INFLUNCE OF SEED SIZE AND STORAGE TREATMENTS ON YIELD AND QUALITY OF FABA BEAN SEEDS

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ABSTRACT

An experiment was carried out at seed test lab and the experimental farm of Sakha Agric. Res. Station, ARC, Egypt during the period from May 1998 to Nov. 2000. Seeds of two faba bean cultivars (Nobaria 1 as a large seeded cv. and Sakha 1 as a medium seeded cv.) were graded after harvesting to obtain two lots (small and large). Every size was divided into two lots, the first one fumigated by Phostoxin and the second was left treatment without, and packaged in jute and tin containers for 6 and 18 months (first and second sowing dates).Data concerned with germination, seedling vigor, infestation with Bruchids, acidity, chemical analysis and seed yield ardab/ feddan were recorded.

The results indicated that, large seeded lot of the two cultivars gave the highest values of germination, seedling vigor, chemical composition, while the infestation with Bruchids and seed yield were not affected by cultivars and seed size. Fumigation treatment and tin container gave the highest values of germination, chemical composition and seed yield, while it gave the lowest values of acidity and infestation with Bruchsids. The percentage of germination, moisture content, fat and protein were decreased by increasing the storage period. On the other hand, acidity, crude fiber, ash and infestation with Bruchids were increased by increasing the storage period. The seed yield decreased at the first sowing season (6 months of storage), this reduction may be due to bad environmental condition and high level of infection with chocolate spot disease. The obtained data concluded that, large seed size, fumigation with recommended dose and tin container can maintain faba bean seed quality to longest duration.

Key words: faba bean seed, storage, package, cultivars, size, treat., period, germination, vigor, chemical composition, yield, bruchids, acidity

INTRODUCTION

Faba bean is the most important food legume crop in Egypt. It play a major role in the Egyptian diet as a source of protein. The national area at the last season 2001 was about 333810 feddan with an average of 8.7 ardab per feddan.

The first objective of this experiment was to determine whether or not growing faba bean from seeds of different sizes would influence seed yield and quality. Salih and Salih (1980) Salih (1981) reported that seed size did not affect on seed yield and yield components of both faba bean and dry bean. Also, Salih (1982) concluded no significant effect of seed size on seed yield of faba bean.

The second objective of this study was to maintain seed quality by suitable storage conditions for the longest duration possible. The most important factors affecting the quality of seeds are methods of handlings and methods of storage. It has been stated by many workers such as Fam, (1983); Yokoyama et al, (1993) and Attia and Badawi, (1996) found that the fumigation with phosphine controlled insects of storage seeds. Also, some workers (Attia and Badawi, (1996); Sayed, (1997) and Samia, (1999) found that the effect of fumigation with phosphine on germination was slight in dry seeds. Harras, (1985) and El-Refai et al. (1988) found that the physical and chemical composition of faba bean were decreased by increasing the storage period. The seed storability is considerably influenced by the kind/variety of seeds. The seed lots having vigorous, undeteriorated seeds store longer than deteriorated germination lots, Agrawal (1985). In recent years, packaging seeds in moisture-resistant or hermetically sealed containers for storage and marketing has been explored. The purpose of such containers is to maintain seeds at safe storage moisture levels. Ordinary paper and cloth containers were least effective, while various laminate and polyethylene materials were moderately effective. Metal cans were completely effective in maintaining seed moisture at the initial 5% level. Such completely moisture-proof containers hermetically seal the seed and are effective for long-term storage up to 10 years or more. The effectiveness of other materials was directly associated with their ability to resist moisture. Copeland and McDonald (1995). Seeds of faba bean were stored in six different package materials and tested periodically for viability, vigor of seedling, physical and changes of five storage periods; 2,4,8,12 and 20 months Sayed (1997). The results indicated that seeds stored within impermeable packages preserved higher values of germination than seeds stored within permeable packages. Prolonging storage periods significantly decreased germination percentages. Moisture content recorded significant

decrease at 8 months and significant increase at 20 months of storage. Data show significant decrease of fat percentage while acidity increased as storage period was increased. No effect on seed protein content was absorved, while seedling vigor greatly decreased when storage period was increased. Samia, (1999) studied the effect of storage containers, period and different seed treatments (dry heat and fumigation) on physical properties and chemical composition of faba bean seeds, the date show that physical properties after fumigation and heat treatment, only slightly deteriorated during storage for 9 months. The moisture content significantly decreased when the seeds were stored in plastic or metal containers. Storage containers and fumigation had no significant effect on crude protein, ether extract of seeds, crude fibers and ash, while the storage period resulted significant reduction in crude protein, ether extract and ash. Crude fiber was significantly effected by storage period.

MATERIALS AND METHODS

The experiments were carried out at Sakha Agric. Res. Station, ARC, Egypt during the period from May 1998 to November 2000. Seeds of two faba bean cultivars (Nobaria 1 as a large seed and Sakha 1 as a medium seed lots) were graded immidiatly after harvesting (zero time) to obtain two lots of small and large seeds from each cultivar. The seeds were divided into two lots, the first one was fumigated with phosphine (Phostoxin) and the other was no-fumigated. Fumigation was carried out in fumigated room at the rate of 2 tablets/m^3 (tablet =3g) and the seeds were exposed to the fumigant for three days. Seeds were packaged in jute and tin containers. Samples were taken at zero time (after harvesting), 6 months (at the first sowing season) and 18 months (at the second sowing season) for physical, chemical analysis and infestation with Bruchids.

Sixteen seed samples were taken after 6 months of storage (first agriculture sowing season) and after 18 months of storage (second agriculture sowing season), compared with the samples which were taken at zero time. For each seed sample, the standard germination test in vitro was conducted. Germination test was carried out under optimum conditions according to international rules (ISTA, 1993).Seeds were kept for 24 hr. in distilled water at room temperature, then transferred to moisture cloth layers and allowed to germinate, at room temperature (25°C) for 12 days. During germination, the cloth layers were kept always moisture by rinsing with water. The radical, shoot length and seedling dry weight were measured according to the procedures reported in the seed vigor testing hand book (A.O.S.A,1991). For each sample, the infestation with Bruchids (Broad bean beetle *Bruchus rufimanus Boh.*, small Broad bean beetle *Bruchidius*

incarnatus and cowpea seed beetle (*Callosobruchus maculates f.*) were determined. For the field emergence test, 120 seeds were planted in 4 rows in three replicates for 16 treatments. E merged seedlings were counted two weeks after planting.

For chemical analysis, each seed sample was ground to a fine powder to pass through 2-mm screen. Moisture, fat, crude protein, crude fiber, ash content and acidity were determined according to the procedures of the A.O.A.C, (1990).

Factorial completely randomized block design was used in field experiment with three replicates, every replicate included 16 treatments. The plot size consisted of four rows. The chemical compositions of the top 25 cm soil depth in both seasons are presented in (Table 1a). Also, the weather conditions in the two growing seasons are presented in (Table 1b) according to data collected from climate laboratory at Sakha Agric. Res. Station. At harvesting two centeral rows were harvested to determine seed yield (ardab /feddan).

Table (1a): Chemical compositions of experimental field soil in the two growing season.

Nutriet status	Seaeons	
	1998/1999	1999/2000
Soil reaction PH	8.10	8.10
Organic matter %	2.00	2.05
Available N ppm	21.00	22.10
Available P ppm	7.82	7.93
Available K ppm	258.00	295.00

Table (1 b): Means of temperature degrees, relative humidity (R.h.) and rainfall every month in the two growing seasons.

Date	1998/1999				1999/2000			
	Temp.C°		R.h.	Rains	Temp.C°		R.h.	Rains
	Max.	Min.	%	(m m)	Max.	Min.	%	(m m)
Nov.	26.0	12.0	75	-	26.5	13.3	79	-
Dec.	20.5	8.0	70	3.6	17.5	9.5	70	17
Jan.	18.7	8.0	68	7.8	16.5	5.8	68	25
Feb.	19.6	7.3	78	11.8	19.6	6.7	75	5
Maech	20.5	10.3	66	-	21.0	8.0	72	5
April	25.5	9.3	74	5.1	24.5	12.0	47	-

Collected data were analyzed according to the factorial completely randomized block design as mentioned by Gomoz and Gomoz (1984). The

treatment averages were compared using the least significant difference (L.S.D) method.

RESULTS AND DISCUSSION

The effect of cultivars, seed size, fumigation, package and storage period on germination, seedling vigor, infestation with Bruchids, acidity, chemical compositions and seed yield ardab /feddan are presented in Table 2. The results reveal that Nobaria 1 cultivar gave significant increase in germination percentage at lab. While it gave a slight increase under the field condition for this trait.. On the large size of seeds, this percentage increased at lab while the small size gave the highest value under field condition, Agrawal (1985), recorded that the seed storability was considerably influenced by variety of seeds. The fumigated seeds gave the highest values of germination percentages under the lab and field condition. This increase may be regard to less infestation with Bruchids . Attia and Badawi, (1996) found that the fumigation treatment with recommended does (3tab/m^3) for 3 days at 25°C and 12 % seed moisture content on germination was the lowest treatment affecting seed viability. Storage with can had a significant increase on seed germination at lab and field conditions when it was compared with jute package. While the storage period resulted significant reduction in germination percentage especially after 18 months. The same results were obtained by Sayed, (1997).

With regard to the seedling vigor (radical length, plumule length and seedling dry weight) as shown in Table 2, the results indicated that no significant differences were observed between cultivars, while the data recorded significant increase of seedling vigor under the large size of seeds, fumigated seeds and can package. Storage period caused a significant decrease on seedling vigor estimates. Similar results were obtained by Attia and Badawi (1996) and Sayed (1997).

The lowest values of acidity percentage were observed with Sakha 1 cultivar, large size of seeds, fumigated seeds, can package and zero period. Sayed (1997) found that the acidity % increased as storage period was increased.

The effect of studied factors on chemical composition showe insignificant differences between cultivars to with respect moisture content, fat and ash percentages Sakha 1 cultivar recorded highest values of protein and crude fiber percentages. On the other hand, the highest value of the chemical compositions were obtained with large size of seeds. Under the fumigation treatment, the high values of moisture content, fat and protein percentages were observed, while the crude fiber and ash percentages increased significantly under non-fumigation treatment. Samia (1999)

Table (2): Effect of cultivars, seed size, seed treatments, package and storage period on germination, seedling vigor, Bruchids infestaion, acidity, chemical compositions and seed yield /feddan.

Interaction	Cultivar		Sig	Size		Sig	Treat.		Sig	Package		Sig	Period			Sig	LSD at (5%)
	Sakha 1	Nobaria 1		Large	Small		Fumiga-tion	Non Fumigation		Jute	Can		Zero	6 months	18 months		
Germination (%) lab	84.25	87.82	**	88.68	83.39	**	92.13	79.94	**	76.63	95.44	**	99.00	86.88	72.23	**	2.64
Germination (%) field	75.79	76.88	N.S	73.42	79.25	**	81.44	71.23	**	68.46	84.21	**	-	85.06	67.60	**	
Seedling vigor																	
Radical length (cm)	20.53	20.94	N.S	21.59	19.88	**	21.19	20.28	*	19.51	21.96	**	22.80	20.73	18.67	**	1.14
Plumule length (cm)	19.31	19.77	N.S	22.38	16.70	**	20.24	18.83	**	18.91	20.17	**	21.81	18.46	18.34	*	2.11
Seedling dry weightmg)	207.60	200.63	N.S	228.03	180.19	**	206.75	201.47	*	181.81	226.42	**	222.33	201.17	188.83	*	15.53
Bruchids	21.76	20.46	N.S	22.37	19.85	N.S	10.08	32.14	**	37.48	4.74	**	2.93	24.98	35.43	**	1.16
Acidity (%)	17.27	17.90	**	17.48	17.68	**	17.35	17.82	**	18.35	16.81	**	15.70	16.94	20.10	**	0.231
Chemical compositions																	
Moisture content (%)	12.00	12.00	N.S	12.07	11.92	**	12.03	11.97	**	12.10	11.89	**	12.04	12.35	11.60	**	0.139
Fat (%)	1.78	1.79	N.S	1.87	1.71	**	1.87	1.71	**	1.67	1.91	**	207	1.84	1.45	**	0.069
Protein (%)	29.79	29.22	**	29.97	29.04	**	29.79	29.22	**	29.20	29.81	**	30.18	29.97	28.36	**	0.207
Crude fiber (%)	5.58	5.36	**	5.81	5.13	**	5.33	5.62	**	5.81	5.14	**	4.95	5.29	6.18	**	0.160
Ash (%)	4.20	4.14	N.S	4.41	3.93	**	4.06	4.27	**	4.22	4.12	**	3.81	4.02	4.67	**	0.225
Seed yield rdab/feddan	14.59	14.68	N.S	14.73	14.54	N.S	15.31	13.95	**	14.05	15.22	**	-	13.53	15.7	**	

recorded that fumigation had no significant effect on crude protein, ether extract of seeds, crude fiber and ash. Under the jute package moisture content, crude fiber and ash increased, while, fat and protein increased at the can package. Moisture content, fat and protein were decreased significantly by storage period and the lowest values were recorded under 18 months of storage, meanwhile the crude fiber and ash were increased significantly by storage period. Similar results were obtained by Sayed (1997).

Seed yield ardab /feddan was not affected by cultivars and seed size (Table 2). While, the highest seed yield was obtained under fumigated treatment and can package. Seed yield ardab /feddan increased significantly at the second growing season (18 months of storage) when it compared to seed yield in the first season (6 months of storage). This increase may be due to the suitable environmental condition and less infection with foliage diseases during the second growing season (Table 1b).

The percentage of infestation with Bruchids was not affected by cultivars and seed size (Table 2). This percentage was decreased significantly with fumigated treatment and can package, while the percentage of infection was increased with increasing the period of storage.

With regard to the interaction between cultivars and seed size, the percentage of protein, crude fiber and ash, were affected significantly (Table 2, 3). The highest values were recorded under large seeds of Sakha 1 cultivar.

The interaction effects between cultivars and seed treatments (fumigation), according to data collected in Table (3) show that significant increase was found on germination at lab and fat percent with fumigation of the two cultivars. On the other hand, the lowest values of Bruchids infestation were recorded with fumigated treatment for the two tested cultivars. While, the other traits were not affected by this interaction.

Data concerned with the effect of the interaction between cultivars and packages on germination, seedling vigor, acidity and chemical composition as well as seed yield ardab /faddan are presented in (Table 3). Significant effects were obtained for germination, plumule length and seedling dry weight. The highest means of these traits were obtained with Nobaria 1 cultivar and can package. The lowest value of acidity was recorded for Nobaria 1 in can package. The lowest means of moisture content were noticed with can package for the two cultivars. While, chemical composition and seed yield ardab /feddan were not affected by cultivars × package interaction. The lowest infection with Bruchids was observed under can package for the two cultivars.

Regarding the interaction effect between cultivars and storage periods, data collected in Table 3 show that significant effect for this interaction was

Table (3): Effect of the interaction between cultivars, seed treatments, package and storage periods on germination, seedling vigor,Bruchids infestation, acidity, chemical compositions and seed yield/feddan.

Interaction	Germination %		Seedling vigor			Bruchids infection (%)	Acidity (%)	Chemical compsitions					Seed yield (ardab/ fed.)
	(Lab)	(Field)	Radical length (cm)	Plumule length (cm)	Seedling dry weight (mg)			Moisture content (%)	Fat (%)	Protein (%)	Crude fiber (%)	Ash (%)	
Effect of the interaction between cultivars and seed size													
Sakha 1 × Large	86.39	73.38	21.04	21.99	233.78	22.45	17.24	12.07	1.82	30.56	6.04	4.51	14.11
Sakha 1 × Small	82.11	78.21	20.02	16.62	181.42	21.07	17.29	11.92	1.75	29.02	5.13	3.88	14.11
Nobaria 1× Large	90.97	73.46	22.14	22.76	222.28	22.29	17.72	12.07	1.92	29.38	5.58	4.31	14.34
Nobaria 1× Small	84.67	80.29	19.74	16.77	178.97	18.62	18.08	11.92	1.67	29.05	5.14	3.98	14.11
Sig	N.S	N.S	N.S	N.S	N.S	**	N.S	N.S	N.S	**	**	**	N.S
L.S.D at (5%)	-	-	-	-	-	0.850	-	-	-	0.175	0.154	0.119	-
Effect of the interaction between cultivars and seed treatments													
Sakha 1 × Fumigation	91.25	81.29	20.77	20.20	212.58	10.18	17.09	12.02	1.84	30.10	5.43	4.13	14.11
Nobaria 1× Fumigation	93.00	81.58	21.61	20.29	200.92	9.98	17.60	12.03	1.89	29.47	5.22	4.00	15.47
Sakha1 ×Non Fumigation	77.25	70.29	20.29	18.42	202.61	33.35	17.44	11.97	1.73	29.48	5.74	4.26	14.11
Nobaria1×Non Fumigation	82.64	72.17	20.27	19.25	200.33	30.94	18.19	11.97	1.70	28.96	5.50	4.29	12.98
Sig	**	N.S	N.S	N.S	N.S		N.S	N.S	*	N.S	N.S	N.S	N.S
L.S.D at (5%)	2.07	-	-	-	-	0.903	-	-	0.051	-	-	-	-
Effect of the interaction between cultivars and package													
Sakha 1 × jute	71.50	68.92	19.01	17.58	174.61	38.89	18.45	12.13	1.68	29.47	5.94	4.24	13.44
Sakha 1 × jute	81.75	68.00	20.00	20.24	188.00	36.07	18.26	12.07	1.66	28.92	5.67	4.21	13.66
Nobaria 1× can	93.89	82.67	22.05	19.30	213.25	4.64	17.58	11.87	1.89	30.11	5.22	4.16	14.79
Nobaria 1× can	97.00	85.75	21.88	21.04	239.58	4.85	16.08	11.92	1.93	29.52	5.05	4.07	14.68
Sig	**	N.S	N.S	**	**	**	**	*	N.S	N.S	N.S	N.S	N.S
L.S.D at (5%)	2.07	-	-	1.12	12.01	0.903	0.185	0.063	-	-	-	-	-
Effect of interaction between cultivars and storage periods													
Sakha 1 × zero	98.83	-	22.78	21.81	240.79	2.22	15.63	12.00	2.02	30.63	5.02	3.87	-
Nobaria 1× zero	99.17	-	22.83	21.80	203.88	3.64	15.77	12.07	2.12	29.73	4.88	3.75	-
Sakha1 × 6 months	82.08	84.50	20.13	18.18	200.25	26.79	16.75	12.39	1.82	30.26	5.44	4.04	13.66
Nobaria1× 6 months	91.67	85.63	21.33	18.74	202.08	23.16	17.13	12.31	1.87	29.68	5.13	4.00	12.53
Sakha1 × 18 months	71.83	67.08	18.69	17.93	181.75	36.28	19.43	11.60	1.39	28.48	6.29	4.67	14.56
Nobaria1× 18 months	72.63	68.13	18.65	18.76	195.92	34.57	20.78	11.61	1.51	28.24	6.06	4.68	15.81
Sig	**	N.S	N.S	N.S	**	**	**	*	**	**	N.S	N.S	*
L.S.D at (5%)	2.54	-	-	-	14.71	1.11	0.226	0.078	0.063	0.203	-	-	0.975

found on germination percentages at lab and field and seedling dry weight. The highest germination percentages were noticed with Nobaria 1 cultivar, while the lowest values of the two traits were obtained under 18 months of storage. Acidity was increased significantly by increasing the storage period. Meanwhile, moisture content, fat and protein were decreased by increasing the storage period. For the two tested cultivars, the highest seed yield was recorded under the second growing season. Concerning with the percentage of infection with Bruchids, the percentage was increased with increasing the period of storage of the two cultivars.

Regarding the interaction effect between seed size and fumigation data collected in Table (4) reveal significant effect only on germination at lab. The highest values were obtained with large size and fumigation treatment. Also, fumigation decreased the infection with Bruchids significantly under large and small seed size.

The interaction effect between seed size and package show insignificant effect for all tested traits.

Data listed in Table (4) show that the interaction between seed size and storage period caused significant decrease on germination percentages at lab and field conditions and plumule length of seedling by increasing the storage period. The reduction increased under the large size of seeds at 18 months. While the acidity was increased by increasing the storage period with large size seeds. Fat and protein percentages were decreased significantly by increasing storage period under the small size seeds, while ash content was increased significantly with large size seeds under 18 months of storage. Seed yield ardab /feddan increased at the second season for the two seed size. The infection with Bruchids increased was with increasing storage periods.

Data in Table (5) show that the effect of interaction between package and fumigation had a significant effect on germination percentages, plumule length and seedling dry weight under can package with non-fumigated and fumigated seeds. The highest seedling dry weight was obtained with non-fumigation × can package. Acidity and moisture content percentages were decreased significantly with can package under fumigation and non-fumigation. On the other hand the highest values for fat and protein contents were recorded under can package × fumigation or non-fumigation. While, crude fiber and ash percentages were increased with jute package × non-fumigation followed by jute package × fumigation. The highest seed yield was obtained with fumigation for jute and can package and with non-fumigation for can package only. Infestation with Bruchids, was decreased significantly with can package under fumigation and non-fumigation treatments.

Table (4): Effect of the interaction between seed size, seed treatments and storage periods on germination, seedling vigor, Bruchids infestation, acidity, chemical compositions and seed yield, /feddan.

Interaction	Germination %		Seedling vigor			Bruchids infection (%)	Acidity (%)	Chemical compositions					Seed yield (ardab/ fed.)
	Lab	Field	Radical length (cm)	Plumule length (cm)	Seedling dry weight (mg)			Moisture content (%)	Fat (%)	Protein (%)	Crude fiber (%)	Ash (%)	
Effect of the interaction between seed size and treatments.													
Large × Fumigation	93.47	78.79	22.03	23.35	228.53	10.40	17.26	12.11	1.95	30.24	5.66	4.30	14.79
small × Fumigation	90.78	84.08	20.35	17.13	184.97	9.75	17.44	11.94	1.78	29.34	4.99	3.82	14.79
large × Non fumigati	83.89	68.04	21.14	21.40	227.53	34.34	17.70	12.04	1.78	29.70	5.96	4.51	13.66
small × Non fumigation	76.00	74.42	19.41	16.26	175.42	29.95	17.93	11.90	1.64	28.74	5.28	4.04	13.32
Sig	* *	N.S	N.S	N.S	N.S	* *	N.S	N.S	N.S	N.S	N.S	N.S	N.S
L.S.D at (5%)	2.392	-	-	-	-	0.850	-	-	-	-	-	-	-
Effect of the interaction between seed size and storage periods.													
Lrge × Zero	100	-	23.90	25.62	247.75	2.93	15.41	12.15	2.20	30.70	5.32	4.04	-
small × Zero	98	-	21.71	18.00	196.92	2.92	15.99	11.93	1.95	29.67	4.58	3.58	-
large × 6 months	89.38	84.17	21.38	21.05	227.83	27.35	16.77	12.42	1.91	30.52	5.68	4.35	13.55
small × 6 months	84.38	85.96	20.08	16.22	174.50	22.60	17.11	12.29	1.78	29.42	4.89	3.69	12.65
large ×18 month	76.67	62.67	19.49	20.47	208.50	36.82	20.26	11.66	1.50	28.70	6.43	4.83	14.90
small × 18 month	67.79	72.54	17.85	15.88	169.17	34.03	19.95	11.55	1.40	28.02	5.93	4.52	15.47
Sig	* *	* *	N.S	* *	N.S	* *	* *	N.S	* *	* *	N.S	* *	0.89
L.S.D at (5%)	2.930	2.59	-	0.9972	-	1.04	0.1547	-	0.0410	0.2133	-	0.1457	-

Recorded data in Table (5) show significant decrease for the interaction between 18 months of storage and non-fumigation treatment on germination percentages, plumule length and seedling dry weight. Acidity was increased and moisture content was decreased by increasing storage period under fumigation and non-fumigation treatments. Fat and protein contents were decreased and crude fiber and ash percentages were increased by increasing storage periods with non-fumigation treatment. The lowest value of infection with Bruchids was recorded under fumigation treatments they, were increased by increasing the period of storage.

A significant interaction between package and storage periods on all traits are presented in Table (6). It is observed that the percentages of germination and seedling vigor recorded higher values under can package × 18 months of storage, while these percentages were decreased significantly under jute package at the same period of storage. The highest value of acidity was observed under 18 months of storage × jute package. Moisture content, fat and protein content were decreased significantly by increasing storage period especially in jute package. While, the highest values of crude fibers and ash percentages were recorded under 18 months × jute package. With can package, the infestation of Bruchids was decreased significantly.

The interaction effects between storage periods, seed treatments and package (Fig.1) or cultivars (Fig.2) or seed size (Fig.3) on germination % show that can package with or without fumigation, fumigation with the two tested cultivars and fumigation with large or small seed sizes gave the highest values under all storage periods.

The interaction effect between seed treatments, package and cultivars (Fig.4) or seed size (Fig.5) on germination % indicated that the treated seeds for the two cultivars in can package recorded the highest values.

The interaction effect between storage periods, package and cultivars (Fig.6) or seed size (Fig.7) on germination %, show that the can package gave the highest values under the two seed size for the two cultivars with the three tested storage periods.

Data listed in (Fig.8) show that the interaction between storage periods, cultivars and seed size caused high values of germination % under 18 months of storage for the large seeds of the two cultivars.

Data in (Fig.9) show that effect of the interaction between storage periods, seed treatments, package and seed size on germination percentage. High percentages of this trait with can package, treated or nontreated, large or small size under all tested periods of storage.

Table (5): Effect of the interaction between packaged, seed treatments and storage periods, on germination, seedling vigor,Bruchids infestation, acidity, chemical compositions and seed yield /fedan.

Interaction	Germination %		Seedling vigor			Bruchids infection (%)	Acidity (%)	Chemical compositions					Seed yield (ardab/ fed.)
	Lab	Field	Radical length (cm)	Plumule length (cm)	Seedling dry weight (mg)			Moisture content (%)	Fat (%)	Protein (%)	Crude fiber (%)	Ash (%)	
Effect of the interaction between package and treatments.													
jute × Fumigation	88.31	77.04	19.94	20.16	193.36	16.49	18.02	12.15	1.79	29.65	5.55	4.12	14.90
Can × Fumigation	95.94	85.83	22.44	20.33	220.14	3.66	16.68	11.90	1.94	29.92	5.10	4.02	14.79
jute × Non fumigation	64.94	59.88	19.07	17.48	170.25	58.47	18.69	12.05	1.55	28.74	6.06	4.42	12.31
Can × Non fumigation	94.94	82.58	21.49	20.18	232.69	5.81	16.95	11.89	1.87	29.70	5.17	4.11	14.68
Sig	**	**	N.S	**	**	**	**	*	**	**	**	**	**
L.S.D at (5%)	1.807	3.37	-	0.7181	5.726	1.36	0.1089	0.0586	0.0563	0.1378	0.1137	0.0812	0.90
Effect of the interaction between seed size and storage periods.													
Fumigation × Zero	99.00	-	23.28	21.81	223.08	2.46	15.70	12.04	2.07	30.18	4.95	3.81	-
Non fumigation × Zero	99.00	-	22.28	21.81	223.08	3.40	15.70	12.04	2.07	30.18	4.95	3.81	-
Fumigation × 6 months	93.96	89.46	20.66	19.01	207.29	5.88	16.89	12.37	1.96	30.21	5.12	3.89	13.44
Non fumigation × 6 months	79.79	80.67	20.80	17.91	195.04	44.07	16.99	12.33	1.73	29.73	5.45	4.16	12.76
Fumigation × 18 month	83.42	73.42	19.63	19.91	189.88	21.89	19.45	11.67	1.57	28.97	5.90	4.49	16.15
Non fumigation × 18 month	61.04	64.79	17.72	16.78	187.79	48.96	20.76	11.54	1.34	27.75	6.45	4.86	14.23
Sig	**	N.S	N.S	**	*	*	**	*	**	**	**	*	N.S
L.S.D at (5%)	1.141	-	1.459	0.9215	6.579	1.60	0.9547	0.0670	0.0805	0.2047	0.1672	0.2023	-

Table (6): Effect of the interaction between package and storage periods, on germination, seedling vigor,Bruchids infestation, acidity, chemical compositions and seed yield/feddan.

Interaction	Germination %		Seedling vigor			Bruchids infection (%)	Acidity (%)	Chemical compositions					Seed yield (ardab/ fed.)
	Lab	Field	Radical length (cm)	Radical length (cm)	Radical length (cm)			Moisture content (%)	Fat (%)	Protein (%)	Crude fiber (%)	Ash (%)	
Jute × Zero	99.00	-	23.28	21.81	224.46	3.42	15.70	12.04	2.07	30.18	4.95	3.81	-
Can × Zero	99.00	-	22.28	21.81	224.46	2.43	15.70	12.04	2.07	30.18	4.95	3.81	-
Jute × 6 months	76.88	83.04	19.02	17.60	177.88	44.38	17.28	12.68	1.72	29.68	5.63	4.03	12.76
Can × 6 months	96.88	87.08	22.44	19.32	221.71	5.57	16.61	12.02	1.97	30.18	4.95	4.01	13.44
Jute × 18 month	54.00	53.87	16.21	17.81	145.96	64.63	22.08	11.59	1.22	27.72	6.84	4.83	14.45
Can × 18 month	90.46	81.33	21.13	19.38	221.46	6.22	18.13	11.62	1.68	29.29	5.51	4.52	16.03
Sig	**	**	**	**	**	**	**	**	**	**	**	**	N.S
L.S.D at (5%)	2.213	3.37	1.313	0.8794	7.013	1.67	0.1334	0.0717	0.0689	0.1688	0.1392	0.0995	-

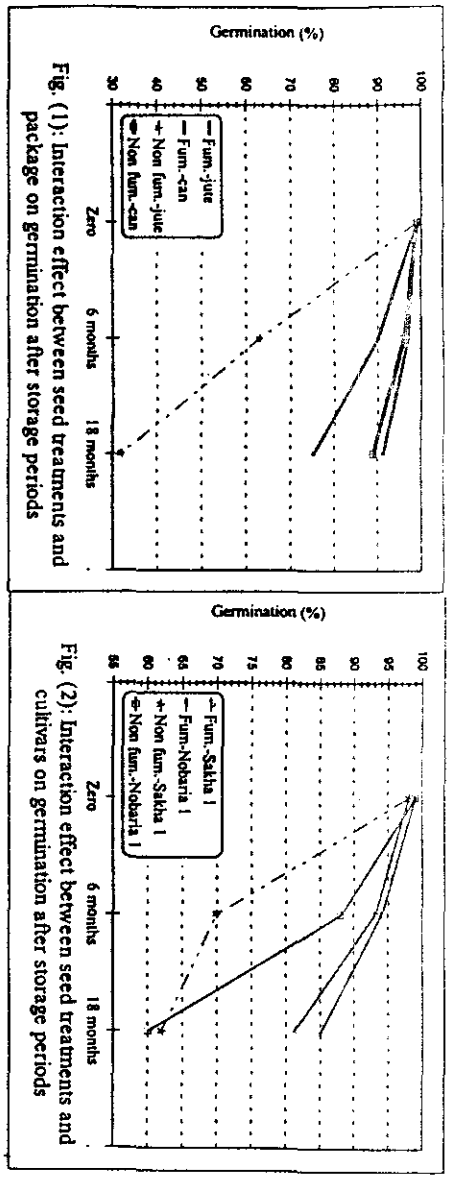

Fig. (1): Interaction effect between seed treatments and package on germination after storage periods

Fig. (2): Interaction effect between seed treatments and cultivars on germination after storage periods

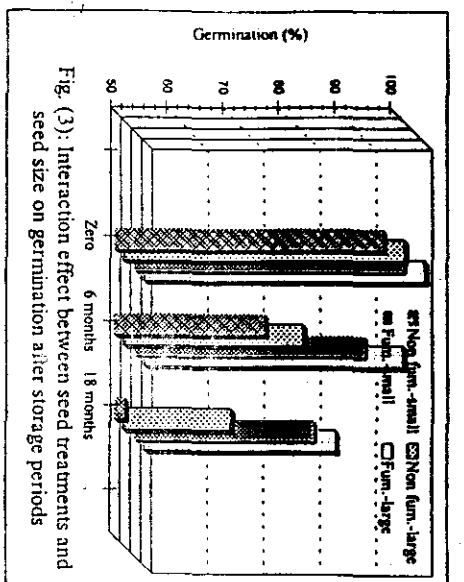

Fig. (3): Interaction effect between seed treatments and seed size on germination after storage periods

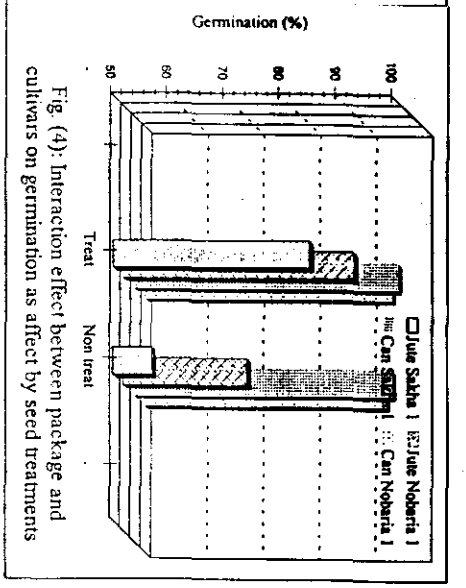

Fig. (4): Interaction effect between package and cultivars on germination as affect by seed treatments

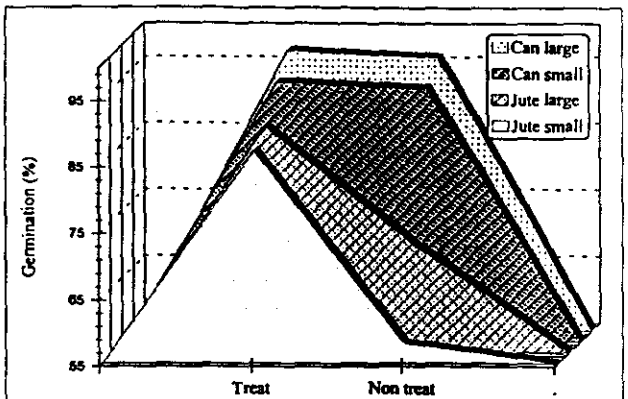

Fig. (5): Interaction effect between package and seed size on germination as affect by seed treatments

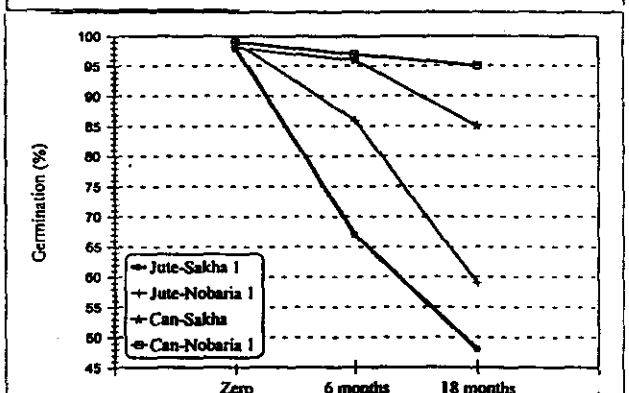

Fig. (6): Interaction effect between cultivars and seed size on germination after storage periods

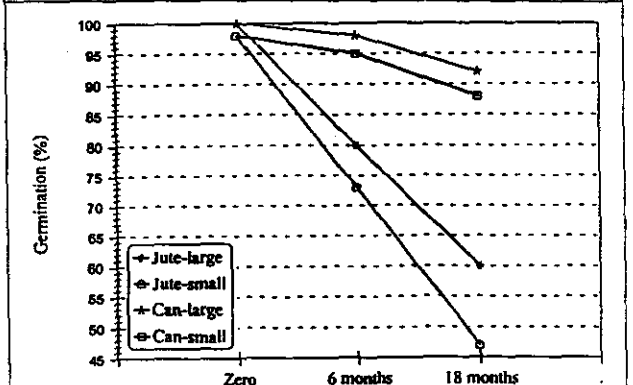

Fig. (7): Interaction effect between package and seed size on germination after storage periods

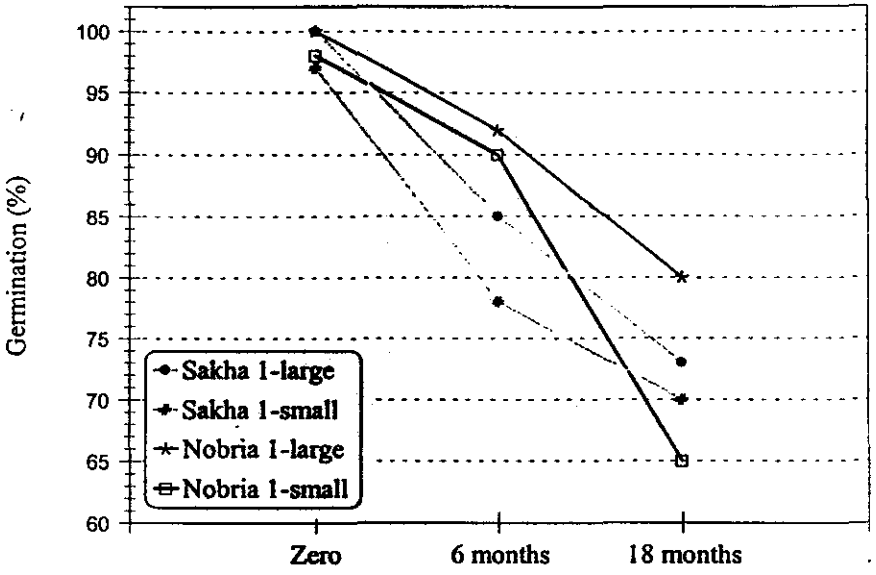

Fig. (8): Interaction effect between cultivars and seed size on germination after storage periods

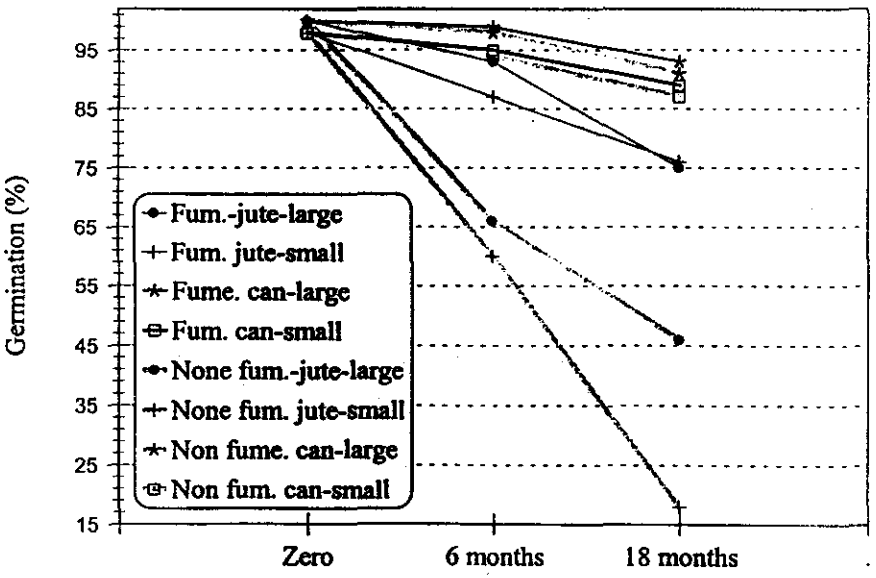

Fig. (9): Effect of seed treatments, package and seed size on germination after storage periods

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الملخص العربى

تأثير المعاملات التخزينيه وحجم البذور على جوده ومحصول بذور الفول البلدي

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تمت هذه الدراسة في معمل تكنولوجيا البذور والمزرعة البحثية لمحطة البحوث الزراعية بسخا في الفترة من مايو ١٩٩٨ وحتى أبريل ٢٠٠٠. أخذت بذور صنفي من الفول البلدي (نوباريه ١ يمثل الفول كبير حجم البذور، سخا ١ يمثل الفول متوسط حجم البذور) بعد الحصاد مباشرة وتم تدريج كل صنف إلى حجمين أحدهما كبير والآخر صغير ثم تقسيمهم إلى نصفين ثم تبخير الأول بأقراص الفستوكسين بمعدل ٣ أقراص للمتر المكعب من حجم المخزن وتم تعريضها لمدة ٣ أيام والجزء الأخر لم يتم تبخيره وتم توزيعهما على نوعين من العبوات الأول عبوات من الجوت والثاني عبوات من الصاج (تشبه البراميل) وتركت بالمخزن لحين الزراعة في الموسم الأول (نوفمبر ١٩٩٨) ثم أخذت

العينات، وترك الجزء الثاني حتى الزراعة في الموسم الثاني (نوفمبر ١٩٩٩) . تم أخذ عينات لدراسة تأثير هذه المعاملات على الإنبات سواء في المعمل أو الحقل وكذا حيوية البذور والإصابة بخنافس الفول (خنفساء الفول الكبيرة، خنفساء الفول الصغيرة وخنفساء اللوبيا) والحموضة الكلية والمكونات الكيماوية مثل نسبة البروتين والدهون والرطوبة الألياف والرماد وتم تقدير محصول الفدان من البذور لموسمي الزراعة عندما اختبرت هذه المعاملات في حقل التجارب.

وقد دلت النتائج على أن حجم الفول الكبير لصنفي الفول المختبرين أعطى نسبة إنبات عالية وكذلك حيوية أعلى وكانت نسبة المكونات الكيماوية عالية مقارنة بالحجم الصغير، في حين لم تتأثر نسبة الإصابة بالخنافس وكذلك محصول البذور بالحجم أو بصنف الفول. أعطى التبخير والتخزين في عبوات من الصاج أعلى القيم للإنبات ومعظم المكونات الكيماوية وكذلك محصول البذور بالأردب للفدان يليه التخزين في عبوات من الصاج دون تبخير في حين انخفضت نسبة الحموضة في البذور وكذلك الإصابة الحشرية بالخنافس. بزيادة مدة التخزين انخفضت نسبة الإنبات، الرطوبة، الدهون و البروتين خاصة في العبوات الجوت سواء معاملة بالتبخير أو غير معامله في حين زادت الحموضة الكلية والألياف في البذور وكذلك الرماد ونسبة الاصابه بالخنافس. عموما كان محصول الموسم الأول أقل من محصول الموسم الزراعي الثاني وذلك راجع إلى الأصابه بأمراض المجموع الخضري وعدم مناسبة الظروف الجوية للحصول على محصول جيد. ويمكن استنتاج أن الحجم الكبير للبذور وكذلك التخزين في عبوات صاج سواء معامله بالتبخير أو بدون تبخير تطيل مده حيوية البذور للفول البلدي وتحافظ على جودتها. ويلاحظ أن استخدام العبوات والمصنوعه من الصاج يجنبنا استخدام الكيماويات مع المحافظة على حيوية البذور وتركيبها الكيماوي وذلك لمده موسمين زراعيين على الأقل .