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Susceptibility of Faba bean cultivars to Bird's Damage under drought and normal irrigation

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ABESTRCT

In complete randomized block design with three replicates, thirty-three lines and cultivars of faba bean (*Vicia faba* L.) were evaluated for birds damage under drought condition (sawing irrigation only) and normal irrigation (sawing irrigation and supplemental irrigation) during 1997/1998 season. The effect of some biochemical contents and external morphological characters on bird's damage were studied .The results showed that, the highest damage was in the H 106 Moshtoher entry followed by 502/785/84 and H127 entries, they were (9.2,7.8 %), (8.2,7.3 %) and (7.7,7.0 %) under drought and normal irrigation respectively. On the other hand the lowest damage was in the 815/717/92 , 849/1433/99 ,854/1492/92 and 843/1354/92 entries .They were (0.0,0.0), (0.0,0.0), (0.0,0.0) and (0.3 ,0,0 %)respectively. The damage increased under drought irrigation more than the normal irrigation in most varieties. Carbohydrate contents and tannins were the highly biochemical internal parameters affecting bird's ability to cause damage in the different broad bean varieties. Carbohydrate contents were (51.3, 53.3%) and tannins catching were (67.1, 66.3 mg /100g seeds) in H106 variety which showed the highest damage while they were (42.1, 45.8 %) and (264.1, 251.3 mg /100g seeds) in 815/797/92 variety which was the lowest damage under drought and normal irrigation respectively. For the external morphological parameters, the hull to seed ratio and the plant height were the most effective parameters, for the bird damage on broad bean.

Introduction

Human and animals intensively use broad bean *Vicia faba* L. It contains about 24.5 % protein. Therefore, it is one of the most important legume crops in Egypt .The main problem in Egypt's agricultural economy is poor water management and lack of water resources. Faba bean in northern Delta could be grown successfully without supplemental irrigation (Tawadros, 1986). Grain -eating birds are the most important pest causing damage to cereal and legume crops in many African countries (Anonymous, 1980). Some birds cause crop losses by attacking the grain and others by picking the germinating grain from the soil. In Egypt some species are grainivorious, they feed upon grains and seeds while others are fruitvorious they feed upon fruits. House sparrow, *Passer domesticus*, the crested lark, *Calirdo cristata*, starling, *Sturnus vuigaris* and Egyptian goose, *Alopochen aegyptiacus* are the main birds attacking the cereal crops in Egypt (Bruggres, 1980). Losses due to birds differ considerably from variety to anther regarding their external and internal characters (Lokma, 1992). Most of the damage in cereal fields occurred in the milky and dough stage (El Deeb, 1991,Wilson *et al*, 1995 and Abou El Khear and Ashoush, 1998). Therefore, the present study was undertaken to investigate the effect of some external and internal characteristics on birds' damage to faba bean under drought and normal irrigation.

Material and Methods

Field experiments were carried out at Etay El baroud Research Station during 1997/1998 season. Thirty three lines of broad bean *V. faba* were evaluated under drought conditions (sowing irrigation)and normal irrigation in a complete randomized block design with three replicates. It was arranged (5.4 m^2) with three ridges, 60 cm in between and three meters long. The bird damage was assessed during different ripening stages of faba bean varieties. In each variety, hundred pods were selected randomly for carrying out the damage assessment. In dough stage before

harvesting ten damaged and undamaged pods were collected randomly to estimate loss ratio (Lokma, 1992). The total losses per hectare were calculated as follows :

Average damage % = Number of infested pods / 100 ..... A

Average loss in infested pods =Weight of uninfested pods - Weight of infested pods / Weight of uninfested pods B

Average loss in the crop % = A x B..... C

Yield loss (Ton / Hectare) = C x total calculated weight per Hectare (Dehaven, 1974, El- Deeb *et al* 1985, and Wilson *et al* 1995). The physical characteristics, number of pod plants, seed yield / m^2, plant height, number of branches, % hull to seed ratio and total solids were determined for all tested varieties according to the method described by (Youssef, 1978). Also the internal parameter, tannins mg catching were determined in 100 gm . seeds for all the tested varieties using vanillin hydrochloric acid (V-Hcl) method as described by (Burn, 1971). Also proteins and carbohydrate contents were determined according to (A.O.A.C.1990). Daily observation and birds' traps in this area showed that the house sparrow *Passer domesticus* was the most common and important species.

The data were calculated as mean ± SD and analyzed using analysis of variance (ANOVA) . The P value of < 0.05 was considered significant

Results and discussion

The percentage of damage and seed yield (T./ha.) on broad bean Varieties *Vicia faba* were recorded under drought and normal irrigation in 1997/1998 season. Table (1) showed different degrees of damage between the entries .At the same time the drought treatment increased the percent damage more than the normal irrigation in most entries . H106 Moshtoher entry showed the higher percentage of damage, it was 9.4% ,7.8% under drought and normal irrigation followed by 502/785/84 and

Table (1) : The damage and seed yield (T /ha)on some broad bean varieties under drought (A) and normal irrigation (B) 1997.

Varieties	Damage %			Seed Yield (T/ha)	
	A	B	Mean	A	B
H 106	9.4	7.8	8.6	2.6	2.5
502 / 785 / 84	8.2	7.3	7.7	3.6	3.4
H 127	7.7	7.0	7.3	3.2	3.1
H843	7.4	6.7	7.1	3.9	3.7
T.W.	7.2	6.1	6.6	1.2	1.4
Giza 461	6.6	5.3	5.9	3.2	3.3
H145	6.3	5.0	5.6	3.5	3.6
Giza 643	5.0	3.9	4.5	3.6	3.0
Giza 3	4.8	3.7	4.3	3.6	4.0
836 /122 / 92	4.4	3.6	4.0	4.1	4.5
843 /699 / 84	3.9	2.9	3.4	3.7	3.7
H 102	3.6	2.8	3.2	3.3	3.5
H 103	3.4	2.3	2.8	3.4	3.6
Y.El sedeek	3.3	1.9	2.6	3.4	3.5
Giza 429	3.0	1.8	2.4	3.4	3.5
H 143	3.0	1.8	2.4	3.6	3.6
H 151	2.7	1.8	2.2	3.5	3.5
848 /1428 /92	2.3	1.8	2.0	4.0	4.3
Giza blanka	1.8	1.4	1.7	3.5	3.1
H 109	1.1	1.2	1.2	3.1	3.3
H 129	1.1	1.2	1.2	3.6	3.4
732 /800 /90	1.1	0.9	1.0	3.7	3.7
H 138	1.0	0.7	.8	3.0	3.1
Giza 717	0.6	0.5	0.5	3.5	3.7
Giza 716	0.5	0.0	0.3	3.1	3.2
Giza 714	0.5	0.0	0.3	3.7	3.8
1 LB 738	0.4	0.0	0.2	2.3	2.3
644 /750 / 84	0.4	0.0	0.2	2.8	2.9
843 /1354 /92	0.3	0.0	0.15	4.0	4.3
840 /1279 /92	0.2	0.0	0.1	4.4	4.5
854 /1492/92	0.2	0.0	0.1	4.0	4.0
849 /1433 /99	0.0	0.0	0.0	4.3	4.3
815 /717 /92	0.0	0.0	0.0	4.1	4.1

Mean	3.03	5.4		3.28	2.53
L.S.D 0.05					
E	0.22			2.05	
I	0.07			0.51	
E x I	0.09			2.90	

E : Entries I : Irrigation

H127 entries, they were (8.2, 7.3 %) and (7.7,7.0%) respectively. On the other hand, 815/717/92, 849/1433/99 ,854 /1492 /92 ,840 /1279 /92 and 843 /1354 /92 entries showed zero percent damage.. Lokma 1992 found that losses due to birds considerably differed among the different varieties of broad bean as well as among wheat varieties. Similar findings were reported by Cummincs *et al* 1989, El-Deeb, 1991, Wilson *et al* 1995 and Abou El- Khear and Ashoush, 1998.According to seed yield (Ton /ha.) as shown in table (1): There are significant differences between some entries, but the differences between the two irrigation treatments weren't significant. Normal irrigation produced more seed yield (T. /ha.) specially, 840/1279/92 entry (4.47 T. /ha.) followed by 848/1428/92 entry (4.26 T. /ha.) and 836/122/92 entry (4.49 T/ha) respectively. The same results showed by Hotham *et al* 1988 and Linz *et al* 1984 .

Cummincs *et al* 1989 reported that in field tests, 75% of the total bird damage occurred within the first 18 days after anthesis (flowering period) and, then the damage decreased gradually until harvesting .

Table (2): Some external parameter affected on birds' damage on some broad bean varieties under drought (A) and normal irrigation (B) 1997.

Varieties	No. of pods/ plant		Seed yield /plot m3		Plant height (cm)		No. of branches		Hull to seed ratio %	
	A	B	A	B	A	B	A	B	A	B
H106	9.20^{a}	7.30^{a}	471.3^{f}	463.3^{g}	98.70^{b}	95.30^{b}	1.7^{a}	1.3^{a}	12.6^{a}	12.5^{a}
502/785/84	10.7^{a}	10.6^{a}	408.0^{f}	398.3^{g}	105.0^{b}	112.7^{a}	1.6^{a}	1.8^{a}	12.1^{a}	11.8^{a}
H 127	11.4^{a}	9.90^{a}	576.6^{e}	558.3^{e}	101.0^{b}	117.0^{a}	1.8^{a}	1.9^{a}	12.8^{a}	12.9^{a}
H 834	11.4^{a}	12.0^{a}	706.7^{c}	703.3^{b}	102.3^{b}	87.00^{c}	1.8^{a}	1.7^{a}	12.5^{a}	12.3^{a}
T.W.	9.30^{a}	5.70^{a}	217.7^{g}	209.0^{g}	88.00^{c}	93.00^{b}	0.8^{a}	0.7^{a}	12.4^{a}	11.9^{a}
Giza 461	8.60^{a}	8.50^{a}	580.0^{e}	555.7^{e}	112.3^{a}	113.3^{a}	1.6^{a}	1.5^{a}	12.6^{a}	12.8^{a}
H 145	8.50^{a}	8.30^{a}	641.6^{d}	605.0^{c}	110.3^{a}	103.3^{b}	1.3^{a}	1.4^{a}	12.5^{a}	12.5^{a}
Giza 643	8.70^{a}	9.10^{a}	655.0^{d}	633.0^{c}	115.0^{a}	114.7^{a}	1.4^{a}	1.2^{a}	13.4^{a}	12.7^{a}
Giza 3	7.00^{a}	7.20^{a}	635.3^{d}	535.0^{e}	112.3^{a}	116.3^{a}	1.4^{a}	1.3^{a}	14.1^{a}	12.6^{a}
836/122/92	9.10^{a}	8.70^{a}	808.3^{b}	667.3^{b}	117.0^{a}	115.0^{a}	1.5^{a}	1.5^{a}	12.8^{a}	12.5^{a}
843/699/84	10.6^{a}	12.5^{a}	573.3^{e}	541.7^{e}	112.0^{a}	117.3^{a}	1.4^{a}	1.6^{a}	13.8^{a}	12.8^{a}
H102	9.70^{a}	8.90^{a}	626.0^{d}	556.7^{e}	119.7^{a}	113.0^{a}	1.1^{a}	1.3^{a}	14.2^{a}	11.7^{a}
H 103	11.5^{a}	8.90^{a}	650.0^{d}	581.7^{d}	114.3^{a}	104.0^{b}	1.7^{a}	1.3^{a}	13.9^{a}	13.2^{a}
Y.El sedeek	9.10^{a}	8.40^{a}	623.3^{d}	586.7^{d}	112.7^{a}	98.30^{b}	1.4^{a}	1.5^{a}	12.8^{a}	14.5^{a}
Giza 429	8.40^{a}	9.20^{a}	630.0^{d}	596.7^{d}	120.3^{a}	110.7^{a}	1.3^{a}	1.6^{a}	13.7^{a}	13.2^{a}

H143	8.90[a]	9.10[a]	651.7[d]	626.0[c]	116.7[a]	112.3[a]	1.3[a]	1.4[a]	12.8[a]	13.8[a]
H151	10.9[a]	9.80[a]	633.3[d]	616.7[c]	110.7[a]	98.00[b]	1.8[a]	1.8[a]	14.1[a]	14.8[a]
848/1428/92	9.10[a]	7.00[a]	681.7[c]	615.0[c]	103.3[b]	93.70[b]	1.5[a]	1.1[a]	14.5[a]	13.6[a]
Giza blanka	9.70[a]	9.60[a]	631.7[d]	548.3[c]	105.7[b]	98.70[b]	2.2[a]	3.2[a]	14.3[a]	14.5[a]
H 109	10.2[a]	9.60[a]	566.6[c]	513.3[c]	117.0[a]	101.7[b]	1.5[a]	1.6[a]	14.2[a]	15.1[a]
H 129	8.90[a]	8.80[a]	655.0[d]	620.0[c]	112.0[a]	120.3[a]	1.2[a]	1.5[a]	14.5[a]	14.9[a]
732/800/90	8.50[a]	9.10[a]	671.7[c]	548.3[c]	115.7[a]	111.7[a]	1.5[a]	1.2[a]	14.3[a]	13.8[a]
H 138	9.50[a]	9.30[a]	553.3[c]	521.7[c]	102.3[b]	101.6[b]	1.5[a]	1.9[a]	14.2[a]	14.5[a]
Giza 717	9.30[a]	8.30[a]	660.0[d]	586.7[d]	119.7[a]	97.00[b]	1.7[a]	1.3[a]	14.4[a]	15.1[a]
Giza 716	9.60[a]	9.30[a]	570.0[c]	510.0[c]	120.0[a]	106.3[a]	1.6[a]	1.6[a]	14.1[a]	15.2[a]
Giza 714	9.70[a]	10.5[a]	657.0[d]	663.3[b]	113.7[a]	111.7[a]	1.7[a]	1.8[a]	13.9[a]	14.8[a]
1LB738	9.30[a]	10.7[a]	217.7[a]	209.0[a]	125.7[a]	102.7[b]	2.1[a]	1.5[a]	15.1[a]	13.7[a]
644/750/84	9.40[a]	10.1[a]	518.3[c]	475.0[f]	119.7[a]	113.0[a]	1.4[a]	1.4[a]	14.8[a]	13.8[a]
843/1354/92	8.90[a]	8.60[a]	766.7[a]	668.3[b]	123.0[a]	108.7[a]	1.2[a]	1.1[a]	15.2[a]	13.1[a]
840/1279/92	9.80[a]	10.1[a]	805.0[a]	760.7[a]	122[a]	118.3[a]	1.7[a]	1.3[a]	15.1[a]	14.4[a]
854/1492/ 92	9.90[a]	10.5[a]	716.0[c]	718.3[a]	121[a]	121.7[a]	1.5[a]	1.6[a]	14.7[a]	15.2[a]
849 /1433/99	10.6[a]	11.9[a]	761.7[b]	769.3[a]	118.[a]	124.2[a]	1.7[a]	1.4[a]	15.1[a]	15.3[a]
815/717/92	8.90[a]	8.80[a]	655.0[d]	620.0[c]	122.0[a]	122.3[a]	1.7[a]	1.7[a]	14.2[a]	15.1[a]

- Means having the same letter aren't significantly different from each other, P value 0.05 was considered significant.

Table (3) : Some internal parameters affected on birds on some broad bean varieties under drought (A) and normal irrigation (B) 1997.

Varieties	Tannins (mg/100 gm seed)		Total solids %		Protein content %		Carbohydrate %	
	A	B	A	B	A	B	A	B
H106	67.1[f]	66.3[g]	13.9[a]	12.7[a]	21.2[a]	22.1[a]	51.3[a]	53.3[a]
502/785/84	69.2[f]	77.2[f]	13.8[a]	14.8[a]	22.4[a]	26.2[a]	50.5[a]	53.4[a]
H 127	71.3[f]	71.2[g]	11.9[a]	10.7[a]	23.1[a]	25.2[a]	50.2[a]	52.4[a]
H 834	72.5[f]	63.6[g]	12.8[a]	11.8[a]	21.1[a]	25.1[a]	48.1[a]	52.4[a]
T.W	73.6[f]	67.3[g]	13.3[a]	12.4[a]	22.1[a]	25.3[a]	47.7[a]	52.8[a]
Giza 461	71.3[f]	79.8[f]	10.7[a]	9.6[b]	26.1[a]	26.4[a]	47.7[a]	52.8[a]
H 145	73.1[f]	80.5[f]	9.5[b]	11.4[a]	25.1[a]	26.2[a]	48.5[a]	52.5[a]
Giza 643	80.1[f]	87.9[f]	16.1[a]	14.2[a]	22.4[a]	29.3[a]	47.2[a]	51.3[a]
Giza 3	113.0[a]	117.5[d]	14.1[a]	14.1[a]	23.8[a]	28.5[a]	46.5[a]	50.8[a]
836/122/92	112.0[a]	100.3[a]	12.2[a]	14.1[a]	24.8[a]	27.7[a]	46.1[a]	53.4[a]
843/699/89	109.4[a]	97.2[a]	12.8[a]	13.1[a]	26.1[a]	29.1[a]	45.1[a]	49.5[a]
H 102	106.5[a]	103.1[a]	11.2[a]	13.2[a]	27.1[a]	29.2[a]	45.9[a]	45.4[a]
H103	121.5[a]	118.2[d]	12.5[a]	11.2[a]	28.1[a]	27.1[a]	47.5[a]	45.3[a]
Y.EL.sedeek	110.5[a]	110.2[a]	13.8[a]	14.4[a]	26.1[a]	25.9[a]	46.5[a]	47.2[a]
Giza 429	110.8[a]	162.8[a]	15.1[a]	14.5[a]	23.1[a]	25.7[a]	47.5[a]	46.3[a]
H 143	140.1[d]	136.4[d]	16.2[a]	15.1[a]	26.7[a]	24.4[a]	45.4[a]	46.0[a]
H 151	144.5[d]	135.3[d]	16.3[a]	16.[a]	23.1[a]	23.5[a]	46.4[a]	47.5[a]

848/1428/92	170.4[c]	181.6[c]	9.7[a]	9.8[a]	22.7[a]	24.9[a]	48.1[a]	48.5[a]
Giza blanka	173.6[c]	102.2[c]	6.9[b]	7.9[b]	22.1[a]	25.7[a]	45.2[a]	48.1[a]
H 109	180.2[c]	178.1[c]	7.4[b]	8.8[b]	22.7[a]	24.9[a]	43.5[a]	45.1[a]
H 129	173.4[c]	187.6[c]	11.2[a]	10.2[a]	29.1[a]	30.5[a]	42.2[a]	45.3[a]
732 /800/90	174.6[c]	183.2[c]	11.8[a]	12.2[a]	19.5[b]	29.1[a]	49.8[a]	45.2[a]
H 138	162.3[c]	126.5[d]	13.1[a]	13.7[a]	25.1[a]	27.8[a]	41.0[a]	46.1[a]
Giza 717	190.5[c]	191.2[b]	12.5[a]	8.5[b]	22.1[a]	24.1[a]	42.1[a]	46.8[a]
Giza 716	182.1[c]	104.1[b]	7.6[b]	13.1[a]	23.7[a]	26.1[a]	48.2[a]	47.2[a]
Giza 714	185.2[c]	190.1[b]	13.5[a]	14.1[a]	24.4[a]	27.4[a]	42.0[a]	46.8[a]
1 LB 738	163.4[c]	171.3[c]	13.5[a]	12.1[a]	24.5[a]	28.4[a]	41.0[a]	46.2[a]
694 /750 /84	173.2[c]	180.6[c]	13.6[a]	11.2[a]	23.4[a]	29.6[a]	40.2[a]	46.2[a]
843 /1354 /92	209.4[b]	270.3[a]	14.8[a]	12.2[a]	26.2[a]	22.2[a]	39.1[b]	46.1[a]
840 /1279/92	212.4[b]	258.4[a]	12.9[a]	14.1[a]	23.5[a]	21.5[a]	37.2[b]	40.1[b]
854/1492/92	208.4[b]	212.6[a]	13.3[a]	14.8[a]	24.6[a]	24.8[a]	38.1[b]	41.2[b]
849/1433/92	280.2[a]	278.2[a]	12.4[a]	11.4[a]	25.5[a]	27.4[a]	39.2[b]	40.3[b]
815/797/92	264.1[a]	251.3[a]	11.7[a]	12.2[a]	24.9[a]	29.1[a]	38.0[b]	40.8[b]

- **Means having the same letter aren't significantly different from each other, P value 0.05 waPs considered significant**

Table (2) represents the external and physical characteristics for different broad bean entries. For all varieties no significant difference was shown between the two irrigation treatments. Hull to seed ratio % is affecting the ability of birds to cause the damage in the broad bean varieties. There was a reversible relationship. They were (12.5, 12.6 %) in H106 which showed the high damage but they were (15.1 , 14.2%) in 815 / 797 / 92 which have zero percent damage. Also, the plant height was affecting the bird attacking the broad bean entries. The damage was highly on the entries which are short than the higher plants .

Other parameters such as number of pods / plant, number of branches and seed yield /plot m^2 did not affect on the ability of birds to cause the damage to the entries. Abou El- Khear and Ashoush (1998) found some morphological parameters affecting the bird damage such as spike waxes in wheat. Lokma (1992) reported that losses to birds differed considerably among the different varieties of broad bean regarding their external morphological and biochemical characteristics.

Table (3) summarized the internal parameters of some broad bean varieties under drought and normal irrigation. Protein percent and total solids didn't have significant effect on the birds damage between varieties . On the other hand, tannins (mg catching / 100 gm seed) and Carbohydrate % affected the bird's damage. It decreased the percent of damage when the tannins increased. Tannins content was (67.1 , 66.3 mg / 100 gm seed) in H106 entry while (264.1 , 251.3 mg / 100 gm seed) in 815 /797 /92 entry which had the lowest damage, similarly the higher carbohydrate content which was (51.3 , 53.3 %) in H106 showed the highest damage which it was (38.0 ,40.8%) in 815 /797/92 entry .These results are in agreement with the reported results by Lokma (1992).

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الملخص العربي

قابلية أصناف الفول البلدي للإصابة بأضرار الطيور تحت ظروف الري والجفاف الحقلي

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تم تصميم تجربة حقلية فى قطاعات عشوائية كاملة فى ثلاث مكررات لمقارنة ٣٣ صنف من الفول البلدي تحت الظروف الجافة والرى العادي وذلك بمحطة آيتاي البارود موسم ١٩٩٧ /١٩٩٨ وذلك لتقدير نسبة الخسائر الناجمة عن مهاجمة الطيور وأهم الصفات المورفولوجية والكيميائية التي تؤثر على نسبة الخسائر ويمكن إيجاز النتائج فيما يلى•

- نسبة الخسائر تزيد في جميع الأصناف المختبرة تحت الظروف الجافة عنها تحت ظروف الري العادى•
- أعلى إصابة كانت في الصنف H 106 يليه الصنف ٨٤/٧٨٥/٥٠٢ ثم الصنف H127 حيث كانت نسبة الخسائر (٢ ,٩ ,٨٤ ,٧ %) (٢ ,٨ ,٣٤ ,٧%) (٧ ,٧ ، ٧%) وذلك تحت ظروف الري العادي و الظروف الجافة تباعا ومن ناحية أخرى وجد أن أقل الأصناف تعرضا لمهاجمة الطيور هو الصنف٨١٥ /٧١٧ /٩٢ والصنف ٨٤٩ /١٤٣٣ /٩٩ و الصنف ٨٥٤ /١٤٩٢ / ٩٢ والصنف ٨٤٠ /١٢٧٩ / ٩٢ حيث كانت نسبة الخسائر (صفر ،صفر) ، (صفر ،صفر) (صفر ،صفر) ، (صفر ، ٢ , %) وذلك تحت ظروف الري العادي و الظروف الجافة تباعا •
- وجد أن أكثر الصفات المورفولوجية التي تؤثر على مهاجمة الطيور لنباتات الفول هي طول النبات حيث تزيد الإصابة في النباتات القصيرة عن الطويلة وكذلك نسبة وزن القصرة إلي وزن الحبة حيث تتناسب عكسيا مع نسبة الخسائر •

- وجد أن نسبة الكربوهيدرات وكذا المحتوى من مادة التـانين Tannins content أكثر العوامل الكيميائية التى تؤثر على مهاجمة الطيور لأصنـــاف الفـول البلـدي المختبرة حيث وجد أن نسبة الإصابة تقل بانخفاض نسبة الكربوهيـــدرات و زيـادة نسبة التانين في البذور .