

**INVESTIGATIONS ON FABA BEAN, *VICIA FAB* L.  
25. PERFORMANCE OF SEVEN VARIETIES UNDER  
DIFFERENT CULTURAL TREATMENTS AND SEED  
COATING BY MACRO AND MICRONUTRIENTS**

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**ABSTRACT**

*During 2005/2006 and 2006/2007 seasons at the Agric. and Exp. Station of the Fac. Agric., Cairo University, seven faba bean varieties were used to investigate effects of sowing dates, seed soaking in water and seed coating with NPK and micro nutrients in addition to plant spraying with Fe, Zn and Mn-EDTA. The varieties Nubaria 1, Misr 1, Sakha 2, Giza 40, Giza 843 (ARC) and Cairo 4 and Cairo 25 (Fac. Agric. Cairo Univ.) were sown on 15 and 30 November and treated with the above indicated treatments. Varieties did not differ significantly in all characters (stem height, branches, pods, seeds and seed yield per plant) in first season, but differed in second one. Performance at both sowing dates was mostly similar due to short interval of sowing dates. Seed soaking in water did not generally improve plant and yield characters. Plant spraying with microelements and seed coating with either NPK or Fe, Zn and Mn improved plant growth and yield characters compared to soaking and control treatments. Seed coating and plant spraying with nutrients may be recommended to improve seed production in faba bean.*

**Key words:** *Faba bean, Vicia faba, Varieties, Sowing dates, Seed soaking, Spraying, Seed coating, Macronutrients, Micronutrients.*

**INTRODUCTION**

Faba bean (*Vicia faba*, L.) ranks third worldwide in production among cool-season pulses. It is used as a main source of protein both for food and feed in many parts of the world. Also, it is an important crop for soil improvement and is used as break crop in cereal rotation system to keep the Egyptian soil fertile and productive through nitrogen fixation. The acreage and seed yields vary from season and location to another. This is attributed to various biotic and abiotic stresses. Therefore, the yield of faba bean greatly fluctuates from year to year. When farmer is forced to sow faba bean late than recommendations, the crop may face effects of climatic stresses. In such case a farmer may "help" crop growth by using macro

and/or microelements. Using such macro (NPK) and micro (Fe, Zn and Mn) nutrients may alleviate stress effects and enhances plant growth. Egyptian soils have a high-pH and CaCO<sub>3</sub>-content and low content of organic matter. Under such conditions availability of most micronutrients to plant may be reduced (Mengel and Kirkby 1982 and Amin *et al* 1988). The increase of faba bean yield due to use of micronutrients (Zn, Mn, Fe, Cu) has been reported by Amin *et al* (1988), Osman *et al* (1991) and Azer *et al* (1992). Azer *et al* (1992) and Waly (1996) noticed that there is an antagonism between Mn and Fe, whilst others Ibrahim and Shalaby (1994) and Nassar (1997) reported that Mn - application increased Fe - uptake. Macro and micro elements may be used as soil fertilizers, as foliar spray and/or as seed coating; what will be the response of different faba bean varieties when their seeds were coated with macro and micronutrients, soaked in water or when plants were spered with micronutrients?

#### MATERIAL AND METHODS

Seven faba bean varieties were used in this study. Five varieties (Nubaria 1, Misr 1, Sakha 2, Giza 40, Giza 843) were kindly obtained from Agric. Res. Center (ARC) and the two varieties (Cairo 4 and Cairo 25) were provided by Fac. Agric., Cairo University. All varieties are of the *Equina* type of seeds except Nubaria 1, which belongs to the *Major* type.

Five treatments were adopted 1. Control, 2. Seed coating by macroelements NPK (19:19:19) with 100 g/kg seeds. Coating was done prior to seeding using 16 % Arabic gum solution as sticking agent (7.5 ml/kg seeds) and seeds were left in air until complete dryness, 3. Seed coating by Fe, Zn, Mn - in form of EDTA compound (1:2:1) with 15 g/kg seeds using the adhesive, 4. Seeds were soaked in water for 24 hr before sowing and 5. Plant foliar spraying by the micronutrients (500 ppm) after 25 and 50 days from sowing.

The trials were conducted at the Agricultural Experimental Station, Faculty of Agriculture, Cairo University in Giza during the two seasons 2005/6 and 2006/7. Sowing dates in both seasons were 15 and 30 November. A split - plot design in a RCBD arrangement with three replications was used. The treatments occupied the main plots whereas the faba bean varieties were arranged in sub plots. Each plot consisted of 3 ridges, 3 m long and 60 cm apart. Seeds were sown in hills (two seeds) at 20 cm on one side of the ridge. Data were statistically analysed according to Snedecor and Cochran (1969).

#### RESULTS AND DISCUSSION

##### Varietal performance

Table (1) presents data of five characters of the seven faba bean varieties in the two sowing dates of both growing seasons:

**Table 1. Mean performance of seven varieties for five characters in two sowing dates of the two growing seasons**

Characters	Varieties	2005 / 6		2006 / 7	
		1 <sup>st</sup> Date	2 <sup>nd</sup> Date	1 <sup>st</sup> Date	2 <sup>nd</sup> Date
Plant height (cm)	Nubaria 1	92.1	103.2	91.3	80.0
	Misr 1	91.7	100.6	96.2	88.9
	Sakha 2	97.8	96.2	96.9	87.7
	Giza 40	90.4	101.9	99.0	93.0
	Giza 843	91.4	100.5	97.4	91.9
	Cairo 4	90.1	100.4	99.7	91.8
	Cairo 25	89.6	101.1	97.5	92.2
LSD 0.05		n.s	n.s	n.s	6.6
No.of branches	Nubaria 1	4.8	4.3	5.8	6.6
	Misr 1	4.4	4.2	4.8	6.1
	Sakha 2	4.5	4.4	4.9	6.5
	Giza 40	4.7	4.7	4.5	6.7
	Giza 843	4.4	4.4	5.0	6.2
	Cairo 4	4.5	4.3	4.8	6.0
	Cairo 25	4.4	4.4	5.0	5.8
LSD 0.05		n.s	n.s	0.6	n.s
Pods/plant	Nubaria 1	28.0	21.1	11.7	11.7
	Misr 1	20.6	19.7	20.4	21.6
	Sakha 2	26.7	19.6	13.9	17.9
	Giza 40	24.7	21.5	21.7	23.8
	Giza 843	23.7	21.9	17.7	22.6
	Cairo 4	21.6	20.6	22.7	25.2
	Cairo 25	22.8	21.4	22.9	24.7
LSD 0.05		n.s	n.s	3.2	3.1
Seeds/plant	Nubaria 1	60.1	57.8	35.3	32.2
	Misr 1	48.8	49.4	51.8	49.6
	Sakha 2	64.4	56.0	41.4	50.5
	Giza 40	56.4	58.0	56.4	60.4
	Giza 843	54.4	56.8	51.8	56.9
	Cairo 4	49.6	55.1	60.8	65.2
	Cairo 25	51.8	57.3	56.4	63.3
LSD 0.05		n.s	n.s	9.3	7.5
Seed yield/plant (g)	Nubaria 1	43.4	46.7	33.6	29.7
	Misr 1	36.5	41.6	37.8	36.0
	Sakha 2	43.9	38.5	34.1	46.1
	Giza 40	40.4	42.1	32.7	36.7
	Giza 843	38.1	42.5	40.4	41.0
	Cairo 4	40.0	40.4	39.0	42.0
	Cairo 25	39.2	41.4	39.1	43.6
LSD 0.05		n.s	n.s	n.s	5.2

1<sup>st</sup> Date: 15 November

2<sup>nd</sup> Date: 30 November

The varieties did not differ significantly in all characters in the first season and under both sowing dates. This occurred irrespective of the fact that Nubaria 1 is a *Major* variety and others belong to the *Equina* type. Moreover, Cairo varieties originated from a completely different breeding program than ARC varieties (Abdalla and Darwish 2008). Contrary to the first season, performance of the varieties differed significantly in the second season (Table 1), under one (plant height, branches, seed yield/plant) or both sowing dates (pods and seeds/plant).

The variability of performance of the varieties was sometimes in favour of the first sowing date, but in other characters (or season), performance was in favour of second sowing date. Variability in reaction of faba bean to growing seasons and conditions is well documented (Abdalla *et al* 1982, Dawwan and Abdel-Aal 1991 and Salama and Awaad 2005). However, it is clear from data of Table (1) that the differences between the two sowing dates (15 days in November) were not sufficient to result in significant differences. It is probable that using wider sowing dates intervals may have provided other data and better performance of early sowing. Authors who investigated effects of delaying sowing dates with prolonged intervals found that late planting decreased most plant characters (Badr *et al* 1974, El-Shaer *et al* 1987, El-Murshedy 1996 and Abou Taleb 2002).

#### **Effects of seed treatments**

The data of Table (2) indicated that soaking seed in water for 24 hr did not improve plant characters significantly than no soaking (control), apart from No. of branches in second sowing date in the second season. However, in all five characters studied (with exception of pods/plant in first sowing date of the second season), spraying with microelements and coating with both NPK and microelements improved plant and yield performance. Either one, or two or the three treatments had significantly higher values over control or over soaking or over control and soaking treatments. Different authors had reported improvement of plant and yield characteristics of faba bean treated with micronutrients. Seed coating with micronutrients either individually or in combination was studied on faba bean (Osman *et al* 1991, Azer *et al* 1992 and Nassar *et al* 2002). They found that application of micronutrients improved vegetative and yield characters. Triple and double combined elements treatments were more effective than single nutrient treatment.

Spraying faba bean was investigated with Zn (El-Gizawy and Mehasen 2009) and with Zn and Fe individually and in combination (Sakr *et al* 1996). Significant differences were reported for yield characters, plant height and branching in favour of foliar treatments compared to control. From the data presented, seed coating with micro and macronutrients may be recommended as additional treatments during seed industry before seeds sale to faba bean growers. Moreover, spraying faba bean plants with micronutrients showed to be necessary to improve faba bean performance and yield even in the clay soil of the Faculty of Agriculture of Cairo University.

**Table 2. Effects of different treatments on five characters in two sowing dates and the two growing seasons.**

Characters	Treatments	2005 / 06		2006 / 07	
		1 <sup>st</sup> Date	2 <sup>nd</sup> Date	1 <sup>st</sup> Date	2 <sup>nd</sup> Date
Plant height (cm)	Cont.	90.3	102.7	95.1	89.0
	Soak.	90.8	100.3	98.5	84.0
	Spray	98.0	100.2	96.7	94.1
	Coat. micro.	87.3	96.3	97.7	88.3
	Coat. macro.	93.2	103.3	96.3	91.4
LSD 0.05		7.0	n.s	n.s	5.7
No. of branches	Cont.	4.6	4.3	4.8	5.9
	Soak.	4.3	4.6	5.3	7.7
	Spray	4.7	4.5	5.2	6.7
	Coat. micro.	4.3	4.3	4.7	5.5
	Coat. macro.	4.8	4.3	4.9	5.5
LSD 0.05		n.s	n.s	n.s	0.8
Pods/plant	Cont.	19.9	17.8	20.4	21.6
	Soak.	19.5	20.5	15.4	20.5
	Spray	24.1	21.7	19.7	22.2
	Coat. micro.	26.5	22.8	19.8	20.8
	Coat. macro.	30.1	21.3	18.3	20.1
LSD 0.05		6.9	3.8	2.7	n.s
Seeds/plant	Cont.	51.6	47.4	43.5	55.1
	Soak.	52.6	54.0	53.0	48.7
	Spray	65.8	59.7	52.4	59.9
	Coat. micro.	50.8	60.7	53.8	55.4
	Coat. macro.	54.6	57.0	49.9	51.0
LSD 0.05		n.s	10.6	n.s	6.4
Seed yield /plant (g)	Cont.	38.1	42.9	30.6	41.5
	Soak.	35.6	41.9	34.3	34.7
	Spray	45.7	45.4	38.2	43.1
	Coat. micro.	42.0	36.7	40.2	40.4
	Coat. macro.	39.6	42.5	40.0	36.8
LSD 0.05		8.2	n.s	6.2	4.4

1<sup>st</sup> Date: 15 November

2<sup>nd</sup> Date: 30 November

Soak: soaking the seeds in water for 24 hr before planting

Spray: spraying the plants by micro-nutrients (500 ppm) after 25 and 50 days from

Coat. micro.: coating the seeds by micro-nutrients (15g/1Kg seeds)

Coat. macro.: coating the seeds by macro-nutrients (100g/1Kg seeds)

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## دراسات على الفول البلدى ٢٥. أداء سبعة أصناف تحت معاملات زراعية مختلفة وتغليف البذور بالعناصر المغذية الكبرى والصغرى

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أجريت هذه الدراسة فى محطة لتجارب والبحوث الزراعية بكلية الزراعة جامعة القاهرة خلال موسمى ٢٠٠٦/٢٠٠٥ ، ٢٠٠٧/٢٠٠٦ حيث استخدم فيها سبعة أصناف من الفول البلدى، خمسة منها (نوبلية ١، مصر ١، سفا ٢، جيزة ٤٠، جيزة ٨٤٣) من مركز البحوث الزراعية وإثنان (قاهرة ٤، القاهرة ٢٥) من كلية الزراعة-جامعة القاهرة. وتم زراعة الأصناف فى العروة الأولى فى منتصف نوفمبر والعروة المتأخرة (نهاية نوفمبر) إضافة الى استخدام المعاملات التالية: نقع البذور فى الماء لمدة ٢٤ ساعة قبل الزراعة، تغليف البذور بالعناصر المغذية الكبرى (NPK)، تغليف البذور بالعناصر الصغرى (Fe, Zn, Mn)، والرش بالعناصر الصغرى (Fe, Zn, Mn).

ولم تظهر أى فروق معنوية بين الأصناف فى صفات طول النبات، عدد الفروع، عدد القرون، عدد البذور ومحصول النبات من البذور فى الموسم الأول ولكن ظهرت الفروق فى الموسم الثانى. كما لم تظهر أى فروق

معنوية بين معادى الزراعة ربما تكونهما متكافئين فى شهر نوفمبر. وام يودى نفع البنور فى الماء الذى تحسن ثابت فى أداء النباتات.

وتظهر من معاملات تغليف البنور بالعناصر المغذية الكبرى والصغرى وكذلك رش النباتات بالعناصر الصغرى تحسن واضح ومعنوى فى نمو النباتات وكذلك عدد القرون والبنور والمحصول وذلك مقارنة بمعاملات التناصح فى المياه أو الكنترول؛ وذلك يمكن للتوصية بمعاملات الرش ومعاملات تغليف البنور بالعناصر المغذية لتحسين إنتاج محصول القول البلدى حتى فى الأرض الطينية مثل أرض محطة تجارب كلية الزراعة فى الجيزة.

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