EFFECT OF SOWING DATE ON PRODUCTIVITY AND EXPORTABLE YIELD OF SOME SUGAR PEA (*Pisum sativum VAR MACROCARPOM*) CULTIVARS IN SHARK EL-OWINAT REGION.

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ABSTRACT

Two field experiments were carried out at Shark EL-Owinat region south west Egypt (dry-temperate conditions) during two growing seasons (2002/2003 and 2003/2004) to study the response of some sugar peas cultivars, i.e. Snow wind, Sugar pearl and Sugar gem to various sowing dates (Oct. 10th, Oct. 25th, Nov. 10th, Nov. 25th and Dec. 10th) on growth and green pods yield as well as pods quality.

Results indicated that, the vegetative growth and dry weight of tested sugar peas plants were clearly affected by sowing dates. The highest values of plant growth and dry weight as well as pods yield and its quality were recorded on Nov. 10th sowing date. On other hand, the lowest values of plant growth were recorded on Oct. 10th sowing date but the lowest values of pods yield were recorded on Dec. 10th sowing date.

Cv. Snow wind recorded higher values of plant growth and green pods yield as well as pods quality. But the lowest values for pods yield were given by cv. Sugar gem plants.

The interaction between the factors of study recorded significant differences for most growth characters and pods yield, cv. Snow wind recorded higher values for the growth parameters and pods yield under the conditions of Nov. 10th sowing date. But the lowest values of pods yield were given by cv. Sugar gem grown on Dec. 10th.

Electrophoretic studies showed that not only cv. Snow wind given the highest specific bands number with highely molecular weight and dark stained bands, but also had the highest pods yield.

INTRODUCTION

Shark El-Owinat is a new region for clean agricultural production. This area is suitable for producing clean products especially for exportation. Sugar pea (*Pisum sativum var macrocarpom*) is one of the most important leguminous vegetable crops for exportation, growing in winter season of Egypt. The pods of sugar pea contains a great amount of protein, phosphorus and potasium. So that sugar pea is considered as one of the most important sources in human food nutrition for such nutrients.

Some varieties are more suitable for the European consumers. So that these varieties were tested in Shark El-Owinat region to evaluate their potentiality under different sowing date.

Sugar pea varieties were differed in their vegetative growth, yield and its attributes as well as pods quality according to genotype (Srivastava and Sirvastava, 1996; Sawan, 2002; Amer *et al.*, 2002; Amer, 2004, all working on beans). Added to that, varieties are differed in their genetic background, i. e. seed protein electrophoresis. Variety had the highest number of major protein bands with highly molecular weight and dark stand bands it was indication that this variety can be gave the highest yield with the pest quality as reported by Amet (1992), Eweda (1993), Sawan (2002) and Amer (2004).

The weather conditions especially monthly mean temperature (^{o}c), relative humidity (%) and evaporation (mm/day) during the growth period are greatly affected on sugar pea growth, pod yield and its attributes as well as pods quality as reported by Mahajan *et al* (1997) which reported that weather conditions was greatly affected on pea plant growth. Added to that, Aziz and Abdul (1989), Petkov and Bcnchera (1996), Knott and Belcher (1998), Saini and Negi (1998), and Singh and Singh (2000) and Amer (2004) mentioned that the plant growth , total yield and quality were differed according to sowing date.

Thus the aim of this investigation is to study the relationships between sugar pea varieties and different sowing dates under Shark El-Owinat region.

MATERIALS AND METHODS

This work was conducted during the two successive winter seasons of 2002/2003 and 2003/2004 under the condition of Shark EL-Owinat region south west Egypt. The experiments were carried out on the Ideal Farm, Ministry of Agriculture, Egypt under drip irrigation system.
The physical and chemical analysis of soil and chemical analysis of irrigation water are shown in Table(A). Meterological data of area were recorded during the growth seasons (Table, B) .

Table (A): Chemical analysis for experimental soil and irrigation water.

	pH	E. C. Mmhos/cm	Cations (Meq./L.)				Anions (Meq./L.)		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO$_3^-$	Cl$^-$	SO$_4^-$
Soil	7.24	10.79	37.6	57.4	22.8	1.32	0.73	14.7	103.69
Irrigation water	7.02	1.01	2.2	2.3	5.5	0.12	1.7	5.4	3.02

Table(B): The Meteorological data at Shark EL-Owinat region during first and second seasons.

Month	First season (2002/2003)			Second season (2003/3004)		
	^{o}C	Relative humidity %	Evaporation mm/day	^{o}C	Relative humidity %	Evaporation mm/day
October	23.9	24.2	16.2	24.7	23.9	16.9
November	19.2	35.1	10.1	18.6	34.8	11.1
December	14.9	40.4	6.8	14.1	42.6	6.3
January	13.8	30.9	7.3	13.2	30.8	6.8
February	14.3	27.6	8.6	13.9	26.9	8.2
March	19.9	24.8	13.4	20.2	24.7	14.1
April	26.4	21.5	16.8	25.9	20.1	16.8

Meteorological data were obtained from the meteorological station at Shark EL-Owinat

Each experiment consisted of 15 treatments which were the combination of five sowing dates; Oct. 10th , Oct. 25th , Nov. 10th , Nov. 25th and Dec. 10th and three sugar peas varieties , i.e. Snow wind, Sugar pearl and Sugar gem.

A split plot design with three replicates was adapted where sowing dates were arranged in the main plots, while the varieties were assigned in the sub-plots. After preparing the soil for cultivation, ditches of 20 cm width

were performed. Organic manure (12 ton compost/fed.) and fertilizers (100, 150 and 100 kg of ammonium sulphate, super-phosphate and potassium sulphate fertilizers, respectively)were added through the ditches and then it were covered by sand. Laterals of the drip irrigation system were spread over the ditches. Seeds of sugar peas cvs (Snow wind, Sugar pearl and Sugar gem) were sown as two seeds per hill which were 15 cm apart on one side of the irrigation lines. The experimental unit area was 16 m^2, it contains four dripper lines with 5 m length for each with 80 cm width. The normal agricultural practices of sugar pea production under the conditions of this area were followed according to the recommendations of Egyptian Ministry of Agriculture.

Data recorded:

A. Plant growth: A random sample of five plants from each plot was taken at flowering stage (70 days after sowing) and the following data were recorded:

1- Plant length (cm).
2- Number of branches per plant.
3- Number of leaves per plant.
4- Dry weight of leaves, branches and whole plant. Leaves and branches were separated and oven dried at 70 $^{\circ}c$ until constant weight and dry weight of leaves, branches and whole plant were determined.

B. Green pods yield and its quality:

1- Early pods yield (ton / fed.).
2- Total pods yield (ton / fed.).
3- Exportable pods yield (ton / fed.).
4- Beginning of harvest season (1st harvest date) days after sowing .
5- Harvesting period (days) .
6- Total Soluble Solids (TSS).
7- Mean pod length, width and thickness (cm).

C. Electrophoretic analysis of dry seeds proteins (SDS-PAGE):

Sodium dodecylsulfate-poly-acrylamid gel electrophoresis (SDS-PAGE) for soluble protein extracted from dry seeds was use to study the genetic background of these varieties. Protein electrophoresis was performed according to Stegeman (1979) and Stegeman et al. (1980). The gels were scanned using Gel Doc 2000 Bio Rad system and analyzed with the quantity one software package supplied by the manufacture. The densitometric scanning of each band was based on its three dimension characters. Each band was recognized by its length, width and intensity. Accordingly, relative amount of band quantity could be measured and scored .

The obtained data were statistically analyzed according to the method described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

A. Plant growth characters:

A. 1. Effect of sowing date: Results in Table (1) reveal that there were significant differences in most growth characters in both 1st and 2nd seasons. Various sowing dates significantly affected plant growth parameter. Planting

on Nov. 10th followed by Nov. 25th led to highly significant increases in plant length and number of leaves per plant. The lowest vegetative growth was recorded by planting on Oct. 10th followed by Oct. 25th.

Dry weight of leaves, branches and whole plant was significantly higher on Nov. 10th and Nov. 25th in both seasons. These results may be due to the favurable conditions at Nov. 10th and Nov. 25th sowing dates to plant growth and development. On the other hand, the lower values of dry weight of leaves, branches and whole plant were recorded on Oct. 10th sowing date. These results are in harmony with those reported by Mahajan *et al* (1997) which reported that weather conditions was greatly affected on pea plant growth. Added to that, Aziz and Abdul (1989), Petkov and Bcnchera (1996) and Knott and Belcher (1998) mentioned that the plant growth of pea was differed according to sowing date.

Table (1): Effect of sowing date on vegetative growth of sugar pea plant.

Sowing date	Plant height (cm)	Number of		Dry weight (gm/plant)		
		Leaves	Branches	Leaves	Branches	Total
First season				.		
Oct. 10th	38.44	36.72	4.17	6.32	2.67	8.98
Oct. 25th	52.11	41.56	4.39	7.33	3.17	10.50
Nov. 10th	84.00	48.44	4.50	9.07	3.70	12.77
Nov. 25th	76.44	45.00	4.00	8.41	3.39	11.80
Dec. 10th	67.11	37.50	3.72	7.94	3.09	11.03
L. S. D.	2.93	3.60	0.26	0.60	0.16	0.59
Second season						
Oct. 10th	34.83	35.44	3.11	4.88	2.25	7.13
Oct. 25th	47.46	38.40	3.67	5.90	2.54	8.44
Nov. 10th	75.28	43.20	3.67	7.45	2.91	10.36
Nov. 25th	67.99	40.67	3.22	7.12	2.59	9.70
Dec. 10th	58.17	34.83	2.89	6.36	2.40	8.76
L. S. D.	3.79	1.88	0.23	0.36	0.26	0.55

A. 2. Effect of variety:

Results in Table (2) clear that genotype is greatly affect on plant growth i. e. Plant height, number of leaves and branches as well as dry weight of leaves and branches. Cv. Snow wind gave the highest values of plant growth parameters followed by cv. Sugar gem but the lowest values were recorded with cv. Sugar pearl. These results are in harmony with those reported by Amet (1992), Eweda (1993), Sawan (2002) and Amer (2004).

A. 3. Interaction Effect:

Results in Table (3) show the effect of the interaction between sowing dates and sugar pea variety on growth characters. Cv. Snow wind recorded higher values for the growth parameters than all the tested cvs on this study under the condition of Nov. 10th sowing date. On the other hand, cv. Sugar pearl gave lower values of growth characters under Oct. 10th sowing date condition.

Thus, it could be suggested, from such results that Nov. 10th sowing date was quite enough for enhancing growth characters for all tested variety.

Table (2): Effect of variety on vegetative growth of sugar pea plant.

Variety	Plant height (cm)	Number of		Dry weight (gm/plant)		
		Leaves	Branches	Leaves	Branches	Total
First season						
Snow wind	67.90	47.53	4.63	8.83	4.17	13.00
Sugar pearl	54.30	35.40	3.80	6.57	2.50	9.06
Sugar gem	68.67	42.60	4.03	8.05	2.94	10.99
L. S. D.	2.38	2.80	0.22	0.22	0.17	0.18
Second season						
Snow wind	62.69	42.25	3.57	7.20	3.03	10.23
Sugar pearl	48.93	35.23	3.07	5.35	2.21	7.56
Sugar gem	58.61	38.04	3.30	6.49	2.37	8.85
L. S. D.	1.38	1.25	0.13	0.22	0.14	0.29

Table (3): Effect of the interaction between sowing date and variety on vegetative growth of sugar pea plant.

Treatments		Plant height (cm)	Number of		Dry weight (gm/plant)		
Sowing date	Variety		Leaves	Branches	Leaves	Branches	Total
First season							
Oct.10th	Snow wind	49.83	41.50	4.33	7.62	3.16	10.77
	Sugar pearl	28.00	26.83	4.00	4.69	2.26	6.95
	Sugar gem	37.50	41.83	4.17	6.69	2.58	9.23
Oct. 25th	Snow wind	58.67	43.33	4.67	8.62	4.35	12.97
	Sugar pearl	40.17	39.67	4.17	5.56	2.42	7.98
	Sugar gem	57.50	41.67	4.33	7.81	2.73	10.55
Nov. 10th	Snow wind	86.67	58.83	5.67	10.07	4.97	15.04
	Sugar pearl	67.83	40.33	3.67	8.09	2.69	10.78
	Sugar gem	97.50	46.17	4.17	9.07	3.44	12.51
Nov. 25th	Snow wind	82.67	55.67	4.67	9.04	4.54	13.58
	Sugar pearl	72.50	35.00	3.67	7.59	2.52	10.12
	Sugar gem	74.17	44.33	3.67	8.60	3.10	11.70
Dec. 10th	Snow wind	61.67	38.33	3.83	8.79	3.85	12.64
	Sugar pearl	63.00	35.17	3.50	6.90	2.60	9.50
	Sugar gem	76.67	39.00	3.83	8.13	2.83	10.97
L. S. D.		5.32	6.26	0.48	0.49	0.39	0.39
Second season							
Oct.10th	Snow wind	45.50	37.83	3.17	5.82	2.49	8.31
	Sugar pearl	25.17	32.33	2.83	3.58	2.07	5.65
	Sugar gem	33.83	36.17	3.33	5.25	2.20	7.45
Oct. 25th	Snow wind	54.07	41.83	3.83	6.98	3.15	10.13
	Sugar pearl	37.30	35.50	3.50	4.50	2.17	6.66
	Sugar gem	51.00	37.87	3.67	6.23	2.30	8.53
Nov. 10th	Snow wind	79.83	49.93	4.33	8.51	3.81	12.32
	Sugar pearl	61.17	38.33	3.17	6.82	2.38	9.21
	Sugar gem	84.83	41.33	3.50	7.03	2.53	9.56
Nov. 25th	Snow wind	74.20	42.00	3.33	7.68	3.12	10.80
	Sugar pearl	64.87	40.33	3.17	6.35	2.26	8.61
	Sugar gem	64.90	39.67	3.17	7.33	2.38	9.70
Dec. 10th	Snow wind	59.83	39.67	3.17	7.00	2.58	9.58
	Sugar pearl	56.17	29.67	2.67	5.48	2.20	7.68
	Sugar gem	58.50	35.17	2.83	6.60	2.43	9.03
L. S. D.		3.09	2.81	0.29	0.49	0.32	0.64

B. Yield and its components:

B. 1. Effect of sowing date: Results in Table (4) show the effect of sowing date on green pod yield and its components. Result clear that the total pods yield and its components were significantly increased by planting in Nov. 10th sowing date followed by Oct. 25th sowing date. But the lowest values of yield were recorded with Dec. 10th sowing date .

With respect to the earliness, results clear that the least number of days to beginning of harvest was in planting of Dec. 10th sowing date (60 day after sowing), on the other hand, the number of days to first harvest was more in plants sown on Oct. 10th and 25th . As fore pod quality, data in Table (4) also clear that pod length and width were not significantly affected by sowing date. Pod thickness was highest in Nov. 25th sowing date followed by Nov. 10th , Oct. 10th and Oct. 25th sowing dates but the lowest values were recorded with Dec. 10th sowing date. With respect to the average pod weight, planting on Dec. 10th gave the highest average pod weight followed by sowing on Oct. 10th , Nov. 25th and Nov. 10th but the lowest values was recorded with the Oct. 25th sowing date. Whereas, pod content of TSS was highest by sowing on Oct. 10th and gradually decreased with delay sowing date. Generally, Nov. 10th sowing date gave the pest pod quality and the lowest values were recorded with Dec. 10th sowing date.

This result was true in both seasons. This result may be due to the favorable conditions on Nov. 10th sowing date to plant growth (Table,1) which gave the highest vegetative growth and pods formation which led to a highest green pod yield and its components as well as gave the pest quality of green pods. These results are harmony with those reported by Mahajan *et al* (1997) and Knott and Belcher (1998).

Table (4): Effect of sowing date on green pod yield and its quality of sugar pea.

Sowing date	Green pod yield (ton/fed.)			Days to first harvest	Harvest period (day)	Average pod				
	Early	Export.	Total			Length (cm)	Width (cm)	Thick. (cm)	Weight (gm)	TSS (%)
First season										
Oct. 10th	1.690	4.539	7.255	71.11	24.67	8.33	1.57	0.75	3.68	10.94
Oct. 25th	1.901	6.367	8.492	75.33	28.89	8.32	1.53	0.74	3.24	10.44
Nov. 10th	2.621	7.751	9.984	69.22	25.44	8.56	1.57	0.75	3.48	10.00
Nov. 25th	1.604	5.809	7.454	60.67	20.33	8.52	1.53	0.77	3.64	9.78
Dec. 10th	1.291	4.411	6.078	60.00	16.33	8.22	1.49	0.69	3.76	9.28
L. S. D.	0.077	0.236	0.429	1.67	0.95	N. S.	N. S.	0.03	0.20	0.66
Second season										
Oct. 10th	1.484	4.319	6.288	73.33	23.44	7.72	1.45	0.66	3.30	10.33
Oct. 25th	2.118	5.242	7.360	69.67	27.33	7.66	1.43	0.64	2.91	9.89
Nov. 10th	2.686	6.080	8.767	64.00	25.44	7.98	1.51	0.64	3.14	9.94
Nov. 25th	1.818	4.810	6.628	56.78	20.33	7.84	1.44	0.72	3.28	9.44
Dec. 10th	1.519	4.018	5.537	55.11	15.33	7.55	1.37	0.61	3.37	9.28
L. S. D.	0.158	0.782	0.788	1.64	1.33	N. S.	N. S.	0.03	0.02	0.29

B. 2. Effect of variety:

Total green pod yield of sugar peas and its components i. e. early and exportable yield were recorded statistical variations between all the tested varieties (Table, 5). In this respect, cv. Snow wind yielded the highest total,

early and exportable yield compared with other tested cvs during the two seasons of study. In addition, the lowest green pod yield was obtained by Sugar gem .

Earliness expressed as number of days elapsed from sowing till the time of the first harvest was recorded. cv. Snow wind was the earlier one in the two seasons however, cv. Sugar gem was later in the two seasons.

With respect to the pod quality, data in Table (5) also show the effect of sugar pea variety on green pod quality i. e. length, width, thickness, weight and TSS. Results clear that cv. Snow wind gave the highest pod length and width with the lowest pod thickness and a moderate pod weight and TSS. Cv. Sugar pearl gave a moderate pod length and width with a highest values of pod thickness, weight and TSS. But cv. Sugar gem gave the lowest values of pod length, width, weight and TSS with a moderate pod thickness as shown in both seasons. These results were harmony with those reporeted by Amet (1992), Eweda (1993), Sawan (2002) and Amer (2004) they reported that the yield and its attributes were differed according to genotype .

Table (5): Effect of variety on green pod yield and its quality of sugar pea.

Variety	Green pod yield (ton/fed.)			Days to first harvest	Harvest period (day)	Average pod				
	Early	Export.	Total			Length(cm)	Width (cm)	Thick. (cm)	Weight (gm)	TSS (%)
First season										
Snow wind	2.101	6.918	9.572	63.87	27.40	9.08	2.08	0.30	3.94	10.00
Sugar pearl	1.690	5.466	7.358	68.27	21.80	8.27	1.30	1.00	3.97	10.70
Sugar gem	1.673	4.941	6.626	69.67	20.20	7.82	1.24	0.92	2.77	9.57
L. S. D.	0.043	0.139	0.243	0.93	0.79	0.12	0.04	0.03	0.12	0.36
Second season										
Snow wind	1.933	6.177	8.562	61.20	25.47	8.40	1.95	0.27	3.54	9.53
Sugar pearl	1.513	4.688	6.404	64.60	21.20	7.62	1.20	0.86	3.57	10.47
Sugar gem	1.505	3.817	5.781	65.53	20.47	7.23	1.17	0.82	2.49	9.33
L. S. D.	0.077	0.357	0.435	0.85	0.89	0.11	0.04	0.04	0.10	0.31

B. 3. Effect of the interaction treatments:

Results in Table (6) clear that the highest pods yield and its components as well as harvest period were recorded with planting cv. Snow wind on Nov. 10th sowing date. But the lowest values were recorded with planting cv. Sugar gem on Dec. 10th sowing date. Results also clear that cv. Snow wind gave the highest yield and its components followed by cvs. Sugar pearl and Sugar gem as shown in all sowing dates.

Cvs Snow wind and Sugar gem gave the highest yield and its components when planting on Nov. 10th sowing date followed by sowing on Oct. 25th , Nov. 25th and Oct. 10th. But the lowest values were recorded with Dec 10th sowing date. However, cv. Sugar pearl gave the highest yield when planting on Nov. 10th followed by sowing on Oct. 25th , Oct. 10th and Nov. 25th but the lowest values were recorded with Dec 10th sowing date as shown in both seasons.

Earliness expressed as number of days elapsed from sowing till the time of the first picking was recorded . Cv. Snow wind under the conditions of

Dec. 10th sowing date was the earlier in the two seasons. On the contrary, cv. Sugar pearl and Sugar gem lies in the end order, the late first picking. In addition the end harvest of cv. Snow wind under Oct. 25th sowing date condition.

Table (6) : Effect of the interaction treatments on green pod yield and its quality of sugar pea.

Treatments		Green pod yield (ton/fed.)			Days to first harvest	Harvest. time	Average pod				
Sowing date	Variety	Early	Export.	Yield			Length (cm)	Width (cm)	Thick. (cm)	Weight (gm)	TSS (%)
First season											
Oct.10th	Snow wind	2.202	5.633	8.568	65.00	28.67	9.30	2.13	0.28	3.90	10.17
	Sugar pearl	1.566	4.370	7.185	74.00	23.33	7.67	1.30	1.05	4.13	11.67
	Sugar gem	1.302	3.612	6.011	74.33	22.00	8.03	1.27	0.91	3.00	11.00
Oct. 25th	Snow wind	2.307	8.117	11.153	71.33	35.00	8.93	2.03	0.30	4.05	9.67
	Sugarpearl	1.693	5.771	7.577	76.67	26.67	8.13	1.23	0.99	3.60	11.00
	Sugar gem	1.704	5.213	6.744	78.00	25.00	7.90	1.33	0.93	2.08	10.67
Nov. 10th	Snow wind	2.610	8.394	11.236	65.33	33.33	8.97	2.10	0.32	4.10	10.17
	Sugar pearl	2.715	7.426	9.767	71.67	21.67	8.43	1.32	1.04	3.77	10.83
	Sugar gem	2.539	7.431	8.949	70.67	21.33	8.27	1.30	0.90	2.57	9.00
Nov. 25th	Snow wind	1.842	7.094	9.724	60.33	24.00	9.33	2.03	0.32	3.97	10.50
	Sugar pearl	1.303	5.396	6.510	65.67	21.00	8.60	1.37	1.03	4.27	10.33
	Sugar gem	1.666	4.935	6.127	65.00	16.00	7.63	1.20	0.96	2.70	8.50
Dec. 10th	Snow wind	1.544	5.351	7.181	57.33	16.00	8.87	2.10	0.30	3.70	9.50
	Sugar pearl	1.174	4.369	5.753	62.33	16.33	8.53	1.27	0.87	4.07	9.67
	Sugar gem	1.155	3.514	5.301	60.33	16.67	7.27	1.10	0.92	3.50	8.67
L. S. D.		0.097	0.311	0.544	2.08	1.77	0.26	0.08	0.06	0.27	0.80
Second season											
Oct.10th	Snow wind	1.892	5.367	8.113	69.33	27.33	8.66	2.01	0.25	3.48	9.67
	Sugar pearl	1.397	4.419	5.923	75.33	22.33	7.12	1.19	0.91	3.73	11.17
	Sugar gem	1.162	3.171	4.827	75.33	20.67	7.39	1.16	0.82	2.72	10.17
Oct. 25th	Snow wind	2.068	7.163	10.113	66.33	33.00	8.22	1.88	0.27	3.55	9.17
	Sugar pearl	1.512	4.448	6.363	70.67	25.00	7.48	1.16	0.89	3.28	10.67
	Sugar gem	1.538	4.114	5.603	72.00	24.00	7.27	1.25	0.76	1.89	9.83
Nov. 10th	Snow wind	2.663	7.299	9.540	60.00	31.33	8.38	2.01	0.29	3.70	9.83
	Sugar pearl	2.403	6.451	8.523	66.67	22.33	7.83	1.24	0.87	3.43	10.67
	Sugar gem	2.254	4.492	8.237	65.33	22.67	7.74	1.29	0.76	2.30	9.33
Nov. 25th	Snow wind	1.646	6.577	8.790	56.67	20.33	8.59	1.91	0.29	3.61	10.17
	Sugar pearl	1.169	4.261	5.957	54.00	21.00	7.91	1.25	0.94	3.82	9.83
	Sugar gem	1.519	3.592	5.137	59.67	19.67	7.02	1.16	0.92	2.42	8.33
Dec. 10th	Snow wind	1.397	4.478	6.253	53.67	15.33	8.16	1.94	0.27	3.37	8.83
	Sugar pearl	1.085	3.859	5.253	56.33	15.33	7.78	1.16	0.69	3.60	10.00
	Sugar gem	1.053	3.717	5.103	55.33	15.33	6.72	1.00	0.86	3.15	9.00
L. S. D.		0.171	0.799	0.973	1.90	1.99	0.24	0.08	0.09	0.23	0.68

With respect to green pod quality, the interaction effect between the two studied factors on pod quality characters i. e. average pod width, length thickness and weight as well as TSS showed significant variation. The high values of TSS were given by cv. Sugar pearl sown on Oct. 10th but the lowest values were recorded with cv. Sugar gem sown on Dec. 10th.

The interaction of any recorded parameter was significant and indicated that the varieties had a strong differential response to a specific weather condition. In other words, gene action was affected by differences in

The interaction of any recorded parameter was significant and indicated that the varieties had a strong differential response to a specific weather condition. In other words, gene action was affected by differences in weather conditions as mentioned by Aziz and Abdul (1989), Petkov and Benchera (1996) and Knott and Belcher (1998) .

C. Electrophoretic studies:

SDS-PAGE for protein banding patterns are shown in figure (1) the descending arrangement of the number of major bands and contribution of band intensities are presented in the same Fig.1. it was clear that cv. Snow wind had the highest number of major protein bands with highly molecular weight and dark stained bands. Moreover, the bands of cvs. Sugar pearl and Sugar gem were nearly equal in band intensities and number of major bands.

From Table (7) and Fig. (1) it was clear that one out of three varieties, Snow wind had the highly dark density of protein banding patterns, also it had the highest number of specific bands (Table, 8). Cv. Snow wind had four Specific bands (BN; 5, 10, 12, 13) at RF% (0.388, 0.600, 0.702 and 0.998) respectively.

Table, 7 show that each variety was characterized by different genetic background and resources. It's of utmost importance to clear that variety Snow wind had the highest number of specific bands, also had the highly dark density protein bands as well as the highest values of early and total yield. These results are in harmony with those reported by Amet (1992), Eweda (1993), Sawan (2002) and Amer (2004).

Table (7) : Densitometeric analysis of water soluble protein (SDS-BAGE) representing band number and molecular weights (MW) of each band for three sugar peas variety.

Band No.	M. W. (Kda)	Relative front	Varieties		
			Sugar gem	Sugar pearl	Snow wind
1	180.04	0.165	0	1	1
2	178.59	0.167	1	0	0
3	145.70	0.232	0	0	1
4	144.91	0.233	1	1	0
5	105.97	0.388	0	0	1
6	105.77	0.389	0	1	0
7	105.49	0.392	1	0	0
8	51.92	0.594	1	0	0
9	50.82	0.599	0	1	0
10	50.49	0.600	0	0	1
11	39.08	0.696	0	1	0
12	38.58	0.702	0	0	1
13	21.30	0.998	0	0	1

Fig. (1): Polyacrylamide gels stained for protein after electrophoresis for three sugar pea varieties.
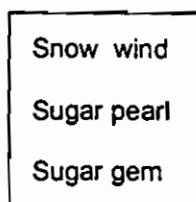
Snow wind

Sugar pearl

Sugar gem

EL-Desuki, M.

Table (8) : Relation between specific bands for sugar peas varieties and
early yield as well as total yield .

Variety	Early yield (ton/fed.)			Total yield (ton/fed.)			Specific bands
	2001/2002	2002/2003	Mean	2001/2002	2002/2003	Mean	
Snow wind	2.101	1.933	2.017	9.572	8.562	9.067	5, 10, 12, 13
Sugar pearl	1.690	1.513	1.602	7.358	6.404	6.881	6, 9, 11
Sugar gem	1.673	1.505	1.589	6.626	5.781	6.204	2, 7, 8
L. S. D.	0.043	0.077		0.243	0.435		

Generally

Nov. 10th sowing date gave the highest vegetative growth, green pods yield and its components as well as gave the pest quality of green pods with the moderate earliness and long harvest period.

Snow wind cultivar gave the highest vegetative growth, total pods yield and its components as well as pods quality, high earliness with the longest harvest period as compared with the other tested cultivars. The superiority of cv. Snow wind was harmony with its genetic background, i. e. seed protein electrophoresis. Snow wind seed gave the highest number of major protein bands with highly molecular weight and dark stand bands.

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تأثير ميعاد الزراعة على إنتاجية بعض أصناف البسلة السكرية تحت ظــروف منطقة شرق العوينات

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أجريت تجربتان حقليتان بمنطقة شرق العوينات – جنوب غرب مصر(منطقة حــارة جافــة) خــلال موسمي ٢٠٠٢/٢٠٠٣ ، ٢٠٠٣/٢٠٠٤ لدراسة استجابة بعض أصناف البسلة الــسكرية (,Snow wind Sugar pearl and Sugar gem) لمواعيد زراعة مختلفة (١٠ أكتوبر ، ٢٥ أكتوبر ، ١٠ نــوفمبر ،٢٥ نوفمبر ، ١٠ ديسمبر) و أثر ذلك على النمو الخضري و محصول القرون الخــضراء و جودتهــا . و بتعبير آخر بيان تأثير الجو الجاف على الأصناف المختبرة و معرفة أنسب ميعاد زراعــة فــي الظــروف المشابهة .

وقد أوضحت النتائج بصفة عامة أن هناك أثر واضح لمواعيد الزراعة على نمــو أصــناف البــسلة السكرية المختبرة و كان أعلى قيم النمو الخضري و كذلك محتواها من المادة الجافة بالإضافة إلي محصول القرون الخضراء وجودتها قد تم تسجيلها في ميعاد الزراعة الثالث (١٠ نوفمبر) . من ناحية أخري فإن أقل قيم النمو الخضري تم الحصول عليها من النباتات المنزرعة في ميعاد الزراعة الأول (١٠ أكتوبر) أما أقــل قيم للمحصول و جودة القرون تم الحصول عليها من النباتات المنزرعة في ميعاد الزراعة الخــامس (١٠ ديسمبر).

و قد سجل الصنف Snow wind أعلى قيم بيانات النمو ومحتوي النباتات من المادة الجافة إضــافة إلي محصول القرون الخضراء و جودتها . أما أقل قيم النمو تم تسجيلها عــن المحــصول كانــت خاصــة بالصنف Sugar gem.

كما أوضحت النتائج أن هناك تأثير معنوي للتفاعل بين عاملي الدراسة . و قد سجل الصنف Snow wind أعلى القيم في قياسات النمو و محصول القرون الخضراء و ذلك تحت ظروف الزراعــة فــي ١٠ نوفمبر . في حين كانت أقل القيم تم الحصول عليها بزراعة الصنف Sugar gem في ١٠ ديسمبر .

و قد أظهرت دراسات التفريد الكهربي للبروتين أن الصنف Snow wind أعطي زيادة فــي عــدد الحزم النوعية و كذلك زيادة كثافة حزم البروتين مما يفسر زيادة إنتاج هذا الــصنف مقارنــة بالأصــناف الأخرى تحت الدراسة .