B	4.00 D	4.00 D	3.69 DE	
	60	5.27 ABC	5.17 ABC	71.03 ABC	72.24 ABC	48.26 CDE	46.17 CD	4.59 BC	4.50 BC	3.70 E	3.70 E	3.61 E	
	75	4.99 BCD	4.80 BCD	68.12 CD	69.9 ABC	46.19 E	44.07 BC	4.19 D	4.00 D	3.50 E	3.50 E	3.58 E	
December 15 <sup>th</sup>	50	5.10 BCD	4.90 ABCD	71.23 ABC	70.80 ABC	49.34 BCD	47.48 G	3.80 DE	3.69 DE	3.58 E	3.58 E	3.58 E	
	60	4.98 CD	4.70 CD	68.52 CD	66.55 CD	46.01 DE	45.19 EF	3.70 E	3.61 E	3.58 E	3.58 E	3.58 E	
	75	4.54 D	4.40 D	62.70 D	62.70 D	44.35 E	43.51 EF	3.50 E	3.58 E	3.58 E	3.58 E	3.58 E	

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## دراسة تأثير مواعيد الزراعة ومعدلات التقاوى على الأزهار والمحصول وصفاته في البسلة.

الشيراوى عبد الحميد أمين، محمد حامد طلبية، حامد محمد محمد عبارى  
قسم بحوث الخضار - معهد بحوث البساتين - مركز البحوث الزراعية - مصر.

أجرى هذا البحث على نبات البسلة بالمزرعة البحثية بالبرامون - معهد بنوث البساتين - جمهورية مصر العربية خلال موسم الشتاء (١٩٩٩/٢٠٠٠، ٢٠٠٠/٢٠٠١) على صفات ماستر بي، وكان التصميم المتبع هو القطع المنشقة مرة واحدة في ثلاث مكررات، حيث خصصت القطع الرئيسية لدراسة مواعيد الزراعة (١٥ أكتوبر، ١٥ نوفمبر، ١٥ ديسمبر) أما القطع الشقيه خصصت لدراسة معدلات التقاوى التالية:-  
١- ٥٠ كجم/فدان، ٢- ٦٠ كجم/فدان، ٣- ٧٥ كجم/فدان.

### أولاً: التأثير على صفات الأزهار:

- ١- أدت الزراعة في ١٥ أكتوبر إلى زيادة عدد الأزهار على النبات وذلك بعد ٥٥ يوم من الزراعة مقارنة ذلك بالزراعة في ١٥ نوفمبر، ١٥ ديسمبر في عامي الزراعة.
- ٢- أدى معدل التقاوى (٥٠ كجم/فدان) إلى زيادة معنوية لعدد الأزهار على النبات بعد ٥٥ يوم من الزراعة مقارنة ذلك بالكثافة المتوسطة (٦٠ كجم/فدان) أو معدل التقاوى (٧٥ كجم/فدان). بينما بكرت النباتات للتزهير عند الزراعة على معدل التقاوى (٥٠ كجم/فدان) تليها التي تزرع على معدل (٦٠ كجم/فدان) وذلك في كلا الموسمين.
- ٣- أدت الزراعة في ١٥ أكتوبر مع معدل (٥٠ كجم/فدان) إلى زيادة معنوية لعدد الأزهار على النبات بعد ٥٥ يوم من الزراعة. بينما تناقصت عدد الأيام من بداية الزراعة حتى خروج أول زهرة عند الزراعة في ١٥ نوفمبر، ١٥ ديسمبر مع الكثافة المنخفضة (٥٠ كجم/فدان) في علمي الزراعة.

### ثانياً: التأثير على صفات الجودة:

- ١- أدت الزراعة في ١٥ أكتوبر، ١٥ نوفمبر إلى زيادة فيتامين ج (الأسكوربيك أسيد)، ونسبة المواد الذائبة الكلية في البذور الخضراء، بينما تقلل الحموضة، أما الزراعة في ١٥ ديسمبر فتقلل نسبة حامض الأسكوربيك والمواد الذائبة الكلية بينما تزيد الحموضة في علمي الزراعة.
- ٢- استخدام معدل التقاوى (٥٠ كجم/فدان) أدى إلى زيادة حامض الأسكوربيك في البذور الخضراء وكذلك نسبة المواد الذائبة الكلية. بينما قلت نسبة الحموضة في عامة التجربة.
- ٣- الزراعة في ١٥ أكتوبر مع معدل (٥٠ كجم/فدان) أدى إلى زيادة حامض الأسكوربيك مع نسبة المسواد الذائبة الكلية، وكذلك انخفاض نسبة الحموضة في عامة الزراعة.

### ثالثاً: التأثير على صفات المحصول ومكوناته:

- ١- الزراعة في ١٥ أكتوبر أدى إلى زيادة الصفات التالية: عدد القرون الخضراء على النبات، وزن القسرن الواحد، طول القرن، عدد ووزن البذور في القرن، وزن ١٠٠ بذرة خضراء، محصول الفدان من القسرون الخضراء في موسمي الزراعة.
- ٢- استخدام معدل تقاوى (٥٠ كجم/فدان) أدى إلى زيادة كل مكونات المحصول، بينما أدت الزراعة على كثافة عالية ٧٥ كجم/فدان إلى نقص لمكونات المحصول.
- ٣- الزراعة في ١٥ أكتوبر، ١٥ نوفمبر مع معدل تقاوى (٥٠ كجم/فدان) أدت إلى زيادة مكونات المحصول معنويًا مقارنة ذلك عند الزراعة في ١٥ ديسمبر مع الكثافة (٦٠ كجم/فدان)، وكذلك مع الكثافة (٧٥ كجم/فدان).

### الخلاصة:

زراعة محصول البسلة صنف ماستر بي تحت ظروف مزرعة البرامون - دقهلية بمعدل تقاوى ٥٠ كجم/ف (كثافة نباتية) وميعاد زراعة في ١٥ أكتوبر أدى إلى زيادة معنوية في عدد الأزهار/نبات وحامض الأسكوربيك ونسبة المواد الصلبة بالكلية الزائدة (TSS) وانخفاض نسبة الحموضة في كلا الموسمين، كما أدت إلى زيادة المحصول الثمري عن المواعيد الأخرى لكلا الموسمين.