

**A NEW RELEASED EARLY MATURE FABA BEAN (*Vicia faba* L.) CULTIVAR "SAKHA 1"**

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**ABSTRACT**

The development of early mature high yielding faba bean (*Vicia faba* L.) cultivars is one of the most important activities of breeding program in Egypt. Early mature cultivars are needed to increase faba bean area through planting faba bean prior to cotton instead of berseem clover. The new cultivar Sakha 1 (x 957) was released in 2001 for early maturity and resistance to chocolate spot (*Botrytis fabae*) and rust (*Uromyces fabae*) along with high yield potential. Sakha 1 was evaluated through a series of yield trials conducted during 1994-95 and 1995-96 seasons in back-up research at Sakha Agric. Res. Station beside 8 on-farm trials conducted in Beheira, Kafr El-Sheikh and Dakhliya governorates in North Egypt during 1996-97, 1997-98 and 1998-99 seasons. Finally, Sakha 1 (x957) was evaluated in 18 demonstration plots selected in Kafr El-Sheikh (14) and Dakhliya (4) in 1999-00 season to demonstrate to farmers and extension staff the impact of planting Sakha 1 prior to cotton in cotton rotation comparing with farmers' cultivars. Data indicated that, Sakha 1 (x 957) produced the highest seed yields (1304, 12.97, 11.30, 12.55 and 8.95 ardab/fed.) among all tested breeding lines in the five growing seasons, respectively and exceeded the check cultivar Giza 461 by 17% in seed yield as an average of the five seasons. Also, over 18 demonstration plots, Sakha 1 exceeded farmers' cultivars in seed yield by about 2 ardab/fed. (28%) as an average. Data of foliar diseases reactions showed that over five seasons, Sakha 1 was markedly resistant to chocolate spot and rust, and almost similar to the resistant cultivar Giza 461. Concerning to earliness, Sakha 1 reached maturity earlier than Giza 461 by about 24 days as an average which allows farmers to grow cotton after faba bean in due time.

**INTRODUCTION**

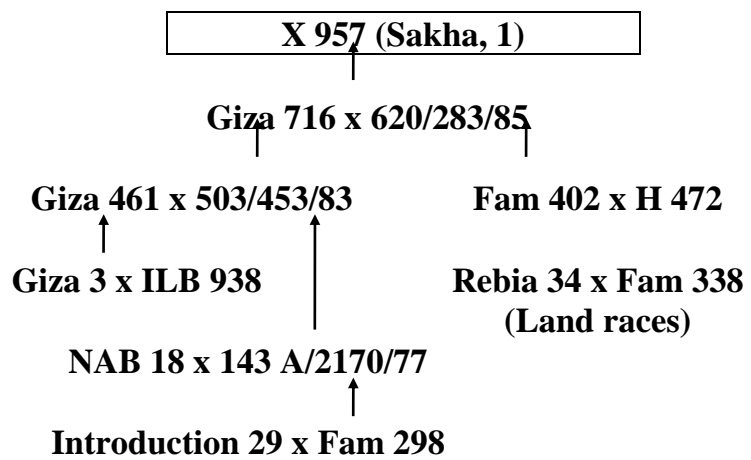
Faba bean (*Vicia faba* L.) is the most important food legume crop in Egypt, that has the potential to meet the increasing demand for food and the shortage of protein in Egyptian diet. The national faba bean area in 2001 season was about 334,000 feddan with an average of 8.7 ardab. The total production from this area reached about 440,000 tons, which is sufficient for the Egyptian population now. However, the population is increasing and expected to be around 80 million by the year 2000 and the total consumption of faba bean is estimated by 550,000 tons. This poses a challenge to scientists and policy makers to meet that demand. So, improving crop management along with expanding faba bean production to the new lands and new cropping rotation such as cotton rotation would be of paramount importance for Egypt to meet the increasing demand of faba bean.

Therefore the development of early mature faba bean cultivars is the most important goal for breeding program. Early mature cultivars are needed to allow farmers to plant cotton and the other early summer crops after faba bean. So, increasing faba bean area through fit it as an alternative crop prior to cotton instead of berseem clover will add a large untraditional area for faba bean production. In this case faba bean should be planted early in November and harvested by the end of

March, to allow farmers to plant cotton in due time. The food legume breeding program had released the first early mature faba bean cultivar Giza 716 in 1994 (Khalil *et al.*, 1995). Amer *et al.* (1997) found that Giza 716 reached maturity two weeks earlier than Giza 461 (the recommended cultivar for North Egypt). The early mature cv. Giza 716 convinced many farmers to grow faba bean prior to cotton instead of berseem. This progress encouraged faba bean breeders to concentrate their efforts in developing new faba bean breeding lines earlier in maturity than Giza 716 through hybridization and selection using the available early mature germplasm accessions and local breeding lines. This program resulted in developing the new breeding line x 957 (Fig. 1) early mature and resistant to foliage diseases along with the high yield potential.

This study concentrated on the final stages of evaluation of the breeding line x 957 for early maturity, resistance to foliage diseases and seed yield potential. This line was recently released under the commercial name Sakha, 1 in 2001.

**Fig. 1**



## MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station during 1994-95 and 1995-96 seasons to evaluate the promising line x 957 for seed yield, resistance to foliage diseases and early maturity. In 1994-95 season x 957 was compared with three recommended cultivars, i.e. Giza 461, Giza 716 and Giza 3 which represent the high level of foliage diseases resistance in Giza 461 and earliness in Giza 716. The four genotypes were arranged in complete block design replicated four times. In 1995-96 experiment x957 plus another two promising line, i.e. x 952/1265 and x 952/1281 were tested comparing with Giza 461 and Giza 716 in complete block design with four replications. In both experiments, each plot contains five ridges, three meters long and 0.6 m apart, while seed yield was estimated from the middle three ridges of each plot in kilograms and transformed to ardab per feddan (ardab = 155 kg and feddan = 4200 m<sup>2</sup>). Also, an on-farm researcher managed trial was conducted at one site in each of Beheira, Kafr El-Sheikh and Dakhliya governorates during 1996-97 and 1997-98 seasons, and one site in both of Beheira

and Dakhlia in 1998-99 season to evaluate the promising line x 957. In each location, five promising breeding lines were evaluated comparing with the recommended cultivar Giza 461 in randomized complete block design with four replications. The plot size was 29.4 m<sup>2</sup>, while 21 m<sup>2</sup> were harvested from each plot to estimate the seed yield in Kilograms per plot and transformed to ardab per feddan. All cultural practices were done at the recommended level. Chocolate spot and rust diseases reactions were recorded according to Bernier *et al.* (1984). Also, the numbers of days from sowing to physiological maturity was recorded for each genotype. Data obtained were statistically analyzed according to Snedecor and Cochran, 1971 and means were compared by the least significant difference method. Finally, the promising line x 957 was evaluated in 18 demonstration plots (one feddan each) selected in Dakhlia (4 plots) and Kafr El-Sheikh (14 plots) governorates to demonstrate to farmers and extension staff the impact of planting the early faba bean line x 957 prior to cotton in cotton rotation comparing with farmers cultivars. Three samples of 21 m<sup>2</sup> each were harvested from each demonstration plot and the adjacent farmer cultivar to estimate the faba bean seed yield in ardab per feddan. This demonstration program was set up with the co-operation between Food Legume Res. Program and the Central Administration of Extension.

## RESULTS AND DISCUSSION

### a. Seed yield per feddan:

Data of back-up research at Sakha showed that, the tested breeding lines were significantly differed in seed yield in 1994-95 and 1995-96 seasons as presented in Table, 1. The highest seed yields (13.04 and 12.97 ardab/fed.) were recorded by x 957 in the two growing seasons, respectively. Data showed also that line x 957 exceeded the recommended cultivar Giza 461 in seed yield per feddan by about 9 and 31% in both seasons, respectively.

Table (2) shows the data of eight on-farm researcher managed trials conducted in Beheira, Kafr El-Sheikh and Dakhlia governorates through three growing seasons. The combined data for the different locations showed that, the breeding line x 957 produced the highest faba bean seed yield (11.30, 12.55 and 8.95 ardab/fed.) in 1996-97, 1997-98 and 1998-99 seasons, respectively. Data revealed also that, x 957 was higher in seed yield per feddan than the recommended cultivar Giza 461 by 9.1, 27 and 9.4% in the three seasons, respectively. In different words, the new line x 957 surpassed the recommended cultivar Giza 461 in seed yield per feddan over five seasons of evaluation by 17% as an average.

**Table (1): Seed yield (ardab/feddan), infection with foliage diseases and maturity of some faba bean genotypes evaluated at Sakha in 1994-95 and 1995-96 seasons.**

Genotype	Seed yield		Diseases infection**		No. of days to maturity
	Ardab/fed.	Relative %*	Chocolate spot	Rust	
<b>1994-95 season</b>					
Giza 461	11.95	100	1.75	1.25	165
Giza 716	11.86	99.2	2.00	1.75	150
Giza 3	10.62	88.9	4.75	2.50	160
X 957	13.04	109.1	2.00	1.50	135
LSD <sub>0.05</sub>	2.09	-	0.38	0.24	-
<b>1995/96 season</b>					
Giza 461	9.87	100	1.25	1.00	170
Giza 716	12.59	127.6	1.50	1.00	155

X 952/1265	13.41	135.9	1.23	1.00	160
X 952/1281	12.79	129.6	1.33	1.00	165
X 957	12.97	131.4	1.33	1.00	145
LSD <sub>0.05</sub>	1.01		NS	NS	-

\* Relative seed yield was computed for each genotype as a percentage from the check cultivar Giza 461.

\*\* Chocolate spot scale 1-9, 1: Highly resistant 9: Highly susceptible  
Rust scale 1-5, 1: Highly resistant 5: Highly susceptible

**Table (2): Seed yield (ardab/feddan) and diseases reaction of some promising faba bean genotypes evaluated in some locations in North Delta region during 1996-97, 1997-98 and 1998-99 seasons.**

Genotype	Seed yield ardab/fed.			Combined yield		Combined diseases reaction		No. of days to maturity
	Beheira	Kafr El-Sheikh	Dakhlia	Ardab/fed.	Relative* %	Chocolate spot	Rust	
<b>1996-97</b>								
Giza 461	10.30	9.59	11.19	10.36	100	4.67	2.0	171
x 952/1265	11.06	9.79	12.04	10.96	105.8	3.67	2.0	166
X 952/1281	11.58	9.38	13.04	11.33	109.4	3.67	2.0	165
X957	10.33	9.78	13.79	11.30	109.1	3.33	2.0	151
X1001	10.96	10.22	12.70	11.29	109.0	3.67	2.0	168
X 8 SK	10.75	11.19	11.30	11.08	106.9	3.67	2.2	170
LSD <sub>0.05</sub>	0.90	0.82	0.82	NS	-	1.13	NS	-
<b>1997-98</b>								
Giza 461	8.64	9.76	11.25	9.88	100	3.76	3.48	162
x 952/1265	9.47	10.99	13.75	11.40	115.4	3.00	3.11	150
X 952/1281	9.12	10.83	14.91	11.62	117.6	3.30	3.48	151
X957	10.62	11.26	15.78	12.55	127.0	3.30	3.00	140
X1001	10.24	10.89	13.24	11.46	116.0	3.78	3.48	160
X 8 SK	10.63	11.44	8.75	10.27	103.9	3.78	4.22	160
LSD <sub>0.05</sub>	NS	1.59	2.33	2.53	-	NS	1.00	-
<b>1998-99</b>								
Giza 461	8.88	-	7.48	8.18	100	-	-	167
x 952	7.84	-	8.05	7.94	97.1	-	-	152
X957	8.91	-	8.99	8.95	109.4	-	-	142
X1001	7.47	-	6.40	6.93	84.7	-	-	161
X 943	7.73	-	6.86	7.29	89.1	-	-	162
X 12	7.55	-	6.72	7.13	87.2	-	-	160
LSD <sub>0.05</sub>	1.35	-	1.29	0.79	-	-	-	-

\* Relative seed yield was computed for each genotype as a percentage from the check cultivar Giza 461.

These results agreed with those obtained by Khalil *et al.*, 1994, who found that four promising breeding lines derived from Giza 3 x ILB 938 outyielded the check cultivar Giza 3 by 21.36, 16.90, 16.67 and 11.97%, respectively) Data recorded over 18 demonstration plots conducted in Dakhlia and Kafr El-Sheikh governorates (Table, 3) indicated that the new faba bean breeding line x 957 exceeded farmers' cultivars in seed yield by about 2 ardab/fed. (28%) as an average. Also, it was noticed that most of these demonstration plots were planted by cotton after faba bean in due time. Similar results were obtained by Nassib *et al.* (1991).

**Table (3): Seed yield (ardab/feddan) of the demonstration plots for x 957 compared to farmer's cultivars in 1999-00 season.**

Governorates	No. of demons.	Seed yield ardab/feddan		Difference	
		X 957	Farmer cv.	Ardab/fed.	%
Dakhliya	4	10.9	8.7	2.2	33
Kafr El-Sheikh	14	7.3	5.5	1.8	37
Mean	18	9.1	7.1	2.0	28

**b. Reaction to chocolate spot and rust diseases:**

The incidence of faba bean foliage diseases mainly chocolate spot (*Botrytis fabae*) and rust (*Uromyces fabae*) through the five seasons of experimental evaluation varied from one season to another from low to medium or high level that in 1998-99 the level of infection was too low to record. Also, the level of infection varied among chocolate spot and rust in each season as shown in Tables 1 and 2. Results of diseases reaction recorded over four seasons indicated that, the promising line x 957 was not significantly different in the level of infection with chocolate spot and rust from the resistant cultivar Giza 461 as presented in Tables 1 and 2. Khalil *et al.* (1994) reported that four promising faba bean breeding lines derived from Giza 3 x ILB 938 were less infected with foliar diseases. Also, varietal differences for chocolate spot resistance in some faba bean entries were found by Khalil *et al.* (1984) and Amer (1986).

**c. Earliness in maturity:**

Data recorded on the number of days to maturity showed that, the length of faba bean growing season had varied from one season to another as shown in Tables 1 and 2. This variation could be attributed to the level of infection with foliar diseases mainly rust and the degree of temperature during March and April, that low temperature in this period may increase the length of the growing season by decreasing the level of rust infection. Concerning the differences among the tested breeding lines in maturity, it was noticed that the promising line x 957 was the superior in earliness and was earlier in maturity than the early cultivar Giza 716 by 10 to 15 days during 1994-95 and 1995-96 seasons. Also, over the five seasons of evaluation x 957 reached maturity earlier than the recommended cultivar Giza 461 by about 24 days as an average (Tables 1 and 2). So, this promising breeding line was recently released in 2001 under the commercial name "Sakha 1" as an early mature faba bean cultivar combined with resistance to foliar diseases along with the high yield potential.

**REFERENCES**

- Amer, M.I. (1986). Effect of some agronomic practices on productivity of some broad bean varieties. Ph.D. Thesis, Fac. of Agric. Zagazig Univ., Egypt.
- Amer, M.I.; K.A. El-Assily; M.M. Radi and Nadi A. El-Aidy (1997). Effect of sowing and harvesting dates on faba bean (*Vicia faba* L.) productivity and seed technological traits. Fayoum J. Agric. Res. & Dev. Vol. 11, No. 1, 23-31.
- Bernier, C.C.; S.B. Haneunik; M.M. Hussein and H.A. Mohamed (1984). Field manual of common faba bean diseases in the Nile Valley. Information Bulletin No. 3 ICARDA, P.O. Box. 5466, Aleppo, Syria.

- Khalil, S.A.; A.M. Nassib; H.A. Mohamed and W.F. Habib (1984). Identification of some sources of resistance for chocolate spot and rust diseases in faba beans. Systems for cytogenetic analysis in *Vicia faba* L. Proceed. Wyn. Coll. 9-13.
- Khalil, S.A.; M.M. El-Hady; M.I. Amer; H.A. Saber; M.A.A. Omar; R.F. Dissouky and N.M. Abou-Zeid (1994). A new released cultivar of faba bean (*Vicia faba* L.) in the Nile Delta of Egypt. International Symposium on Pulses Research, April 2-6, 1994, New Delhi.
- Khalil, S.A.; H.A. Saber; M.M. El-Hady; M.I. Amer; Samia A. Mahmoud and N.M. Abou-Zeid (1995). Utilization of genetic resources in developing new faba bean (*Vicia faba*) cultivars. Rehabilitation of faba bean, Premier Seminaire organise du 24 au 27 Mai 1995, a Rabat, 47-54.
- Nassib, A.M.; S.A. Khalil; M.A. El-Borai; M.M. Radi and F. Shaaban (1991). Pilot demonstration plots on a new faba bean cultivar in Beheira and Kafr El-Sheikh governorates. Report of the Nile Valley Regional Program on Cool Season Food Legumes. Third Annual Regional Meeting, Cairo, 15-23 Sept.
- Snedecor, G.W. and G.W. Cochran (1971). Statistical Methods. 6<sup>th</sup> ed. Iowa State Univ. Press, Ames., Iowa, USA.

### إستنباط صنف مبكر جديد من الفول البلدى "سحا ١"

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يعتبر إنتاج الأصناف المبكرة النضج والعالية المحصول من الفول البلدى من أهم أنشطة برنامج التربية فى مصر ، فإن الأصناف المبكرة النضج مطلوبة لكى يمكن زيادة مساحة الفول البلدى عن طريق زراعته قبل القطن بدلا من البرسيم ، وقد تم إستنباط الصنف الجديد سحا ١ (هجين ٩٥٧) سنة ٢٠٠١م. وذلك لتبكيه فى النضج ومقاومته للتبقع البنى والصدأ بالإضافة للمحصول العالى. وقد تم تقييم الصنف سحا ١ فى سلسلة من التجارب تم تنفيذها فى محطة البحوث الزراعية بسحا خلال موسمى ١٩٩٤/١٩٩٥ ، ١٩٩٥/١٩٩٦ فى البرنامج البحثى بالإضافة إلى ٨ تجارب فى حقول المزارعين ثم تنفيذها فى محافظة البحيرة وكفر الشيخ والدقهلية فى شمال مصر خلال المواسم الثلاثة ١٩٩٦/١٩٩٧ ، ١٩٩٧/١٩٩٨ ، ١٩٩٨/١٩٩٩ ، وأخيرا تم تقييم الصنف سحا ١ (هجين ٩٥٧) فى ١٨ حقل إرشادى تم اختيارها فى كفر الشيخ (١٤) وفى الدقهلية (٤) خلال موسم ١٩٩٩/٢٠٠٠ وذلك لإرشاد المزارعين ومهندسى الإرشاد الزراعى عن أهمية زراعة الصنف سحا ١ قبل القطن فى دورة القطن بالمقارنة بأصناف المزارعين.

وقد أوضحت البيانات أن سحا ١ (هجين ٩٥٧) قد أنتج أعلى محصول بذور وهو (١٣,٠٤ ، ١٢,٩٧ ، ١١,٣٠ ، ١٢,٥٥ ، ٨,٤٥ أردب/الفدان) بالمقارنة بكل السلالات المختبرة خلال مواسم الزراعة الخمسة على التوالي ، وقد تفوق سحا ١ على الصنف الموصى به جيزه ٤٦١ ب ١٧% فى محصول البذور كمتوسط عام للمواسم الخمسة ، أيضا تفوق الصنف سحا ١ على أصناف المزارعين فى ١٨ حقل إرشادى بحوالى ٢ أردب للفدان (٢٨%) كمتوسط عام ، كما بينت بيانات الإصابة بالأمراض الورقية أن سحا ١ كان مقاوم للتبقع البنى والصدأ خلال الخمسة مواسم وكان تقريبا مثل الصنف المقاوم جيزه ٤٦١ ، وبالنسبة للتبكير فإن سحا ١ وصل للنضج مبكرا عن جيزه ٤٦١ بحوالى ٢٤ يوم كمتوسط مما يمكن المزارعين من زراعة القطن بعد الفول البلدى فى الميعاد المناسب.