STUDIES CONCERNING SOME FRENCH BEAN CULTIVARS (*PHASEOLUS VULGARIS* L.) TOLERANCE TO THE BEAN WEEVIL (*ACANTHOSCELIDES OBTECTUS* SAY) ATTACK IN STORAGE CONDITION

STUDII PRIVIND TOLERANȚA UNOR CULTIVARE DE FASOLE DE GRĂDINĂ (*PHASEOLUS VULGARIS* L.) LA ATACUL GĂRGĂRIȚEI FASOLEI (*ACANTHOSCELIDES OBTECTUS* SAY), ÎN CONDIȚII DE DEPOZIT

TRIFAN DANIELA, POPA ANA-MARIA
University of Agricultural Sciences and Veterinary Medicine Iaşi

Abstract. *The research was made for finding some resistant cultivars of french bean (Phaseolus vulgaris L.) to the attack of bean weevil, in storage condition. The infestaion was made artifically in the laboratory condition. The study was completed using 6 certified varieties and 4 local populations of french bean. All the studied cultivars were attacked but the attack was significantly different. The second scope of the experiment is the hibridation of resistant varieties and populations to the attack of bean weevil, for amelioration purposes, in the same time with other important quantitative proprieties.*

Rezumat. *Cercetările au urmărit găsirea unor cultivare de fasole de grădină (Phaseolus vulgaris L.) tolerante la atacul gărgăriței fasolei (Acanthoscelides obtectus Say), în condiții de depozit. Infestarea loturilor de semințe s-a făcut artificial, în condiții de laborator. S-au studiat 6 soiuri omologate şi 4 provenienţe locale. Toate provenienţele luate în studiu au fost atacate, dar atacul a fost diferit de la o provenienţă la alta. Următorul obiectiv urmărit este hibridarea cultivarelor cu rezistenţă crescută la acest dăunător, în vederea ameliorării acestei specii atât pentru rezistenţă faţă de gărgăriţa fasolei cât şi pentru alte caracteristici productive importante.*

The *Acanthoscelides obtectus Say.* Species is an extremely dangerous pest with 2 – 3 generations / year in cultivation conditions and there have been 3 – 4 generations / year recorded in storage condition. When pest control lacks it can produce 100% damages in stocked seeds (A. Odagiu, M. Porca, 2003).

In order to limit the attack of bean weevil (*A. obtectus*) besides complying with the quarantine measures, it is recommended to use the tolerant cultivars. Research aimed to establish the injurious effect of the bean weevil (*A. obtectus*) to the 6 certified varieties and 4 local populations of french bean, in artificial infestation condition and storage condition.

MATERIAL AND METHODS

The study was made regarding the response of 10 french bean (*Phaseolus vulgaris L.*) cultivars – 6 certified varieties and 4 local collected populations from different villages of Braila county – to the attack of weevil *(A. obtectus*) under the conditions of infestation in the laboratory in storage conditions for 3 months (T = 15 – 18^{o}C; RH = 75 – 80%). In the laboratory we determined the protein content in beans (%) of different origin (D. Trifan, 2006).

The experiment consisted on 10 varieties in 4 repetitions, being organized according to the method of randomized blocks. The results of which were statistically

correlated using the variant analysis method. The beans have been distributed 100 beans / sample, they have been weighed by an precision balance and moistured with 1 ml water. This samples have been kept in growing rooms for 3 months, at a relative air humidity of 70% and a temerature of 25°C.

After 3 months, the following were observed:

- the frequency of weevil (*A. obtectus*) attack (%);
- the intensity of attack;
- the total loss of biomass / bean.

Investigations made 3 months after storage pursued the determination of some correlations between the biochemical characteristics of the seed and the importance (frequency, intensity) of the pest attack.

RESULTS AND DISCUSSIONS

The experiments pursued the frequency of weevil bean (*A. obtectus)* attack (%) on different bean derivations (tables 1), the intensity of attack (tables 2), the total loss of biomass/bean caused by the weevil attack on the bean cultivars (tabels 3). Two references have been chosen: Jutta variety (Mt_1) and the average of the attack on all cultivars (Mt_2). The analysis of the data in table 1 shows that the least frequency of the attack was recorded at Jutta variety (15.25%) followed, in increasing order, by Lacu Sarat cultivar (20.50%); Unidor variety (22.25%); Carson (24.50%); Narbbonne (25.00%). The highest frequency of attack was recorded at Tichilesti cultivars (47.00%) followed, in decreasing order, by Lingua di Fuoco variety (45.50%), Movila Miresii cultivars (43.75%), Vadeni (38.25%), Inka (35.75%). By comparing the differences between the frequencies of the attack recorded at different varieties and Mt1 (Jutta variety), it can be noticed that the varieties have been more intensely attacked (from +31.75 to +5.25) the differences being very significantly positive.

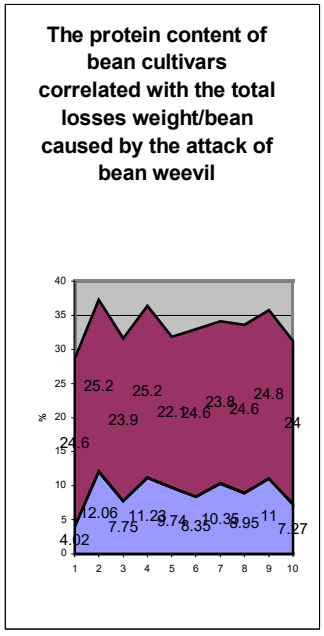
By comparing the differences between the frequencies of the attack recorded at different derivations and Mt_2 (average of varieties), it can be noticed that the following varieties were less intensely attacked, these statistically assured differences being very significant negative: Jutta (48.00%, -16.52), Lacu Sarat (64.52%, -11.27), Unidor (70.03%, -9.52), Carson (77.11%, -7.27). The following varieties have been more intensely attacked, these statistically assured differences being very significan positive: Tichilesti (147.93%, +15.23), Lingua di Fuoco (143.21%, +13.73), Movila Miresii (137.70%, +11.98), Vadeni (120.39%, +6.48).

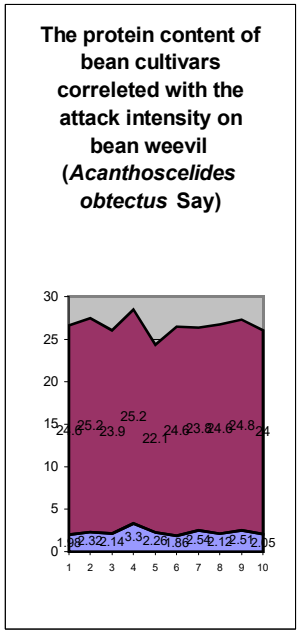
The analysis of the data in table 2 it can be noticed that the most intensely attacked variety is Lingua di Fuoco variety (I = 3.30 opercula/bean), followed, in decreasing order, by Movila Miresii (2.54), Tichilesti (2.51), Carson (2.32) and Inka (2.14). The least intensely attacked was Narbbonne variety with I = 1.86 opercula/bean, followed, in increasing order, by Jutta (1.98) and Lacu Sarat cultivars (2.05). By comparing the differences between the intensities of the attack recorded at different varieties and the average of varieties (Mt_2), it can be noticed that the less intensely attacked were, in deacresing order: Narbbonne (-0.44), Jutta (-0.32), Lacu Sarat (-0.25) and Vadeni (-0.18).

The data regarding the total losses of weight/bean caused by the attack of bean weevil (*A. obtectus*) are presented in table 3. It can be noticed that the lowest

loss/bean has been recorded at Jutta variety (4.02), followed, in increasing order, by: Lacu Sarat variety (7.27%), Inka (7.75%), Narbbonne (8.35%) and Vadeni (8.95).

The protein content was obtained through biochemical analyses using the Kjeldahl method, determining first the nitrogen content at technical maturity and then the nitrogen content at physiologic maturity. The results were multiplied by the 6.25 coefficient to determine the total protein content in the analyzed samples. The results assessment was performed using the statistical row of observations method and the variance analysis. Table 4 show the crude protein of the studied beans varieties. The observation during this research corroborated with the protein content of studied cultivars were statistically correlated and proved that the attack of bean weevil is a positive nonlinear correlation with the protein content.





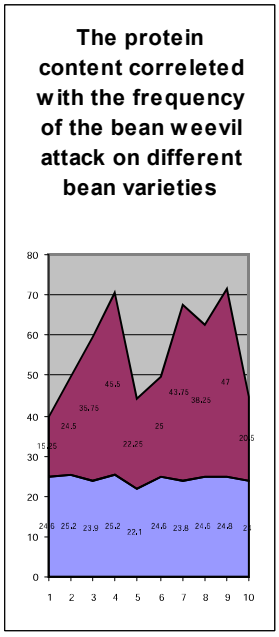


Table 1: **The frequency of the bean weevil *(Acanthoscelides obtectus Say)* attack on different bean cultivars**

Variants	Attack freqency (%) in control Mt_1		± d	Signifiance of difference in control Mt_1	Attack freqency (%) in control Mt_2		± d	Signifiance of difference in control Mt_2
	Absolute values	Relative values			Absolute values	Relative values		
1. Jutta (Mt1)	15.25	100.00	+0.00	-	15.25	48.00	-16.52	000
2. Carson	24.50	160.65	+9.25	***	24.50	77.11	-7.27	000
3. Inka	35.75	234.42	+20.50	***	35.75	112.52	+3.98	***
4. Lingua di Fuoco	45.50	298.36	+30.25	***	45.50	143.21	+13.73	***
5. Unidor	22.25	145.90	+7.00	***	22.25	70.03	-9.52	000
6. Narbbonne	25.00	163.93	+9.75	***	25.00	78.69	-6.77	000
7. Movila Miresii	43.75	286.88	+28.50	***	43.75	137.70	+11.98	***
8. Vadeni	38.25	250.81	+23.00	***	38.25	120.39	+6.48	***
9. Tichilesti	47.00	308.19	+31.75	***	47.00	147.93	+15.23	***
10. Lacu Sarat	20.50	134.42	+5.25	***	20.50	64.52	-11.27	000
11. Varians means Mt_2					31.77	100.00	+0.00	-

$DL_{5\%} = 1.70$ $DL_{1\%} = 2.44$ $DL_{0.1\%} = 3.45$

Table 2: ***The attack intensity on the bean weevil* (Acanthoscelides obtectus Say) *of different bean cultivars***

Variants	The attack intensity(%) in control Mt_1		± d	Signifiance of difference in control Mt_1	The attack intensity(%) in control Mt_2		± d	Signifiance of difference in control Mt_2
	Absolute values	Relative values			Absolute values	Relative values		
1. Jutta (Mt1)	1.98	100.00	+0.00	-	1.98	86.08	-0.32	000
2. Carson	2.32	117.17	+0.54	***	2.32	100.86	+0.02	***
3. Inka	2.14	108.08	+0.16	***	2.14	93.04	-0.16	000
4. Lingua di Fuoco	3.30	166.66	+1.32	***	3.30	143.47	+1.00	***
5. Unidor	2.26	114.14	+0.28	***	2.26	98.26	-0.04	000
6. Narbbonne	1.86	93.93	-0.12	000	1.86	80.86	-0.44	000
7. Movila Miresii	2.54	128.28	+0.56	***	2.54	110.43	+0.24	***
8. Vadeni	2.12	107.07	+0.14	***	2.12	92.17	-0.18	000
9. Tichilesti	2.51	126.76	+0.53	***	2.51	109.13	+0.21	***
10. Lacu Sarat	2.05	103.53	+0.07	***	2.05	89.13	-0.25	000
11. Varians means Mt_2					2.30	100.00	+0.00	-

$DL_{5\%} = 0.043$ $DL_{1\%} = 0.061$ $DL_{0.1\%} = 0.086$

Table 3: ***The total losses of weight/bean caused by the attack of bean weevil*** **(Acanthoscelides obtectus Say)** ***of different bean cultivars***

Variants	Total losses (%) in control Mt_1		± d	Signifiance of difference in control Mt_1	Total losses (%) in control Mt_2		± d	Signifiance of difference in control Mt_2
	Absolute values	Relative values			Absolute values	Relative values		
1. Jutta (Mt_1)	4.02	100.00	+0.00	-	4.02	44.32	-5.05	000
2. Carson	12.06	300.00	+8.04	***	12.06	132.96	+2.99	***
3. Inka	7.75	192.78	+3.73	***	7.75	85.44	-1.32	000
4. Lingua di Fuoco	11.23	279.35	+7.21	***	11.23	123.81	+2.16	***
5. Unidor	9.74	242.28	+5.72	***	9.74	107.38	+0.67	***
6. Narbbonne	8.35	207.71	+4.33	***	8.35	92.06	-0.72	000
7. Movila Miresii	10.35	257.46	+6.33	***	10.35	114.11	+1.28	***
8. Vadeni	8.95	222.63	+4.93	***	8.95	98.67	-0.12	000
9. Tichilesti	11.00	273.63	+6.98	***	11.00	121.27	+1.93	***
10. Lacu Sarat	7.27	180.84	+3.25	***	7.27	80.15	-1.80	000
11. Varians means Mt_2					9.07	100.00	+0.00	-

$DL_{5\%}$ = 0.41 $DL_{1\%}$ = 0.58 $DL_{0.1\%}$ = 0.82

Table 4: **Content in crude protein of french bean (*Phaseolus vulgaris* L.) of different origin (D. Trifan, 2006)**

No.	Variants	Crude protein (%) as compared to Mt_1			
		Absolute value	Relative value	± d	Semnificatie
1	Jutta (Mt_1)	24,6	100.00	+0.00	-
2	Carson	25,2	102.43	+0.60	***
3	Inka	23,9	97.15	-0.7	0
4	Lingua di Fuoco	25,2	102.43	+0.60	***
5	Unidor	22,1	89.83	-2.50	000
6	Narbonne	24,6	100.00	+0.00	-
7	Movila Miresii	23,8	96.74	-0.80	00
8	Vadeni	24,6	100.00	+0.00	-
9	Tichilesti	24,8	100.81	+0.20	**
10	Lacu Sarat	24,0	97.56	-0.60	0

$DL_{5\%}$ = 0.021 $DL_{1\%}$ = 0.029 $DL_{0.1\%}$ = 0.040

CONCLUSIONS

1. All the studied cultivars were attacked but the attack was significantly different. The lowest frequence of the attack has been recorded at Jutta variety (F = 15.25%), followed, in increased order, by Lacu Sarat (20.5%), Unidor (22.25%), Carson (24.5%), Narbbonne (25%). The most violently attacked was Tichilesti cultivar (47.00%), followed, in decreasing order, by Lingua di Fuoco variety (45.5%), Movila Miresii (43.75%), Vadeni (38.25%) and Inka (35.75%).

2. The lowest intensity of attack has been recorded at Narbbonne variety (I = 1.86 opercula / bean) followed by Jutta (1.98), Lacu Sarat (2.05), Vadeni (2.12), Inka (2.14), Unidor (2.26), Carson (2.32), Tichilesti (2.51), Movila Miresii (2.54) and the most intensely attack was recorded at the Lingua di Fuoco variety (3.30).

3. The lowest loss of total biomass / bean has been recorded at Jutta variety (4.02%), followed, in ascending order, by Lacu Sarat (7.27), Inka (7.75), Narbbonne (8.35), Vadeni (8.95), Unidor (9.74), Movila Miresii (10.35), Tichilesti (11.00), Lingua di Fuoco (11.23) and the most significant loss of biomass / bean has been recorded at Carson variety (12.06%).

4. A positive nonlinear correlation was obtained between the protein content of bean cultivars and the attack of bean weevil (*Acanthoscelides obtectus* Say.).

REFERENCES

1. **Cîndea E., Bratu E., 1993 -** *Comportarea unor soiuri de fasole de grădină la atacul dăunătorului Acanthoscelides obtectus Say.,* Analele I.C.L. F., XII, 173-178.
2. **Odagiu A, Porca M., 2002 -***The influence of the chemical composition of different origin beans (Phaseolus vulgaris L.) on tolerance to the bean weevil (Acanthoscelides obtectus Say) Stroke.* Journal of Central European Agriculture, vol.4 No. 1, 13-22.
3. **Porca M., Ghizdavu I., 2001 -** *Comportarea unui sortiment de proveniențe de fasole în condiții de depozitare față de atacul gărgăriței fasolei, Acanthoscelides obtectus Say,* Rev. Prot. Plant., XI – 42, 92-96.
4. **Porca M., Ghizdavu I., Oltean I., Bunescu H., 2002 -** *Researches in artificial infestatiion condition and storage condition of some bean cultivars at bean weevil damage, Acanthoscelides obtectus Say,* Journal of Central European Agriculture, vol.4 No. 1, 31-38
5. **Tălmaciu M., 2003 -** *Protecția plantelor – Entomologie.* Editura „Ion Ionescu de la Brad", 112-114
6. **Trifan D., 2006 -** *Obținerea unor surse noi de germoplasmă la specia Phaseolus vulgaris cu calități productive competitive.* USAMV Iasi, Lucrări ştiințifice – vol.49, seria Agronomie