EVALUATION OF FABA BEAN CULTIVARS AND SOME PROMISING BREEDING LINES CALTIVATED IN EGYPT

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Abstract

Faba bean cultivars (13 varieties and 38 genotypes) were evaluated for their nutritioned and antinutritional values. There were three varieties characterized by their high percentage of protein (28.40, 28.10, and 30.33%) and carbohydrate (58.74, 54.74 and 58.38 %) namely Giza 674, 716 and 3.

Varieties low in tannins were Giza 843, 717, 643, 461 and 716. (68.55, 98.11, 92.88,84.81 and 107.19) mg catchine /100 gm sample. There were three varieties of good quality stewed faba beans (foul medamis) Giza (717,716,3) and five breeding lines characterized with high protein and carbohydrate content. There were six genotypes characterized by low tannins and fifteen of the 38 the 38 genotypes were of low phenols .

INTRODUCTION

Faba beans is considered as a high protein crop grown in Europe, Africa and Asia, and used as haman food and animal Feed. In Egypt, faba bean is one of the most common legumes consumed in the stewed form called Medams also, as germinated and blanched form called Nabet (EL-Shimi, 1980).

The nutritive value of faba bean is some what limited due to the presence of inhibitors (tannins, phenols, phytic acid and trypsin Inhibitor). Hence, it is important to improve both the productivity and nutritional value of faba beans. Attempts have been made in the near past to improve the nutritive value of faba beans through breeding, way of processing and by preparing protein isolates and concentrates Chavan *et al.*, (1988).

Many researchers have reported that the nutritive value of many legumes was enhanced by heat processing and germination (Chen, 1970; Hsu *et al.*, 1980; Ziena, 1989; Mansour and El-Adawy, 1994). The traditional method for preparing Medamis in Egypt is by simmering the beans for about 12 hr at low heat however, the long cooking time reduces the nutritive value of legumes (EL-Mahdy, 1974; Kon and Sanshuck, 1981; Youssef *et al.*, 1986 and Ziena, 1989).

In this study, thirteen faba bean cultivars and 38 genotypes were evaluated by determing there nutritive value, antinutritional factors (tannins, phenols) and cooking quality.

MATERIALS AND METHODS

Thirteen cultivars and 38 breedig lines from Food Legume Research Section, Field Crops Inst., A.R.E., were evaluated for their antinutritional factors, chemical composition and cooking quality. Some chemical composition of faba bean (crude protein, ash and Phosphorus) were determined according to the methods outlined in AOAC (1990), hydrolyzable carbohydrate was determind according to the method described by Dubois *et al.*, (1959) .

Tannins were determind using valnilin-hydrochloric acid (V-HCl) method as described by Burn (1971). Total phenols were determind by Folin Denis by Swain and Hills (1959) .

Total solids, Hulls to seed ratio, hydration coefficient and stewing percentage were determind according to the method described by El-Tabey *et al.*, (1985) .

RESULTS AND DISCUSSION

1- Faba been cultivars

Data represented in table (1) show that protein and hydrolazable carbohydrate

ranged between 24.10 to 30.33 and 50.24 to 58.38% respectively, while phosphorus from 315.59 to 485.57 (mg%). Giza (3, 674 , 716) were characterized by high percentage of protein, carbohydrate and phosphorus. The lowest cultivars for their content of protein and carbohydrate were L. 40/93, Giza 402, Giza 714.

Table 1. Chemical composition of faba bean varieties (Protein - Charbohydrate-Phosphorus).

No.	Varieties	Protein % N x 6.25	Total hydrolyzable Carbohydrates %	Phosphorus mg/100g
		On dry weight basis		
1	Giza 843	26.01	55.76	323.498
2	Giza 674	28.40	58.74	322.944
3	Giza 2	26.81	53.71	397.416
4	Giza 717	28.79	53.72	367.871
5	Giza 402	28.40	50.24	464.54
6	Giza 643	27.20	50.75	328.794
7	Giza 714	25.10	35.81	315.394
8	L. 40/93	24.10	52.01	365.484
9	Giza blanca	26.86	52.46	326.448
10	Giza 429	26.91	54.42	316.066
11	Giza 461	27.64	57.66	365.331
12	Giza 716	28.10	54.74	489.52
13	Giza 3	30.33	58.38	397.443

Results of table (2) show tannins and phenols contents as antinutritional factors which were in the range of 68.55 to 470.74 and 59.87 to 115.7 mg catchine and pyrogallol/100 gm sample .

The highest tannins and phenols content were found in L. 40/93 and Giza 674 while lowest ones were found in Giza 843 and Giza 3, respectively. In this concern, Lindgern (1975) compared various legumes including field beans and found a negative correlation between protein digestibility and tannin. Nitsan (1971) reported that much of the increased nutritive value of dehulled field beans was due to the removal of the field beans tannin, which is known to be concentrated in the seed coat.

Results in table (3) show the cooking quality of the 13 faba been cultivars, hulls to seed ratio showed a slight variations between varieties which were found in the range of 11.4 and 14.51%. Concerning hydration coefficient a positive correlation ($r=0.5877$) was found between stewing percentage and total solids. Stewing

Table 2. Some Antinutritional factor of faba bean varieties (Tannins-Phenols).

No.	Varieties	Tannins mg catchine/100g samples	Phenols mg pyrogallol/100g sample
		On dry weight basis	
1	Giza 843	68.55	78.32
2	Giza 674	278.99	155.7
3	Giza 2	203.37	66.71
4	Giza 717	98.11	63.36
5	Giza 402	269.66	74.42
6	Giza 643	92.88	76.42
7	Giza 714	95.10	75.73
8	L. 40/93	470.74	93.32
9	Giza blanca	122.40	66.88
10	Giza 429	367.77	83.60
11	Giza 461	84.81	64.48
12	Giza 716	107.19	66.56
13	Giza 3	273.45	69.87

Table 3. Physical properties and cooking quality of faba bean varieties.

No.	Varieties			Hydration coefficient %		Stewing %
		Total solids %	Hulls to seed ratio %	after soaking	after stewing	
1	Giza 843	17.414	12.32	116.29	228.06	70
2	Giza 674	12.887	11.67	109.39	230.41	60
3	Giza 2	14.263	11.45	110.83	242.05	60
4	Giza 717	14.668	11.96	102.93	242.54	80
5	Giza 402	18.699	12.62	106.87	235.39	70
6	Giza 643	16.145	11.80	109.008	239.43	90
7	Giza 714	14.025	13.25	103.59	226.44	40
8	L. 40/93	14.075	11.40	105.72	234.79	40
9	Giza blanca	6.957	12.34	194.74	254.37	20
10	Giza 429	16.020	14.51	108.96	225.18	50
11	Giza 461	8.619	12.66	101.6	244.7	70
12	Giza 716	13.007	12.65	109.04	255.9	70
13	Giza 3	15.061	11.72	102.38	250.4	80

percentage ranged from 20 to 90%.

The highest stewing percentage was found in Giza 643 while the lowest one was found in Giza Blanca. In this respect, shehata *et al.*, (1985) reported that the percentage of seed coat and hydration coefficient of dry beans were the principal properties affected the texture and hydration coefficient of cooked beans. Cooking quality of faba beans could be predicted to certain extent by determining percentage of seed coat and/or hydration coeffficient of dry seeds.

2- The promising breeding lines (genotypes)

Results in table (4) show the protein content and hydrolazable carbohydrate in the 38 genotypes of faba beans. Protein content ranged from 23.9 to 30.07% Genotype 854/1492/92 gave the highest value of protein (30.07%) followed by comp. 60/1775/88 (29.48 %), x-908 (29.14%) and x-938 (28.92%) respectively. L. 926/904/93 had the lowest value of protein compared to other lines .

Hydrolyzable carbohydrate varied from 50.09 to 58.91% X-902., and L.927-92/ 93B had the highest values (58.19% 58.88 %) respectively followed by L. 504/882/94 (58.51 %). Lines 926/904/93 and 927/930/93 had the lowes amount of hydrolyzable carboyhydrate (50.09 and 50.19), respectively.

Results in table (5) show that tannin contents and total phenols ranged from 81.17 to 628.94 mg as catchine/100 gm and 32.4 to 33.01 mg as pyrogallol / 100gm respectively. Tannins content was higher in 917/820/93 (628.94 mg/100g) followed by comp. 72/1897/88 (566.06 mg/100g). Lines 502/785/184 and 504/882/94 had lower amount of tannins (81.17 and 90.87 mg/100g) compared to other lines.

Total phenols were higher in comp. 22/1897/88 (33.01 mg/100g) followed by L.917/820/93 (251.08 mg/g) Lines 502/785/48 and 952/1264/93 had the lower content of total phenols (32.4 and 44.54 mg/100g) compared to other lines respectively.

Lines 502/785/84 and 504/882/94 had low content of tannins and total phenols while comp. 72/1897/88 and 917/820/93 had the higher contents of tannins and total phenols compared to the other line

Table 4. Some chemical composition of faba bean breeding lines (Protein-Carbohydrate) .

No.	Genotypes	Protein % (N x 6.25)	Total hydrolyzable Carbohydrates %
		On dry weight basis	
1	911/787/911	26.20	51.89
2	927/299/93B	28.61	58.88
3	939/1025/93	28.69	52.39
4	927/930/93	27.81	50.19
5	936/977/93	27.88	50.09
6	942/1139/93	27.71	57.54
7	919/856/93	26.88	56.36
8	502/785/84	27.47	56.02
9	939/1102/93	28.30	57.29
10	812/743/92	27.50	54.87
11	849/1433/92	27.86	51.03
12	935/966/93	26.54	58.58
13	919/863/93	28.44	54.88
14	952/1265/93	27.77	58.39
15	910/779/93	28.33	58.04
16	952/1264/93	26.12	58.04
17	504/882/94	27.17	58.51
18	917/839/93	28.05	56.96
19	48/669/84A	27.40	54.03
20	927/947/93	25.70	56.17
21	comp.72/1897/88	27.20	54.32
22	919/868/93	27.26	53.99
23	815/797/92	26.30	56.37
24	929/966/93	25.30	54.54
25	311/1170/81	26.10	54.93
26	comp.60/1775/88	29.48	54.04
27	756/1100/90	27.22	54.93
28	854/1492/92	30.07	54.38
29	123a/45/76	27.12	54.67
30	644/750/87	25.90	56.72
31	899H	26.80	56.03
32	917/820/93	26.70	57.73
33	606/309/86B	27.02	53.72
34	812/747/92	27.12	53.51
35	926/904/93	23.91	58.65
36	X-938	28.92	54.71
37	X-908	29.14	55.54
38	X-902	25.57	58.91

Table 5. Some antinutritional faba bean varieties (Tannins-Phenols)

No.	Genotypes	Tannins mg catchine /100g sample	Phenols mg pyrogallol/100g sample
		On dry weight basis	
1	911/787/911	279.88	195.56
2	927/299/93B	228.94	64.80
3	939/1025/93	315.60	91.93
4	927/930/93	139.32	48.71
5	936/977/93	111.13	87.24
6	942/1139/93	100.90	55.50
7	919/856/93	181.24	76.91
8	502/785/84	81.17	32.4
9	939/1102/93	242.72	81.81
10	812/743/92	395.28	70.89
11	849/1433/92	378.28	71.28
12	935/966/93	467.38	78.27
13	919/863/93	167.20	78.75
14	952/1265/93	208.19	59.9
15	910/779/93	266.03	74.75
16	952/1264/93	172.83	44.54
17	504/882/94	90.87	78.73
18	917/839/93	167.64	83.06
19	48/669/84A	233.18	188.55
20	927/947/93	233.24	163.85
21	comp.72/1897/88	566.06	333.01
22	919/868/93	158.94	90.33
23	815/797/92	354.32	157.08
24	929/966/93	213.68	33.53
25	311/1170/81	176.95	130.89
26	comp.60/1775/88	203.46	65.28
27	756/1100/90	83.39	75.24
28	854/1492/92	92.63	65.39
29	123a/45/76	315.06	117.75
30	644/750/87	185.63	151.79
31	899H	436.37	83.12
32	917/820/93	628.94	251.08
33	606/309/86B	116.48	72.89
34	812/747/92	287.27	85.13
35	926/904/93	293.25	62.19
36	X-938	122.33	100.73
37	X-908	157.25	58.16
38	X-902	285.70	57.29

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تقييم بعض اصناف وسلالات الفول البلدى المزروعة فى مصر

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تم عمل تقييم تكنولوجى لعدد ١٣ صنف و ٣٨ سلالة الفول البلدى المزروعة فى مصر وقد وجد ان هناك ثلاثة اصناف عالية فى نسبة البروتين (٢٨,٤٠ ، ٢٨,١٠ ، ٣٠,٣٣٪) والكربوهيدرات (٣٨ ، ٥٨، ٧٤، ٥٤ ، ٤٧، ٥٨٪) وهى جيزة ٦٧٤ ، جيزة ٧١٦ ، جيزة ٣) .

كما وجد ان الاصناف جيزة ٨٣٤، جيزة ٧١٧، جيزة ٦٤٣ ، جيز ٤٦١ ، جيزة ٧١٦) منخفضة فى نسبة التانينات وكانت على التوالى ٦٨,٥٥ ، ٩٨,١١ ، ٩٢,٨٨ ، ٤١,٩٢ ، ١٠٧,١٩ ملليجرام كاتشين١٠٠/ جرام عينة.

اما الاصناف الاتية فقد وجد انة يمكن استخدامها فى التغذية كفول مدمس حيث ان درجة التسوية الخاصة بها عالية جدا (جيزة ٧١٧ ، جيزة ٧١٦ ، جيزة ٣).

اما بالنسبة للسلالات فقد وجد ان هناك ٥ سلالات عالية فى نسبة البروتين والكربوهيدرات ، ٦ سلالات منخفضة فى نسبة التانينات والفينولات من عدد ٣٨ سلالة تحت الدراسة.