*U.K.J. Agric. Sci.*6 (1), 1998.

A Note on the Effect of Fertilization on the Seed Quality of Faba Bean

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Faba bean (*Vicia faba* L.) is an important food and cash crop in the Sudan. Faba beans, like other pulses, are good sources of calories, proteins, carbohydrates and fibres. However, faba bean cultivars vary greatly in their chemical composition, proximate analysis, *in vitro* protein digestibility (IVPD) and tannin content (El Tinay *et al.* 1989). Biological, chemical and organic fertilizers were reported to affect faba bean yield, protein content and seed quality (Babiker *et al.* 1995; Elsheikh and Elzidany 1997). The objective of this investigation was to study the response of four faba bean genotypes to *Rhizobium* inoculation and nitrogen and chicken manure fertilization in terms of proximate composition, tannin content and *in vitro* protein digestibility.

A field experiment was conducted in the Demonstration Farm of the Faculty of Agriculture, University of Khartoum (Shambat), during 1994/95 cropping season in a factorial design with four replicates. The experimental site was prepared by deep ploughing, harrowing, leveling and riding; then divided into 5x4 m plots. Seeds of the lines "H-72" (released as an improved variety), "00564", "00594" and "00605" were either treated with *Rhizobium* strain TAL 1397, 80 kg N/ha (urea) or 2.5 ton chicken manure/ha. At harvest, seeds were cleaned and the proximate analysis was carried out according to AOAC (1975), whereas, the IVPD was determined according to Saunder *et al.* (1973).

The moisture and ash contents of the seeds were not affected by the fertilization treatments (Table 1). However, the moisture content in line "00605" was significantly lower than in the other lines irrespective of

the fertilization treatments. Recently, Elsheikh and Elzidany (1997) reported that the effect of fertilization on moisture content of faba bean seeds varied from no response to a significant effect, whereas the ash content showed no response.

The *Rhizobium* inoculation and chicken manure significantly increased the crude fibre of the four lines (Table 1); the highest increase was shown by line "00605". The nitrogen fertilizer had no effect on crude fibre content of the four lines. This is in contrast to the findings of Elsheikh and Elzidany (1997) who reported that nitrogen and manure treatments significantly increased the crude fibre percentage of faba been seeds. It is worth noting that the crude fibre content reported here is higher than that reported by El Tinay *et al.* (1989) and Elsheikh and Elzidany (1997).

The fat content of "00564", "00594" and "00605" was significantly decreased with chicken manure treatment (Table 1), while all fertilization treatments significantly increased the fat content of cv. "H-72". Elsheikh and Elzidany (1997) found that *Rhizobium* and sulphur treatments had no effect on the fat content of faba bean seeds, whereas the nitrogen and manure treatments significantly increased it.

The protein content (Table 1) varied from 28.4% (in "00594") to 31.2% (in "00564"). All treatments significantly increased the protein content except in "00564". *Rhizobium* inoculation increased the protein content by 6.4%, 7.4% and 5.0% for "H-72", "00594" and "00605", respectively. The increment due to the chicken manure and nitrogen treatments ranged from 0.0% and 0.0%, in "00564" to 13% and 6.3%, respectively, for "00594". Inoculation and nitrogen, sulphur and chicken manure fertilization were found to increase protein content of faba bean (Elsheikh and Elzidany 1997). The enhancing effect of *Rhizobium* inoculation could be attributed to the high concentration of nitrogen available to plants which increased the protein content, whereas that of chicken manure could be attributed to improved nutritional status of the plant and the role of manure in enhancing the nutrients uptake (Babiker *et al.* 1995).

The carbohydrates content was significantly reduced by *Rhizobium* inoculation and chicken manure fertilization (Table 1). Moreover, a significant reducing effect of nitrogen fertilizer was observed in "00605" compared to the control. This could be attributed to higher levels of protein as a result of nitrogen fertilization. Similarly, Elsheikh and Elzidany (1997) found that the *Rhizobium* inoculation and manure treatments significantly decreased carbohydrates content of faba bean seeds.

With the exception of "00605", all treatments significantly increased the IVPD compared to the control (Table 1). The IVPD of "00605" was higher than that of the other lines, though it did not respond to fertilizers. It was reported by Babiker *et al.* (1995) that nitrogen significantly increased grain protein and IVPD, however, *Rhizobium* inoculation gave inconsistent results.

The tannin content varied inconsistently in the different lines and different fertilization treatments. Line "00564" had significantly higher tannin content than the other three. Babiker *et al.* (1995) and Elsheikh and Elzidany (1997) reported that the tannin content of faba bean was significantly increased by *Rhizobium*, chicken manure, sulphur and nitrogen treatments.

The results indicated that the type of cultivar as well as the nature of biological, chemical or organic fertilizer affects the seed composition, especially the protein, carbohydrates, crude fibre and ash content. It is clear that seed composition is influenced by the genotype and the fertilization treatment. This paper stresses the importance of the history of the seeds, i.e. their origin and previous agronomic treatments, as factors that could influence the results and interpretation of any analytical studies conducted on free market seeds.

Table 1. Effect of Rhizobium, nitrogen and chicken manure on proximate composition, tannin and in vitro protein digestibility of seeds of four faba bean lines.

Treatment	Moisture (%)	Crude fibre (%)	Fat (%)	Ash (%)	Protein (%)	Carbohydrate (%)	Tannin (%)	IVPD (%)
"H-72"								
Control	6.70[a]	8.87[a]	0.93[a]	3.40[a]	29.6[a]	50.5b	0.019[a]	82.9[a]
Rhizobium	6.73[a]	10.32b	1.62b	3.48[a]	31.5c	46.4[a]	0.018b	98.3c
80 kg N/ha	6.72[a]	8.43[a]	1.34b	3.40[a]	30.1b	50.0b	0.025c	91.0b
2.5 ton M/ha	6.51[a]	10.80b	1.45b	3.58[a]	31.5c	47.6[a]	0.036d	99.1c
"00564"								
Control	6.67[a]	10.78[a]	1.44b	3.53[a]	31.2[a]	47.2b	0.034b	91.2[a]
Rhizobium	6.62[a]	11.35b	1.52b	3.42[a]	31.2[a]	46.0[a]	0.028[a]	96.5b
80 kg N/ha	6.67[a]	10.05[a]	1.43b	3.45[a]	31.1[a]	47.3b	0.029[a]	95.7b
2.5 ton M/ha	6.53[a]	11.95b	1.01[a]	3.55[a]	31.2[a]	45.3[a]	0.039c	97.5b
"00594"								
Control	6.02[a]	9.88[a]	1.33b	3.83[a]	28.4[a]	50.5b	0.029b	87.5[a]
Rhizobium	6.23[a]	10.80b	1.35b	3.57[a]	30.5b	47.6[a]	0.026b	92.9b
80 kg N/ha	6.17[a]	9.18[a]	1.52b	3.83[a]	30.2b	49.1b	0.018[a]	94.7b
2.5 ton M/ha	6.05[a]	10.77[b]	1.05[a]	3.70[a]	32.1c	46.3[a]	0.021[a]	97.9c
"00605"								
Control	5.78[a]	10.20[a]	1.37b	3.87[a]	30.3[a]	48.4c	0.022[a]	97.6[a]
Rhizobium	5.90[a]	13.00b	1.57b	3.85[a]	31.8b	43.9[a]	0.030b	97.4[a]
80 kg N/ha	5.98[a]	10.37[a]	1.43b	3.57[a]	31.9b	46.8b	0.018[a]	97.5[a]
2.5 ton M/ha	5.90[a]	13.10b	1.08[a]	3.88[a]	31.4b	44.6[a]	0.030b	98.3[a]

Means not sharing a common superscript in a column (for each cultivar) are significantly diffe
Duncan's Multiple Range Test.

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مجلة جامعة الخرطوم للعلوم الزراعية : المجلد السادس – العدد الأول ، 1998م

تأثير التسميد على نوعية بذور الفول المصرى

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موجز البحث : أجريت تجربة حقلية لدراسة تأثير الرايزوبيوم و 80 كجم نتروجين/هكتار و2.5 طن سماد مخلفات الدواجن/هكتار على التحليل التقريبى وهضم البروتينات خارجياً ومحتوى التانين لأربع سلالات من الفول المصرى هى "H-72" و "00564" و "00594" و "00605" أدى التلقيح بالرايزوبيوم لزيادة معنوية فى نسبة الألياف ولنقص معنوى فى نسبة الكاربوهيدرات لكل السلالات وقد كانت نسبة الألياف فى السلالة "00605" أكبر معنويا من غيرها اختلفت السلالات فى محتواها من الكاربوهيدرات ، وكان أقلها السلالة "00605" بينما كان الاختلاف بين سلالتى "H-72" و "00594" معنويا تراوحت نسبة البروتين فى السلالات بين 28.4٪ (فى "00594") و 31.2٪ (فى 0054") ، وزادت كل المعاملات محتوى البروتين زيادة معنوية لكل السلالات عدا "00564" باستثناء السلالة "00605" ، أدت كل المعاملات لزيادة معنوية فى درجة هضم البروتين خارجيا مقارنة بالشاهد ، ولم تتأثر نسبتى الرطوبة والرماد أما محتوى التانين فقد اختلف باختلاف المعاملات ومصدر البذور ، وقد كانت نسبة التانين فى السلالة :"00564" أكبر معنويا من غيرها من السلالات .