THE INFLUENCE OF THE CHEMICAL COMPOSITION OF DIFFERENT ORIGIN BEANS (*PHASEOLUS VULGARIS* L.) ON TOLERANCE TO THE BEAN WEEVIL *(ACANTHOSCELIDES OBTECTUS* SAY) STROKE

INFLUENȚA COMPOZIȚIEI CHIMICE A BOABELOR DE FASOLE (PHASEOLUS VULGARIS L.) DE DIFERITE PROVENIENȚE ASUPRA TOLERANȚEI LA ATACUL GĂRGĂRIȚEI FASOLEI (*ACANTHOSCELIDES OBTECTUS* SAY)

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REZUMAT

Gărgărița fasiolei A*canthoscelides obtectus* Say este un daunător deosdebit de periculos, în lipsa măsurilor de combatere putând produce pierderi de până la 100% la semințele depozitate. Cercetările efectuate România au evidențiat că pentru limitarea atacului acestui dăunător, alături de respectarea măsurilor de carantină şi combatere se recomandă folosirea provenienţelor rezistente sau tolerante (Manolache şi col., 1966; Marghitu şi col., 1978). Cercetările au urmărit stabilirea compoziției chimice la fasolea de diferite proveniențe, precum şi stabilirea de corelații între diversele componente chimice şi toleranța acestora față de atacul *A. obtectus*.

CUVINTE CHEIE: gărgărița fasolei, proveniențe, dăunare, compozitie chimică, toleranță

ABSTRACT

Bean weevil A*canthoscelides obtectus* Say is a very harmful pest. When pest control lacks it can produce 100% damages in stocked seeds. Research performed in Romania emphasized the importance of resistant or tolerant origins use besides the quarantine and fight measures in order to limit the stroke of this pest (Manolache et al., 1966; Marghitu et al., 1978). Research aimed to establish the chemical composition of the beans of different origins in the same time with correlation between the different chemical components and their tolerance against *A. obtectus* stroke.

KEY WORDS: bean weevil, cultivars, damages, chemical composition, tolerance

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DETAILED ABSTRACT

Bean weevil *A. obtectus* is a very harmful pest. When pest control lacks it can produce 100% damages in stocked seeds (Cândea, 1984). Research performed in Romania emphasized the importance of resistant or tolerant origins use besides the quarantine and fight measures in order to limit the stroke of this pest (Manolache et al., 1966; Marghitu et al., 1978). Research aimed to establish the chemical composition of the beans of different origins in the same time with correlation between the different chemical components and their tolerance against *A. obtectus* stroke. A number of 9 bean of different origins were analyzed during the 2002 (varieties, hybrids, lines, and populations) in order to determine the chemical components (%): crude protein, crude fat, crude ash, crude fiber, non - nitrogenous substances, and also their tolerance to bean weevil stroke. We aimed to determine, in this respect, the existence of bean origin influence on tolerance against bean weevil stroke.

INTRODUCTION

The protein content of foodstuffs is one of the most important preoccupation of researchers worldwide. Protein are essential components of feed diets. No "sindrom of human or animal feed deficiency" is so harmful as protein deficiency as Mincu (1978 (cited by Olaru, 1972) showed. Due to its important content in protein of high quality and valuable amino acids (lysine, arginine, triptophan), beans are used in human nutrition as a very important element, over 500 millions of people being currently consumers (FAO). Previous research demonstrated that the chemical composition is the main responsible of the resistance against pests stroke, no tegument thickness (Cardona, 1989; Maldonado et al., 1996, Moss and Credland, 1994; Perju et al., 1983, Ghizdavu e al., 1997). Even though a clear mechanism of beans resistance against bean weevil stroke is not well known yet, isolation and characterization of the chemical components and also the quantification of their role in resistance determination being necessary (Regnault, 1999).

MATERIAL AND METHOD

A number of 9 different bean origins were analyzed (Ami, Vera, Star, Milenium, Diva, Clujana, local population - red bean -, local population - white bean -, and Avans).

The crude chemical composition was determined using the classical laboratory methodology. Protein was determined using Kjeldahl method. Dry mater, and ash were gravimetrically determined. Crude fiber was identified using a fiber extractor, and non – nitrogenous substances by difference of total.

RESULTS AND DISCUSSION

Tables 1- 6 show the crude chemical composition in all analyzed variants, and also the statistics.

Data (table 1) show the highest crude protein percent in Diva variant (20.11%), and the lowest in local population with white bean (16.80%). Very significant negative differences were recorded in Clujana, local populations against Mt_1, and only for local population with white bean against Mt_2. Data (table 2) show the highest crude fat percent in Avans variant (1.80%), and the lowest in Clujana variant (0.90%). Very significant positive difference was recorded in Avans, and for both Vera and local population with red bean very significant negative, against Mt_1 while for Ami, Milenium, Diva and local population with white bean significant differences. In all analyzed variants we found very significant negative differences against Mt_2. Data (table 3) show the highest dry matter percent in Ami variant (92.71%), and the lowest in Star variant (89.90%). Very significant positive difference was recorded in Ami, Vera, Diva, and for local population with white bean against Mt_1 while for Star, Milenium, Clujana, and local population with red bean very significant negative differences. Ami, Vera, Diva, and local population with white bean recorded very significant positive differences against Mt_2, while Star, Milenium, Clujana, and local population with red bean had very significant negative differences. Data (table 4) show the highest dry matter percent in local population with white bean variant (5.78%), and the lowest in Clujana variant (4.22%). Very significant positive difference was recorded in Ami, Diva, and for local population with white bean against Mt_1 while for Star negative distinct significant, for Star variant negative distinct significant, and for Avans and local population with red beans small differences not statistically assured differences were recorded. Vera, Milenium, and Clujana, recorded very significant negative differences against Mt_2, while local population with red bean had no statistically assured differences. Data (table 5) show the highest dry matter percent in local population with white bean variant (6.09%), and the lowest in Diva variant (5.20%). Very significant negative differences were recorded in Star, and Diva variants against Mt_1. Ami, Vera, Milenium, Clujna, and for local population with red bean no significant statistical differences were recorded. Ami, Star, Milenium, Diva, and local population with red beans recorded very significant negative differences against Mt_2. Data (table 6) show the highest dry matter percent in Vera variant (62.94%), and the lowest in Star variant (59.58 %). Very significant positive difference was recorded in Ami, and Vera Mt_1 while for Star and Diva negative very significant negative differences were recorded. Ami,Vera, Clujana, and local population with red bean recorded very significant negative differences against Mt_2, while local population with white distinct significant positive, and Milenium significant positive. Star, and Diva recorded very significant negative differences.

Table 1: Content in crude protein of bean (*Phaseolus vulgaris* L)
of different origin (Cluj – Napoca, 2000)
Tabelul 1: Conținutul în proteină brută al boabelor de fasole de diferite proveniențe

No. Nr. crt.	Variant Varianta	Crude protein (%) - as compared to Mt_1 Proteină brută (%) – față de Mt_1		± d	Significance of difference against Mt_1 Semnificația diferenței față de Mt_1	Crude protein (%) - as compared to Mt_2 Proteină brută (%) – față de Mt_2		± d	Significance of difference against Mt_2 Semnificația diferenței față de Mt_2
		Absolute value Valoare absolută	Relative value Valoare relativă			Absolute value Valoare absolută	Relative value Valoare relativă		
1.	Average of the variants (Mt_1) Media variantelor (Mt_1)	18.21	100.00	+0.00	-				
2.	Ami (white) Ami (alb)	18.61	102.20	+0.40	***	18.61	108.70	+1.49	***
3.	Vera (white) Vera (alb)	18.45	101.30	+0.24	***	18.45	107.76	+1.33	***
4.	Star (white) Star (alb)	19.21	105.50	+1.00	***	19.21	112.20	+2.09	***
5.	Milenium (coloured) Milenium (colorat)	18.22	100.10	+0.01	-	18.22	106.42	+1.10	***
6.	Diva (white) Diva (alb)	20.11	110.40	+1.90	***	20.11	117.46	+2.29	***
7.	Clujana (coloured) Clujana (colorat)	17.89	98.20	-0.32	000	17.89	104.49	+0.77	***
8.	Local pop. (red bean) Populație loc. (bob roșu)	17.33	95.20	-0.88	000	17.33	101.22	+0.22	***
9.	Local pop. (white) Populație loc. (alb)	16.80	92.30	-1.40	000	16.80	98.13	-0.32	000
10.	Avans (Mt_2) Avans (Mt_2)	17.12	94.00	-1.09	000	17.12	100.00	+0.00	-
			$DL_{5\%}$ = 0.021 $DL_{1\%}$ = 0.029 $DL_{0.1\%}$ = 0.040						0.021 0.029 0.040

Table 2: Content in crude fat of bean (*Phaseolus vulgaris* L)of different origin (Cluj – Napoca, 2000)
Tabelul 2: Conținutul în grăsime brută al boabelor de fasole de diferite proveniențe

No. Nr. crt.	Variant Varianta	Crude fat (%) - as compared to Mt_1 Grăsime brută (%) – față de Mt_1		± d	Significance of difference against Mt_1 Semnificația diferenței față de Mt_1	Crude fat (%) - as compared to Mt_2 Grăsime brută (%) – față de Mt_2		± d	Significance of difference against Mt_2 Semnificația diferenței față de Mt_2
		Absolute value Valoare absolută	Relative value Valoare relativă			Absolute value Valoare absolută	Relative value Valoare relativă		
1.	Average of the variants (Mt_1) Media variantelor (Mt_1)	1.22	100.00	+0.00	-	1.27	70.55	-0.53	000
2.	Ami (white) Ami (alb)	1.27	104.20	+0.05	-	1.10	61.11	-0.70	000
3.	Vera (white) Vera (alb)	1.10	90.20	-0.12	00	1.09	10.55	-0.71	000
4.	Star (white) Star (alb)	1.09	89.40	-0.13	00	1.14	63.33	-0.66	000
5.	Milenium (coloured) Milenium (colorat)	1.14	93.50	-0.08	-	1.21	67.33	-0.59	000
6.	Diva (white) Diva (alb)	1.21	99.30	-0.01	-	0.90	50.00	-0.90	000
7.	Clujana (coloured) Clujana (colorat)	0.90	73.80	-0.32	000	1.08	60.00	-0.72	000
8.	Local pop. (red bean) Populație loc. (bob roșu)	1.08	88.60	-0.14	00	1.14	63.00	-0.66	000
9.	Local pop. (white) Populație loc. (alb)	1.14	93.50	-0.08	-	1.80	100.00	+0.00	000
10.	Avans (Mt_2) Avans (Mt_2)	1.80	147.70	+0.58	***				-
			$DL_{5\%}$ = 0.106 $DL_{1\%}$ = 0.146 $DL_{0.1\%}$ = 0.201						0.106 0.146 0.201

Table 3: Content in dry matter of bean (*Phaseolus vulgaris* L)of different origin (Cluj – Napoca, 2000)
Tabelul 3: Conținutul în substanță uscată al boabelor de fasole de diferite proveniențe

No. Nr. crt.	Variant Varianta	Dry matter (%)-as compared to Mt_1 Substanță uscată (%) – față de Mt_1		± d	Significance of difference against Mt_1 Semnificația diferenței față de Mt_1	Dry matter (%)-as compared to Mt_2 Substanță uscată (%) – față de Mt_2		± d	Significance of difference against Mt_2 Semnificația diferenței față de Mt_2
		Absolute value Valoare absolută	Relative value Valoare relativă			Absolute value Valoare absolută	Relative value Valoare relativă		
1.	Average of the variants (Mt_1) Media variantelor (Mt_1)	92.26	100.00	+0.00	-				
2.	Ami (white) Ami (alb)	92.71	101.60	+1.45	***	92.71	102.01	+1.83	***
3.	Vera (white) Vera (alb)	92.32	101.20	+1.06	***	92.32	101.50	+1.44	***
4.	Star (white) Star (alb)	89.90	98.50	-1.36	000	89.90	98.90	-0.98	000
5.	Milenium (coloured) Milenium (colorat)	90.78	99.50	-0.48	000	90.78	99.88	-0.10	000
6.	Diva (white) Diva (alb)	91.44	100.20	+0.18	***	91.44	106.60	+0.56	***
7.	Clujana (coloured) Clujana (colorat)	90.53	99.20	-0.73	000	90.53	99.61	-0.35	000
8.	Local pop. (red bean) Populație loc. (bob roșu)	90.76	99.50	-0.50	000	90.76	99.86	-0.12	000
9.	Local pop. (white) Populație loc. (alb)	91.81	100.60	+0.55	***	91.81	101.02	+0.93	***
10.	Avans (Mt_2) Avans (Mt_2)	90.88	99.60	-0.38	000	90.88	100.00	+0.00	-
			$DL_{5\%}$ = 0.021 $DL_{1\%}$ = 0.029 $DL_{0.1\%}$ = 0.040						0.021 0.029 0.040

Table 4: Content in crude ash of bean (*Phaseolus vulgaris* L)of different origin (Cluj – Napoca, 2000)
Tabelul 4: Conținutul în cenușă brută al boabelor de fasole de diferite proveniențe

No. Nr. crt.	Variant Varianta	Crude ash (%) - as compared to Mt_1 Cenușă brută (%) – față de Mt_1		± d	Significance of difference against Mt_1 Semnificația diferenței față de Mt_1	Crude ash (%) - as compared to Mt_2 Cenușă brută (%) – față de Mt_2		± d	Significance of difference against Mt_2 Semnificația diferenței față de Mt_2
		Absolute value Valoare absolută	Relative value Valoare relativă			Absolute value Valoare absolută	Relative value Valoare relativă		
1.	Average of the variants (Mt_1) Media variantelor (Mt_1)	4.82	100.00	+0.00	-				
2.	Ami (white) Ami (alb)	5.23	108.40	+0.41	***	5.23	106.00	+0.30	***
3.	Vera (white) Vera (alb)	4.25	88.10	-0.57	000	4.25	86.20	-0.68	000
4.	Star (white) Star (alb)	4.60	95.40	-0.22	00	4.60	93.30	-0.33	000
5.	Milenium (coloured) Milenium (colorat)	4.33	89.90	-0.49	000	4.33	87.82	-0.60	000
6.	Diva (white) Diva (alb)	5.34	110.70	+0.52	***	5.34	108.31	+0.41	***
7.	Clujana (coloured) Clujana (colorat)	4.22	87.50	-0.60	000	4.22	85.59	-0.71	000
8.	Local pop. (red bean) Populație loc. (bob roșu)	4.89	101.40	+0.07	-	4.89	99.18	-0.04	-
9.	Local pop. (white) Populație loc. (alb)	5.78	119.80	+0.97	***	5.78	117.24	+0.85	***
10.	Avans (Mt_2) Avans (Mt_2)	4.93	102.20	+0.11	-	4.93	100.00	+0.00	-
			$DL_{5\%}$ = 0.127 $DL_{1\%}$ = 0.175 $DL_{0.1\%}$ = 0.241						0.127 0.175 0.241

Table 5: Content in crude fiber of bean (*Phaseolus vulgaris* L)of different origin (Cluj – Napoca, 2000)
Tabelul 5: Conținutul în celuloză brută al boabelor de fasole de diferite proveniențe

No. Nr. crt.	Variant Varianta	Crude fiber (%) - as compared to Mt_1 Celuloză brută (%) – față de Mt_1		± d	Significance of difference against Mt_1 Semnificația diferenței față de Mt_1	Crude fiber (%) - as compared to Mt_2 Celuloză brută (%) – față de Mt_2		± d	Significance of difference against Mt_2 Semnificația diferenței față de Mt_2
		Absolute value Valoare absolută	Relative value Valoare relativă			Absolute value Valoare absolută	Relative value Valoare relativă		
1.	Average of the variants (Mt_1) Media variantelor (Mt_1)	5.66	100.00	+0.00	-				
2.	Ami (white) Ami (alb)	5.69	100.50	+0.03	-	5.69	97.43	-0.15	00
3.	Vera (white) Vera (alb)	5.56	98.20	-0.10	-	5.56	95.20	-0.28	0000
4.	Star (white) Star (alb)	5.42	95.70	-0.24	000	5.42	92.80	-0.42	000
5.	Milenium (coloured) Milenium (colorat)	5.58	98.50	-0.08	-	5.58	95.54	-0.26	000
6.	Diva (white) Diva (alb)	5.20	91.80	-0.46	000	5.20	89.04	-0.64	000
7.	Clujana (coloured) Clujana (colorat)	5.68	100.30	+0.02	-	5.68	97.26	-0.16	00
8.	Local pop. (red bean) Populație loc. (bob roșu)	5.63	99.40	-0.03	-	5.63	96.40	-0.21	000
9.	Local pop. (white) Populație loc. (alb)	6.09	107.50	+0.43	***	6.09	104.28	+0.25	***
10.	Avans (Mt_2) Avans (Mt_2)	5.84	103.10	+0.18	**	5.84	100.00	+0.00	-
			$DL_{5\%}$ = 0.106 $DL_{1\%}$ = 0.146 $DL_{0.1\%}$ = 0.201						0.106 0.146 0.201

Table 6: Content in non – nitrogenous extractive substances (NES)of bean (*Phaseolus vulgaris* L) of different origin (Cluj – Napoca, 2000)
Tabelul 6: Conținutul în substanțe extractive neazotate (SEN)al boabelor de fasole de diferite proveniențe

No. Nr. crt.	Variant Varianta	NES (%) - as compared to Mt_1 SEN (%) – față de Mt_1		± d	Significance of difference against Mt_1 Semnificația diferenței față de Mt_1	NES (%) - as compared to Mt_2 SEN (%) – față de Mt_2		± d	Significance of difference against Mt_2 Semnificația diferenței față de Mt_2
		Absolute value Valoare absolută	Relative value Valoare relativă			Absolute value Valoare absolută	Relative value Valoare relativă		
1.	Average of the variants (Mt_1) Media variantelor (Mt_1)	61.27	100.00	+0.00	-				
2.	Ami (white) Ami (alb)	61.91	101.10	=0.64	***	61.90	101.10	+0.72	***
3.	Vera (white) Vera (alb)	62.94	102.70	=1.67	***	62.94	102.85	+1.75	***
4.	Star (white) Star (alb)	59.38	96.90	-0.89	000	59.38	97.04	-1.81	000
5.	Milenium (coloured) Milenium (colorat)	61.51	100.40	=0.24	-	61.51	100.50	+0.32	*
6.	Diva (white) Diva (alb)	59.58	97.20	-1.69	000	59.58	97.36	-1.61	000
7.	Clujana (coloured) Clujana (colorat)	61.83	100.90	+0.56	**	61.83	101.04	+0.64	***
8.	Local pop. (red bean) Populație loc. (bob roșu)	61.83	100.90	+0.56	**	61.83	101.04	+0.64	***
9.	Local pop. (white) Populație loc. (alb)	61.79	100.90	+0.53	***	61.79	100.90	+0.60	**
10.	Avans (Mt_2) Avans (Mt_2)	61.19	99.90	-0.08	-	61.19	100.00	+0.00	-
			$DL_{5\%}$ = 0.318 $DL_{1\%}$ = 0.438 $DL_{0.1\%}$ = 0.603						0.318 0.438 0.603

CONCLUSIONS

1. The content of crude protein, crude fat, dry matter, crude, ash, crude fiber, and no – nitrogenous extractive substances had no direct negative or positive influence on the tolerance of beans of different origin against bean weevil *A. obtectus* stroke.
2. The chemical analyze of beans must be deeply studied in order to determine the influence of both bean pigments, and amino acids on tolerance of beans of different origins against bean weevil *A. obtectus* stroke.

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