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EFFECT OF SOWING DATES ON GENEACTION OF SOME SNAP BEAN *(Phaseolus vulgaris L.)* VARIETIES UNDER THE CONDITIONS OF SHARK AL-OWINAT REGION

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ABSTRACT : Two field experiments were carried out at Shark Al-Owinat region south west Egypt (dry temperate conductions) during two growing seasons (2000/2001 and 2001/2002), to study the response of some snap bean vars.; i.e., Paulista, Samantha, Coby, Amy, Argose and Ferrari to various sowing dates; i.e., Oct. 10th, Nov. 1st, Nov. 22nd, Dec. 12th, Jan. 15th and Feb. 7th on growth and fresh pod yield as well as pods quality. In other words, to show the effect of dry-temperate conditions on vars. choice and to know the suitable sowing date under such conditions.

Vegetative growth and green yield of the tested snap bean vars. were clearly affected by sowing dates. The highest values of dry weight per plant were recorded on Oct. 10th and Feb. 7th sowing dates followed by Nov. 22nd and Dec. 12th sowing dates under low tunnels. The best values of green yield were obtained by Feb. 7th sowing dates followed by Oct. 10th and Nov. 22nd sowing dates.

Argose and Paulista plants recorded higher values for dry weight per plant. But, Ferrari var. recorded the lowest values of dry weight per plant. Argose and Paulista vars recorded the highest values of total green yield. Moreover, Paulista var yielded the best exportable yield and the optimal values of pods quality followed by Samantha, Amy and Coby vars.

The highest values of early and total green yield were obtained by sowing Argose and Paulista vars on Feb. 7th and Oct. 10th But, the best exportable green pods yield and the best pods quality were obtained by sowing Paulista var. on Feb. 7th and Oct. 10th followed by

Amy, Samantha, and Coby vars on the same sowing dates. The shortest period to the beginning harvest was recorded on sowing Amy var. on Feb. 7th, but the longest period for Paulista and Coby vars was under low tunnels planting.

Electrophoretic studies showed that not only the varieties Argose and Paulista had the highest dark stained protein bands and the highest specific bands number, but also had the highest yield.

Key words : Snap bean, sowing dates, varieties, growth, pods yield and quality, electrophoretic study.

INTRODUCTION

Shark Al-Owinat is a new reclaimed area in south west Egypt. Environmental conditions in this area are desert conditions. Temperature is high allover the day and low allover the night. The difference between day and night temperature is wide. These severe conditions necessitates more research for choosing suitable vegetable crops and varieties which produce more and high quality under these conditions. Sowing dates of cultivated crops became of more importance under these conditions. The greatest productivity of snap bean for local consumption or export could be achieved through improving the agriculture practices specially sowing date and testing favourable varieties.

The present work is an attempt of searching the possibility of producing snap beans for exportation. So that, different sowing dates and their effect on the growth, green yield and its quality are the main goal of our research. Since the area is new reclaimed and sources of contamination are rare, therefore the possibility of producing clean product for exportation arises.

Some investigators dealt with sowing dates of snap bean under similar conditions (Saini and Negi, 1998; Yaman, 1998; Amer *et al.*, 2002a). On the other hand, the variation among varieties in various growth and total yield characters was detected by Das *et al.* (1996), Bisognin *et al.* (1997) and Ismail (2000). The effect of interaction between sowing dates and varieties have been investigated by several authors (Ahlawat, 1995; Sharma *et al.*, 1997; Vieira *et al.*, 2000).

Therefore, the aim of this study was to determine the high yielding ability with best quality cultivar and the suitable sowing date for snap bean under dry temperate condition of Shark Al-Owinat region.

MATERIALS AND METHODS

Two field experiments were conducted in the two consecutive seasons of 2000/2001 and 2001/ 2002 on the Idial Farm, Ministry of Agriculture, Shark Al-Owinat (South west Egypt).

Each experiment consisted of 36 treatments, which were the combination of six sowing dates; Oct. 10th, Nov. 1st, Nov. 22nd, Dec. 12th, Jan. 15th and Feb. 7th and six varieties; i.e., Paulissta, Samantha, Coby, Amy, Ferrari and Argose. All sowing dates were conducted under open field except 3rd and 4th sowing dates which were carried out under low tunnels.

A split plot design with four replicates was adapted where, sowing dates were arranged in the main plots, while the varieties were assigned in the sub-plots. The experimental unit area was $15m^2$ (1.5x10m). It contains two dripper lines with 10m length for each with 75 cm width.

Seeds of snap bean *(Phaseolus vulgaris L.)* were sown as one seed per hill which were 7 cm apart on both sides of the irrigation lines. The normal agricultural practices of snap bean production under the conditions of this area were followed according to the recommendations of Egyptian Ministry of Agriculture.

The soil of the experimental field was sandy in texture with 99.4% sand and 0.6% silt. The chemical analysis of irrigation water and experimental soil are presented in Table 1.

Meteorological data of the area were recorded during the growth season (Table 2).

Table 1 : Chemical analysis for experimental field and irrigation water

	pH	EC	Cations (Meq/L)				Anions (Meq/L)		
			Ca^{++}	Mg^{++}	Na^{++}	K^{+}	HCO_3^-	Cl^-	SO_4^{--}
Soil	7.4	2.53	8.1	3.9	14.7	0.51	2.4	5.9	18.91
Irrigation water	7.02	1.01	2.2	2.3	5.5	0.12	1.7	1.7	3.02

Table 2 : Average of some meteorological and soil temperature data at Shark Al-Owinat region

Year	2000				2001				2002			
Data	Degree of temp.		RH (%)	ST*	Degree of Temp.		RH (%)	ST	Degree of temp.		RH (%)	ST
Month	Max	Min			Max	Min			Max	Min		
Jan.	21.64	5.56	30.8	9.31	22.3	4.30	36.2	13.1	18.5	3.10	54.0	11.7
Feb.	21.4	6.2	27.1	10.5	23.3	5.60	31.2	14.0	25.0	7.70	45.0	14.9
Mar.	27.8	8.2	25.4	15.3	31.6	11.7	25.3	19.4	30.5	12.0	32.4	18.5
Apr.	36.4	15.4	22.7	21.7	35.3	16.7	21.5	23.7	33.6	16.2	27.4	25.9
May.	37.8	18.6	20.3	24.2	38.0	19.4	16.0	26.7	37.5	20.2	25.3	26.8
Jun.	41.7	20.6	19.0	27.3	38.4	20.0	17.0	27.2	39.7	21.3	21.4	28.1
July.	42.83	23.1	16.3	28.6	40.3	22.4	18.0	28.4	41.5	22.3	19.0	29.6
Aug.	38.6	21.9	16.9	27.7	40.4	23.7	23.0	29.4	41.7	23.9	17.3	29.3
Sept.	37.7	21.5	21.3	25.7	37.9	21.3	25.0	27.3	39.2	22.4	25.0	28.2
Oct.	31.6	14.8	29.6	21.6	32.2	15.8	36.0	22.6	33.1	16.7	24.3	23.4
Nov.	27.6	10.8	34.4	16.9	26.2	9.7	45.0	17.7	27.4	11.3	36.4	16.1
Dec.	22.4	5.9	42.5	13.0	22.2	5.6	48.0	14.3	23.0	7.2	41.2	15.2

* Soil temperature at 20 cm depth.

Data recorded :

A. Plant growth

A random sample of five plants from each plot was taken at flowering stage (45 days after sowing) and the following data were recorded :

1. Plant height (cm),
2. Number of branches/plant,
3. Number of leaves/plant and
4. Dry weight of leaves, branches, and whole plant. Branches and leaves were separated and oven dried at 70°C until constant weight and dry weight of leaves, branches and whole plant were determined.

B. Green pods yield and quality

1. Early green pods yield (ton/fed.),
2. Total green pods yield (ton/fed.),
3. Exportable green pods yield (ton/fed.),
4. Un-exportable green pods yield (ton/fed.),
5. Beginning of the harvest season (1st harvest date) days after sowing,
6. Total soluble solids (TSS). A random sample of green pods at maturity stage was blended and TSS were determined in filtrate by carlzies refractometer and
7. Mean pod length and diameter.

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

Sodium dodecylsulfate-polyacrylamide gel electrophoresis (SDS-PAGE) for soluble protein extracted from dry seeds was used 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 analysed 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.

Statistical analysis :

The obtained data were subjected to statistical analysis according to the methods described by Steel and Torrie (1960).

RESULTS AND DISCUSSION

A. Plant Growth

A.1 Effect of sowing date

Results in Table 3 reveal significant differences for most growth characters in both 1st and 2nd seasons. Various sowing dates

Table 3 : Effect of sowing dates on snap bean plant growth

Date of sowing	Plant			Dry weight (gm/plant)		
	Height (cm)	No of leaves	No of branches	Leaves	Branches	Whole
First Season 2000/2001						
Oct. 10th	22.28	10.94	10.14	5.13	1.99	7.12
Nov. 1st	19.46	9.22	4.64	2.78	1.14	3.93
Nov. 22nd	26.25	13.14	5.42	4.49	1.54	6.04
Dec. 12th	27.54	12.92	6.58	3.24	2.76	6.00
Jan. 15th	19.11	17.94	4.42	1.85	0.94	2.79
Feb. 7th	30.19	13.14	7.36	4.62	1.87	6.49
L. S. D. 5%	3.07	2.06	0.70	0.82	0.40	1.04
Second Season 2001/2002						
Oct. 10th	23.72	11.97	7.19	5.67	2.42	8.09
Nov. 1st	21.01	10.67	5.89	3.71	1.55	5.26
Nov. 22nd	28.31	15.36	6.47	5.35	1.98	7.33
Dec. 12th	29.88	16.14	6.58	4.04	3.27	7.31
Jan. 15th	21.61	20.39	5.75	2.67	1.43	4.11
Feb. 7th	32.63	17.39	7.33	5.52	2.31	7.83
L. S. D. 5%	3.04	1.15	0.78	0.91	0.41	1.13

significantly affected plant growth parameters. Planting on Feb. 7th in open field followed by Nov. 22nd and Dec. 12th sowing dates under low tunnels led to highly significant increases on plant height and number of leaves per plant. The lowest vegetative growth was recorded by planting on Nov. 1st and Jan. 15th.

Dry weight of leaves, branches and whole plant were significantly higher on Oct. 10th plantation followed by Feb. 7th, Nov. 22nd and Dec. 12th, respectively without significant differences. On the other hand, lower values of dry weight of leaves, branches and whole plant were recorded on Nov. 1st and Jan 15th sowing dates. These results were similar in the two seasons.

These results might be attributed to the favourable effect of temperature, humidity and light during the growth season. These findings are in harmony with those of Dapaah *et al.* (1995) and Amer *et al.* (2002a).

A.2 Effect of variety

Results in Table 4 show the effect of varieties on growth characters of snap bean plants. Such results indicate significant variations among varieties with respect to their vegetative growth. In this respect, Argose plants were the tallest and denser leaves followed by Paulista plants. On the contrary, Ferrari was the shortest and lower leaf numbers in the two growing seasons.

Argose plants recorded the highest values of dry weight of leaves, branches and whole plant. In addition, Ferrari recorded the lowest values of leaves, branches and whole plant dry weight.

The differences in vegetative growth among varieties may be due to their potentiality for natural resources, irrigation water and nutrients use efficiency. On the other hand, the different behaviour in these characters might reflect the differential expressivity of certain genes during ontogenetic processes which may interact with the developmental and environmental factors in relation to water relationships, such explanation elucidates that genes responsible for the biosynthesis of such characters might be varied in their action. These results agree with those of Bisognin *et al.* (1997); Reddan *et al.* (1997); Ismail (2000) and Amer *et al.* (2002b).

Table 4 : Effect of variety on growth characters of snap bean plants

Varieties	Plant			Dry weight (gm/plant)		
	Height (cm)	N. of leaves	N. of branches	Leaves	Branches	Whole
			First Season 2000/2001			
Ferrari	19.58	10.50	4.97	2.80	1.35	4.16
Coby	22.71	13.19	6.95	3.51	1.52	5.02
Paulista	24.85	14.06	6.39	4.21	1.92	6.13
Amy	22.69	13.09	7.08	3.26	1.42	4.68
Samantha	23.67	13.48	7.27	3.90	1.86	5.76
Argose	31.32	13.25	5.67	4.44	2.18	6.62
L. S. D. 5%	1.76	1.55	0.89	0.43	0.24	0.57
			Second Season 2001/2002			
Ferrari	21.25	12.61	5.64	3.41	1.69	5.09
Coby	24.21	14.67	6.75	3.93	1.87	5.80
Paulista	27.74	17.53	6.64	5.33	2.53	7.86
Amy	24.31	14.39	6.69	3.88	1.75	5.63
Samantha	25.94	15.94	6.72	4.82	2.41	7.23
Argose	33.71	16.78	6.78	5.60	2.71	8.31
L. S. D. 5%	1.51	0.90	0.62	0.42	0.25	0.51

A.3 Interaction effect

Results in Tables 5a and b show the effect of interaction between sowing dates and snap bean varieties on growth characters. Argose var recorded higher values for the growth parameters than all the tested varieties under this study under all the sowing dates. On the other hand, Ferrari var gave lower values of growth characters under all the dates except Feb. 7th plantation.

Thus, it could be suggested, from such results, that Oct. 10th sowing date was quite enough for enhancing growth characters for all varieties followed by planting on Nov. 22nd and Dec. 12th (under low tunnels).

These results agree with those obtained by Redden *et al.* (1997); Saini and Negi (1998) and Vieira *et al.* (2000).

Table 5a : Effect of interaction between sowing dates and snap bean varieties on growth characters during the season of 2000/2001

Sowing date	Varieties	Plant			Dry weight (gm/plant)		
		Height (cm)	No of leaves	No of branches	Leaves	Branches	Whole
Oct. 10th	Ferrari	17.33	6.67	5.17	2.72	1.06	3.78
	Coby	17.50	10.83	9.67	4.48	2.07	6.55
	Paulista	21.17	11.83	11.50	6.81	2.44	9.25
	Amy	22.33	12.33	9.83	3.64	1.35	5.00
	Samantha	21.67	16.00	13.50	6.53	2.33	8.86
	Argose	33.67	9.67	9.50	6.62	2.67	9.30
Nov. 1st	Ferrari	16.50	7.67	3.17	2.32	0.77	3.09
	Coby	15.33	8.50	5.00	2.76	1.11	3.87
	Paulista	19.00	9.83	4.17	2.99	1.18	4.17
	Amy	17.67	9.83	5.50	2.28	0.93	3.21
	Samantha	18.17	10.00	5.00	2.89	1.02	3.91
	Argose	30.07	9.50	5.00	3.45	1.85	5.30
Nov. 22nd	Ferrari	21.83	11.33	6.00	2.97	1.04	4.01
	Coby	31.33	13.83	4.67	4.28	1.14	5.42
	Paulista	25.00	13.00	3.83	5.16	1.81	6.97
	Amy	22.83	13.50	7.17	4.34	1.47	5.81
	Samantha	24.00	14.17	6.33	4.84	1.71	6.54
	Argose	32.50	13.00	4.50	5.38	2.11	7.49
Dec. 12th	Ferrari	20.50	8.33	4.67	2.41	2.01	4.41
	Coby	25.27	12.83	7.17	2.99	2.19	5.19
	Paulista	30.50	13.17	6.50	3.09	3.19	6.27
	Amy	29.83	18.83	8.67	3.52	2.32	5.84
	Samantha	28.67	13.67	6.50	3.07	3.17	6.25
	Argose	30.50	10.67	6.00	4.35	3.68	8.03
Jan. 15th	Ferrari	17.83	17.83	3.67	1.57	0.67	2.25
	Coby	17.50	17.50	4.50	2.02	0.95	2.97
	Paulista	22.00	23.00	5.00	2.29	1.13	3.42
	Amy	14.17	13.17	4.83	1.70	0.84	2.54
	Samantha	20.33	14.33	4.83	1.50	0.87	2.37
	Argose	22.83	21.83	3.67	2.03	1.17	3.20
Feb. 7th	Ferrari	23.50	11.17	7.17	4.83	2.57	7.39
	Coby	29.33	15.67	10.67	4.50	1.63	6.13
	Paulista	31.45	13.67	7.00	4.95	1.75	6.69
	Amy	29.33	10.83	6.50	4.07	1.59	5.66
	Samantha	29.17	12.67	7.50	4.57	2.08	6.65
	Argose	38.33	14.83	5.33	4.83	1.58	6.41
L. S. D. 5%		4.30	3.81	2.19	1.04	0.58	1.40

Table 5b : Effect of interaction between sowing dates and snap bean varieties on growth characters during the season of 2001/2002

Parameters / Treatments		Plant			Dry weight (gm/plant)		
Sowing dates	Varieties	Height (cm)	No of leaves	No of branches	Leaves	Branches	Whole
Oct. 10th	Ferrari	18.67	7.67	4.67	3.18	1.39	4.57
	Coby	17.17	11.00	7.33	4.81	2.41	7.22
	Paulista	23.50	13.17	8.33	7.34	2.91	10.25
	Amy	23.67	11.50	7.33	4.05	1.69	5.74
	Samantha	23.67	14.83	7.33	7.16	2.83	9.99
	Argose	35.67	13.67	8.17	7.49	3.27	10.76
Nov. 1st	Ferrari	17.83	9.00	4.17	2.82	1.10	3.92
	Coby	16.67	8.50	6.00	3.10	1.44	4.54
	Paulista	22.00	12.17	5.67	4.12	1.85	5.97
	Amy	18.67	10.83	6.00	2.94	1.26	4.21
	Samantha	19.83	11.67	6.33	3.89	1.45	5.35
	Argose	31.07	11.83	7.17	5.38	2.18	7.56
Nov. 22nd	Ferrari	23.17	13.33	6.83	3.64	1.37	5.01
	Coby	33.00	16.17	5.50	4.61	1.47	6.08
	Paulista	27.67	16.33	4.83	6.49	2.44	8.93
	Amy	25.17	15.50	7.83	4.77	1.80	6.57
	Samantha	26.00	15.83	7.17	5.74	2.21	7.94
	Argose	34.83	15.00	6.67	6.85	2.58	9.42
Dec. 12th	Ferrari	22.17	12.00	5.33	3.07	2.34	5.41
	Coby	27.60	14.50	7.50	3.53	2.53	6.05
	Paulista	33.50	17.83	7.33	4.45	3.95	8.41
	Amy	31.50	20.50	6.50	4.29	2.65	6.94
	Samantha	31.33	16.33	7.00	4.07	3.84	7.91
	Argose	33.17	15.67	5.83	4.85	4.28	9.13
Jan. 15th	Ferrari	19.50	19.17	5.17	2.24	1.01	3.25
	Coby	19.50	20.50	5.33	2.35	1.42	3.77
	Paulista	25.33	25.33	6.17	3.29	1.80	5.09
	Amy	15.83	14.83	5.33	2.36	1.18	3.54
	Samantha	23.00	18.00	5.83	2.50	1.54	4.04
	Argose	26.50	24.50	6.67	3.30	1.67	4.97
Feb. 7th	Ferrari	26.17	14.50	7.67	5.49	2.90	8.39
	Coby	31.33	17.33	8.83	5.17	1.96	7.13
	Paulista	34.45	20.33	7.50	6.28	2.25	8.53
	Amy	31.00	13.17	7.17	4.87	1.92	6.79
	Samantha	31.83	19.00	6.67	5.57	2.58	8.15
	Argose	41.00	20.03	6.17	5.76	2.25	8.01
L. S. D. 5%		3.70	2.20	1.51	1.04	0.60	1.26

B. Green Pods Yield and Quality

B.1 Effect of sowing date

Results in Table 6 indicate that the studied characters were significantly affected by sowing date. The highest early, exportable and total green pods yield were obtained by sowing on Feb. 7th followed by Oct. 10th and Nov. 22nd sowing dates. Other sowing dates yielded lower yields of early, exportable and total one. The lowest green pods yield was obtained by Nov. 1st sowing date. It could be concluded that the optimal sowing date in this study was Feb. 7th and any delay or advancement in sowing date caused reductions in green pod yield especially when sown on Nov. 1st under open field conditions. Sowing on Feb. 7th increased yield by 35% compared with Nov. 1st sowing date. Higher quality of green pods expressed as pod length, diameter and TSS and also exportable yield were obtained by Feb. 7th followed by Oct. 10th sowing dates. The lowest values of exportable yield were produced by sowing date on Nov. first.

Table 6 : Effect of sowing dates on snap bean yield and its quality

Date of sowing	Yield (ton / fed.)				1st harvesting time(day)	Pod quality		
	Early	Export.	Un-export.	Total		TSS	Length (cm)	Diameter (cm)
First Season 2000/2001								
Oct. 10th	1.645	4.760	1.657	6.423	49.11	6.53	13.49	0.71
Nov. 1st	1.790	3.868	1.318	5.186	58.22	5.72	12.73	0.75
Nov. 22nd	1.401	4.510	1.631	6.141	69.50	5.89	12.46	0.74
Dec. 12th	1.344	4.312	1.621	5.934	67.28	6.28	12.55	0.75
Jan. 15th	1.989	4.259	1.534	5.792	58.89	5.92	12.76	0.74
Feb. 7th	1.777	5.146	1.870	7.016	46.89	5.86	12.74	0.75
L. S. D. 5%	0.068	0.160	0.112	0.276	1.23	0.36	0.33	0.03
Second Season 2001/2002								
Oct. 10th	1.728	4.866	1.875	6.741	52.11	6.58	13.50	0.70
Nov. 1st	1.922	3.867	1.574	5.442	62.06	5.78	12.68	0.73
Nov. 22nd	1.483	4.618	1.621	6.239	71.56	5.83	12.57	0.69
Dec. 12th	1.469	4.475	1.751	6.226	71.00	6.03	12.50	0.72
Jan. 15th	2.132	4.364	1.716	6.080	62.06	5.97	12.37	0.73
Feb. 7th	1.837	5.221	2.065	7.286	49.22	6.03	12.52	0.73
L. S. D. 5%	0.079	0.109	0.125	0.183	1.24	0.48	0.36	0.02

The least number of days to beginning of harvest were in plants of Feb. 7th sowing date (48 day after sowing) followed by Oct. 10th sowing date (50 day after sowing). On the other hand, the number of days to first harvest was more in plants sown under low tunnels on Nov. 22nd and Dec. 12th (70 and 69 day after sowing respectively).

These results agree with those reported by Ahlawat (1995), Dapaah *et al.* (1995), Akdag (1997), Redden *et al.* (1997), Sharma *et al.* (1997), Vinod *et al.* (1999), Singh and Singh (2000), and Amer *et al.* (2002a).

B.2 Effect of variety

Data in Table 7 show the variations among all the tested varieties for green pod yield and its components as well as pods quality.

Green pods yield of Argose var. out yielded those of the other tested varieties followed by Paulista var. On the other hand, Paulista var. yielded the best exportable yield followed by Amy and Samantha vars. The superiority of production for Argose and Paulista vars. might be due to its higher vegetative growth and dry matter accumulation (Table 4).

Argose, Paulista and Coby vars. recorded higher values of total soluble solids compared with other varieties. Moreover, Paulista, Samantha and Amy vars. gave the optimal values of pod length and pod diameter.

The variability in green pods yield among the tested varieties might be due to differential expressively of certain genes during ontogenetic processes which may interact with the developmental and environmental factors. In other words, these variations among varieties in their vegetative growth and green pods yield are expressed electrophoretically in Fig. 1. Argose and Paulista had the highest number of specific bands compared with Coby, Samantha and Amy vars. which reflected one specific band only. Ferrari did not reflect any specific bands (Table 10). These variations in the vegetative growth and green yield might be due to their different potentiality in the natural resources, water and nutrient use efficiency.

These results are in agreement with those reported by Das *et al.* (1996), Srivastava and Srivastava (1996), Bisognin *et al.* (1997), Amer *et al.* (2002b) and Sawan (2002).

Table 7 : Effect of variety on green pods yield and its quality of snap bean plants

Varieties	Yield (ton / fed.)				1st harvesting time(day)	Bod quality		
	Early	Export.	Un-export.	Total		TSS	Length (cm)	Diameter (cm)
First Season								
Ferrari	1.476	3.759	1.578	5.338	58.28	5.59	11.49	0.77
Coby	1.388	4.605	1.006	5.611	58.94	6.33	10.81	0.66
Paulista	1.819	5.530	0.924	6.459	59.11	6.31	12.47	0.71
Amy	1.578	4.951	0.715	5.666	57.22	5.67	11.11	0.69
Samantha	1.515	4.896	0.750	5.646	58.78	5.97	12.54	0.65
Argose	2.171	3.113	4.658	7.772	57.56	6.33	18.31	0.96
L. S. D. 5%	0.061	0.141	0.092	0.153	0.73	0.28	0.36	0.04
Second Season								
Ferrari	1.589	4.010	1.626	5.636	60.78	5.50	11.42	0.75
Coby	1.531	4.850	1.066	5.915	61.61	6.17	10.72	0.65
Paulista	1.937	5.769	1.015	6.785	62.56	6.14	12.51	0.69
Amy	1.626	5.124	0.707	5.831	60.33	5.72	11.04	0.67
Samantha	1.615	4.949	0.974	5.923	61.89	6.17	12.28	0.65
Argose	2.273	2.710	5.214	7.923	60.83	6.53	18.17	0.90
L. S. D. 5%	0.063	0.153	0.137	0.225	1.06	0.31	0.28	0.02

B.3 Interaction effect

Data tabulated in Tables 8a and b show that the highest values of early and total green pods yield were obtained by sowing Argose var. on Feb. 7th and Oct. 10th followed by Paulista var. on the same sowing dates.

On the other hand, the best exportable yield was obtained by Paulista var. sown on Feb. 7th and Oct. 10th followed by Amy and Samantha vars. The period to the first harvest was the shortest in case of Amy var. which sown on Feb. 7th while the longest period to the beginning of harvest was when Paulista and Coby vars. were sown under low tunnels on Nov. 22nd.

The interaction effect between the two studied factors on pod quality characters; i.e., TSS, pod length and pod diameter showed significant variation. The high values of TSS were given by Coby var. sown on Nov. 1st and Argose var. sown on Jan. 15th.

Table 8a : Effect of interaction between sowing dates and snap bean varieties on green pods yield and its quality during 2000/2001

Parameters / Treatments		Yield (ton / fed.)				1st harvesting time(day)	Bod quality		
Sowing dates	Varieties	Early	Export.	Un-export.	Total		TSS	Length (cm)	Diameter (cm)
Oct. 10th	Ferrari	1.318	3.646	1.625	5.271	48.67	6.37	12.73	0.73
	Coby	1.184	4.982	1.046	6.028	50.00	6.67	11.20	0.62
	Paulista	1.971	6.368	1.058	7.460	51.00	6.50	12.70	0.73
	Amy	1.467	5.268	0.645	5.913	48.00	6.50	11.90	0.60
	Samantha	1.426	5.105	0.736	5.841	49.00	6.67	13.20	0.62
	Argose	2.503	3.190	4.834	8.024	48.00	6.50	19.23	0.96
Nov. 1st	Ferrari	1.545	3.143	1.330	4.473	56.67	4.33	11.83	0.78
	Coby	1.303	3.989	0.872	4.861	58.67	7.00	11.83	0.75
	Paulista	2.063	4.449	0.786	5.236	58.33	5.83	12.93	0.78
	Amy	1.902	4.490	0.464	4.954	56.33	5.33	11.37	0.77
	Samantha	1.698	4.304	0.548	4.852	61.00	6.00	12.17	0.67
	Argose	2.232	2.835	3.908	6.743	58.33	5.83	16.23	0.73
Nov. 22nd	Ferrari	1.288	3.962	1.619	5.580	70.33	5.67	10.87	0.77
	Coby	1.346	4.728	1.040	5.768	71.67	5.67	10.33	0.63
	Paulista	1.541	5.527	0.959	6.486	70.33	6.00	12.30	0.68
	Amy	1.227	4.683	0.748	5.431	68.33	5.33	10.83	0.70
	Samantha	1.322	5.076	0.890	5.966	68.33	6.17	12.03	0.65
	Argose	1.680	3.084	4.530	7.614	68.00	6.50	18.40	0.99
Dec. 12th	Ferrari	1.294	3.733	1.525	5.258	66.67	6.17	11.50	0.82
	Coby	1.200	4.447	0.980	5.427	66.67	6.50	10.33	0.63
	Paulista	1.336	5.194	0.875	6.069	67.33	6.83	12.17	0.72
	Amy	1.275	4.769	0.878	5.647	67.00	6.33	10.80	0.63
	Samantha	1.207	4.709	0.706	5.415	67.67	5.83	12.07	0.67
	Argose	1.752	3.022	4.764	7.786	68.33	6.00	18.43	1.03
Jan. 15th	Ferrari	1.815	3.691	1.497	5.188	60.00	5.50	10.90	0.73
	Coby	1.708	4.283	0.952	5.235	60.00	6.17	10.43	0.70
	Paulista	2.144	5.284	0.794	6.079	60.67	6.50	12.37	0.62
	Amy	1.821	4.648	0.754	5.402	57.67	5.17	10.87	0.73
	Samantha	1.841	4.700	0.722	5.423	58.00	5.50	13.17	0.65
	Argose	2.606	2.945	4.481	7.426	57.00	6.67	18.80	1.03
Feb. 7th	Ferrari	1.596	4.383	1.873	6.256	47.33	5.50	11.13	0.77
	Coby	1.589	5.200	1.144	6.344	46.67	6.00	10.70	0.65
	Paulista	1.858	6.358	1.069	7.427	47.00	6.17	12.33	0.72
	Amy	1.773	5.846	0.802	6.648	46.00	5.33	10.90	0.70
	Samantha	1.596	5.483	0.899	6.382	48.67	5.67	12.63	0.67
	Argose	2.253	3.604	5.432	9.036	45.67	6.50	18.77	0.98
L. S. D. 5%		0.149	0.344	0.225	0.374	1.78	0.68	0.8813	0.10

Table 8b : Effect of interaction between sowing dates and snap bean varieties on green pods yield and its quality during 2001/2002

Parameters / Treatments		Yield (ton / fed.)				1st harvesting time(day)	Bod quality		
Sowing dates	Varieties	Early	Export.	Un-export	Total		TSS	Length (cm)	Diameter (cm)
Oct. 10th	Ferrari	1.384	3.950	1.587	5.537	52.00	6.83	12.13	0.71
	Coby	1.224	5.259	1.154	6.413	52.33	6.83	11.23	0.63
	Paulista	2.230	6.684	1.181	7.865	54.33	6.33	13.30	0.69
	Amy	1.482	5.462	0.663	6.125	51.00	6.33	12.67	0.61
	Samantha	1.526	5.215	0.900	6.115	52.00	6.50	13.30	0.63
	Argose	2.522	2.626	5.764	8.390	51.00	6.67	18.37	0.92
Nov. 1st	Ferrari	1.682	3.401	1.392	4.793	60.00	4.17	11.93	0.73
	Coby	1.773	4.110	1.005	5.115	62.00	6.50	11.70	0.74
	Paulista	1.922	4.656	0.821	5.477	62.00	6.17	12.37	0.70
	Amy	1.879	4.690	0.600	5.290	58.33	5.17	10.83	0.74
	Samantha	1.786	4.091	0.996	5.086	64.33	6.67	11.87	0.68
	Argose	2.488	2.257	4.633	6.890	65.67	6.00	17.37	0.80
Nov. 22nd	Ferrari	1.426	4.165	1.655	5.820	69.00	5.33	10.80	0.72
	Coby	1.366	4.962	1.113	6.075	71.00	5.33	10.40	0.63
	Paulista	1.622	5.868	0.878	6.746	74.00	5.50	12.37	0.65
	Amy	1.244	5.070	0.564	5.634	71.00	5.67	10.77	0.67
	Samantha	1.462	5.180	1.135	6.315	72.00	6.33	12.40	0.63
	Argose	1.777	2.462	4.381	6.843	72.33	6.83	18.70	0.86
Dec. 12th	Ferrari	1.464	3.947	1.615	5.562	69.00	5.67	11.30	0.75
	Coby	1.241	4.829	0.939	5.768	73.00	6.17	10.30	0.65
	Paulista	1.642	5.473	0.935	6.408	71.67	6.83	12.57	0.68
	Amy	1.361	4.731	0.701	5.432	72.33	5.83	10.37	0.65
	Samantha	1.277	4.963	0.824	5.787	70.00	5.67	12.00	0.64
	Argose	1.826	2.907	5.489	8.397	70.00	6.00	18.47	0.94
Jan. 15th	Ferrari	1.920	3.895	1.591	5.487	64.00	5.50	10.87	0.77
	Coby	1.930	4.518	0.992	5.511	62.67	6.33	10.33	0.63
	Paulista	2.260	5.477	0.953	6.429	64.00	5.50	12.30	0.68
	Amy	1.995	4.954	0.739	5.693	62.00	5.50	10.83	0.70
	Samantha	1.962	4.850	0.726	5.575	61.67	6.00	12.03	0.65
	Argose	2.724	2.488	5.294	7.782	58.00	7.00	17.83	0.92
Feb. 7th	Ferrari	1.655	4.699	1.918	6.617	50.67	5.50	11.50	0.80
	Coby	1.655	5.420	1.190	6.610	48.67	5.83	10.33	0.63
	Paulista	1.946	6.458	1.324	7.782	49.33	6.50	12.17	0.72
	Amy	1.792	5.838	0.971	6.810	47.33	5.83	10.80	0.63
	Samantha	1.675	5.394	1.266	6.660	51.33	5.83	12.07	0.67
	Argose	2.299	3.518	5.720	9.238	48.00	6.67	18.27	0.92
L. S. D. 5%		0.155	0.375	0.336	0.551	2.61	0.76	0.6921	0.05

The interaction of any recorded parameter was significant and indicated that the vars. had a strong differential response to a specific weather conditions such as night temperature. In other words, the differential for tested varieties gene action was affected by differences in weather conditions.

These results are in agreement with findings of Ahlawat (1995), Srivastava and Srivastava (1996), Bisognin *et al.* (1997) and Sharma *et al.* (1997).

C. Electrophoretic Studies

SDS-PAGE for protein banding patterns are shown in figure 1 the descending arrangement of the studied varieties, concerning the number of major bands and contribution of band intensities are presented in the same Fig. 1.

It was clear that the variety Argose had the highest number of major protein bands with highly molecular weight and very dark stained bands. Such darkly stained bands were followed by the bands of Paulista var. Moreover, the bands of Samantha and Coby vars. were nearly equal in band intensities and number of major bands. Such differentiation in band density and number confirms the different behaviour of the tested varieties for many studied characteristics. Thus, characterization of the genetic resources and markers based on the biochemical levels are possible as shown in Fig. 1. It could be mentioned that there was an unique banding pattern out of the patterns in each plane. Such unique patterns were characterized as specific bands that were absent for the other plans. Such bands reflected the genetic background of each variety.

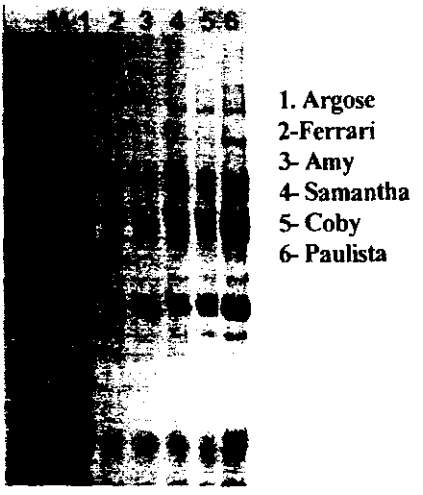

Fig. 1 : Polyacrylamide gels stained for protein after electrophoresis for six snap bean varieties.

Table 9 : Densitometeric analysis of water soluble protein (SDS-PAGE) representing band number and molecular weights (M.W.) of each band for six snap bean varieties

Band No.	M.W. (KDa)	Relative front	Varieties					
			Argose	Ferrari	Amy	Samantha	Coby	Paulista
1	180.35	0.164	0	0	1	1	1	0
2	179.23	0.166	1	1	0	0	0	1
3	146.22	0.229	0	0	1	0	1	0
4	145.64	0.231	0	1	0	1	0	1
5	144.56	0.233	1	0	0	0	0	0
6	114.30	0.316	0	0	0	1	1	0
7	113.91	0.319	1	0	0	0	0	1
8	110.36	0.347	0	0	0	1	1	0
9	109.99	0.352	0	0	0	0	0	1
10	103.11	0.413	1	1	0	0	0	0
11	102.24	0.421	0	0	1	1	1	1
12	69.77	0.531	1	0	0	0	0	0
13	66.31	0.541	0	0	0	0	1	0
14	65.56	0.543	0	0	0	1	0	0
15	64.48	0.547	0	0	0	0	0	1
16	51.35	0.597	1	0	0	0	0	0
17	49.73	0.604	0	1	0	1	1	0
18	47.85	0.612	0	0	1	0	0	0
19	46.72	0.617	0	0	0	0	0	1
20	42.42	0.655	1	0	0	0	0	0
21	41.69	0.667	0	1	1	1	1	0
22	40.85	0.674	0	0	0	0	0	1
23	38.44	0.704	1	0	0	0	0	0
24	37.88	0.711	0	0	0	0	0	1
25	35.97	0.737	0	0	0	0	0	1
26	29.34	0.832	1	0	0	0	1	1
27	26.32	0.893	1	1	1	1	0	1
28	25.84	0.914	1	1	0	0	1	1
29	24.77	0.932	1	1	1	1	1	1
30	23.85	0.939	0	0	1	1	1	0

From Table 9 and Fig. 1 it was clearly noticed that two out of six varieties, Argose and Paulista had the highly dark density of protein banding patterns, also they had the highest number of specific bands. The variety Argose had five specific bands (BN; 5,12,16,20,23) at RF% 0.233, 0.531, 0.597, 0.655 and 0.704, respectively. Moreover, the variety Paulista had six specific banding patterns (BN; 9,15,19,22, 24 and 25) at RF% 0.352, 0.547, 0.617, 0.674, 0.711 and 0.737, respectively. The smallest number of specific bands were detected from the four remained varieties. The varieties Samantha, Amy and

Coby had one specific band but Ferrari had no specific band.

Table 10 show that each variety was characterized by different genetic background and resources. It's of utmost importance to clear that varieties Argose and Paulista that 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.

Tables 8a, 8b and 10 showed gene action stability for the testing varieties at all testing sowing dates.

The results are in agreement with those reported by Amet (1992), Eweda (1993) and Sawan (2002).

Table 10 : Relation between specific bands for snap bean varieties and early yield as well as total yield

Variety	Early yield (ton/fed)			Total yield (ton/fed)			Specific bands
	2000/ 2001	2001/ 2002	Mean	2000/ 2001	2001/ 2002	Mean	
Ferrari	1.476	1.589	1.533	5.338	5.636	5.487	-
Coby	1.388	1.531	1.460	5.611	5.915	5.763	13
Paulista	1.819	1.937	1.878	6.454	6.785	6.620	9,19,22,24,25
Amy	1.578	1.626	1.602	5.666	5.831	5.749	18
Samantha	1.515	1.615	1.365	5.646	5.923	5.785	14
Argose	2.171	2.273	2.222	7.772	7.923	7.848	5,12,16,20,23
LSD	0.061	0.174		0.063	0.225		

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تأثير مواعيد الزراعة على التعبير الجينى لبعض أصناف الفاصوليا تحت ظروف منطقة شرق العوينات

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أجريت تجربتان حقليتان بمنطقة شرق العوينات – جنوب غرب مصر (حارة جافة) خلال موسمى ٢٠٠٠/٢٠٠١، ٢٠٠١/٢٠٠٢ لدراسة استجابة بعض أصناف الفاصوليا (بوليستا، سامنثا، كوبى، أمى، ارجوز، فرارى) لمواعيد زراعة مختلفة (١٠ أكتوبر، أول نوفمبر، ٢٢ نوفمبر، ١٢ ديسمبر، ١٥ يناير، ٧ فبراير) وأثر ذلك على النمو، ومحصول القرون وجودتها، بتعبير أخر لبيان تأثير الجو الحار الجاف على الأصناف المختبرة، ومعرفة أنسب ميعاد زراعة فى الظروف المشابهة.

كان هناك أثر واضح لمواعيد الزراعة على نمو أصناف الفاصوليا المختبرة، وكانت قيم الوزن الجاف للنبات فى أعلى معدلاتها بالزراعة فى ١٠ أكتوبر، و٧ فبراير يليهما فى الترتيب الزراعة فى ٢٢ نوفمبر و١٢ ديسمبر (تحت الأنفاق).

وقد تم الحصول على أعلى محصول من القرون الخضراء بالزراعة فى ١٠ أكتوبر و٢٢ نوفمبر، وقد أعطى الصنفان أرجوز وبوليستا أعلى قيم المادة الجافة للنبات، بينما كان الصنف فرارى أقل الأصناف فى محتواه من المادة الجافة، وكانت أعلى معدلات المحصول تم الحصول عليها من الصنفين أرجوز وبوليستا، ولكن الصنف بوليستا أعطى أفضل محصول تسويقى وأفضل مواصفات قرون ويليه فى الترتيب الأصناف سامنثا، وأمى، وكوبى.

وقد أظهرت دراسات التفريد الكهربى للبروتين أن الصنفين بوليستا وأرجوز ليست فقط الأعلى كثافة فى حزم البروتين والأكثر عدداً للحزم النوعية ولكنهما أيضاً اعطيا أعلى محصول من القرون الخضراء.