

ORIGINAL PAPERS

BIOLOGICAL AND ECOLOGICAL PECULIARITIES OF BEAN WEEVIL (*ACANTHOSCELIDES OBTECTUS* SAY.) - A BASIS AS AN ALTERNATIVE HOST FOR BREEDING OF OVIPARASITE *USCANA SENEX* G.

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INTRODUCTION

A complex of pests - *Sitona lineatus* L., *S. crinitus* Hrbst., *Laspeyresia nigricans* F., *Bruchus pisorum* L., *Etiella zinckenella* Tr., *Kakotrips obustus* Uz., *Acyrtosiphon pisum* Harr. and *Bruchus pisorum* L. were found on the cultural variety of pea. The hidden form of its larvae life makes difficult the conducting of the destructive measures against this pest, and application of the insecticides with a large spectrum of action reduces noticeably the number of the natural enemies and contributes to appearance of the resistant populations of it [1]. There is sufficient information about the possibility of controlling this pest number by natural entomophages, among these are the oviparasite *Uscana senex* G. and ovi-larvoparasite *Triaspis rugosus* Szepi [2-4].

MATERIAL AND METHODS

In connection with the fact that the reproduction of the insects is based on the principle of more rational utilization of the nutritive substratum, the task of our studies was the creation of optimal conditions for reproduction of *A. obtectus* with the lowest labor and financial expenses. With this purpose *Pisum sativum* L. as the most spreaded bean crop as well as *Faba vulgaris* Mch. and *F. var. minor* Besk. were tested as a substratum and different kind of *Fasoleus vulgaris* Savi.

RESULTS AND DISCUSSIONS

The results of these investigations are presented in table 1.

As one can see from the results presented in table 1, the most favorable crop for reproduction of *A. obtectus* is *F. vulgaris* the qualitative and quantitative indices of its development surpass the ones of other crops.

Table 1. The quantitative indices of the *A. obtectus* larvae inculcation

Crop	Seeds infected %	Beetles eclosion %	Larvae inculcation in 1 seed indiv.	Seed use productivity %
<i>Pisum sativum</i> L.	9,6	62,6	1,7	13,3
<i>Faba vulgaris</i> Moench	12,7	74,7	2,8	15,0
<i>Faba var. minor</i> Besk	36,7	65,3	4,2	21,3
<i>Fasoleus vulgaris</i> Savi	71,2	85,4	6,8	79,6

Thus the percentage of the seeds populated by *A. obtectus* on grain *P. sativum* was 9,6 with the use productivity of the substratum for larvae development was 13,3% while on *F. vulgaris* these indices constituted 71,2 and 79,6% respectively. Consequently in a natural form such crops as *P. sativum*, *F. vulgaris* and *F. var. minor* with mass laboratorial rearing of *A. obtectus* are less economic. The principal cause of the insignificant infection of these crops by *A. obtectus* is the different biochemical composition of the seeds suitable for nutrition of pest larvae at a different degree.

It was revealed that the Beltskaia-16 variety was the most susceptible and the less resistant to infection from 5 varieties of haricot bean proposed for development of *A. obtectus* as a laboratory host of egg obtaining for *U. senex* reproduction (table 2).

Table 2. Variety resistance of haricot bean to infection by *A. obtectus* under the laboratorial conditions

Variety	Seed infection %	Inculcation number, indiv.	Beetle eclosion, indiv.	Female fertility, indiv.	Variety production %
Beltskaia - 16	69,0	6,8	80,3	284,0	80,3
Aluna	48,0	11,7	61,1	186,0	64,5
Moldavian white	44,0	9,8	83,0	82,0	60,2
Moldavian improved	51,2	12,1	70,1	116,0	51,2
Variety blend	56,2	15,6	63,4	112,0	58,4

The results presented in table 2 demonstrated that the variety of haricot bean Beltskaia-16 is the most accepted substratum in a natural form for obtaining of the high indices of *A. obtectus* reproduction, the fact that is confirmed by the significant number of the eclosed beetles and their fertility as compared with the similar indices on other varieties. On such varieties of the haricot bean as Aluna, Moldavian white, Moldavian improved and a mixture of varieties, the seed productivity significantly yielded to variety Beltskaia-16 and constituted by varieties from 51 to 64%.

The influence of the feeding up on the female fertility of *A. obtectus* allowed establishing a direct dependence of it on the form of feeding up. So the number of eggs laid by the females of *A. obtectus* in the experimental variant where they were offered a 10% solution of sugar as an additional nutrition exceeded by a significant value the similar indices in the variant without additional nutrition.

Duration of egg laying in the investigated variants was increased 1,2 times when the individuals were feeding only by distilled water and 1,5 and 1,3 times in variants with the solutions of sugar and honey respectively as compared with the control.

Consequently the carbo-hydrate feeding up as well as distilled water are necessary on the whole both for ripening and more complete realization of the eggs and for life prolongation of feeding adults of *A. obtectus*.

Determination of the quantitative and qualitative indices of the grain moth in dependence of temperature has demonstrated that the biological indices of its development are realizing the most completely under the laboratorial conditions at temperature 25 to 290C.

Life duration of the adults kept at 27 to 300C was lower by 8 to 10 days as compared with the individuals grown at temperature 22 to 230C. It's worth mentioning that at temperature 180C the development of the larvae was not observed.

Fertility of the eclosed females at temperature 270 C was significantly higher than the one of the females which eclosed at temperature 230 C. With determination of the influence of different conditions of maintenance of *A. obtectus* which are the thickness of the substratum layer, on the biological parameters of its development, it was established that the grain infestation of haricot bean was different in dependence on the layer thickness of haricot bean. So the percentage of the inculcations in the variants which differed by the layer thickness (1, 2, 3, 4, 5 and 6 cm) had no discrepancies by a significant value during the development of *A. obtectus* under the conditions of complete darkness. With 16 hours light period, this index decreased 2,5 times while layer thickness of the haricot bean increased up to 5 cm, i.e. the number of inculcations per one seed of haricot bean decreased by a significant value. So, it was established that temperature increasing on 4 or 50C joked the change of the sexual index to the side of male increasing. Consequently the decreasing of the female number, in this case, tells up on the number of eggs obtained from a unit of the forage. However it is necessary to note that the number of eclosed beetles was dependent on the layer thickness of haricot bean in a lower grade where they were developing.

CONCLUSIONS

The intensive egg lying by the females under laboratorial conditions takes place during 10 days with a clear expressed peak on 6-10th day from the beginning of laying. In this time period, 80% of the eggs are laid that constitutes up to 10 g from 1 kg of haricot bean at a maximum realization of the females egg production. It was noted that in different periods of egg laying their quantity in 1 mg constitutes 34 to 44 pieces i.e. more than 34 thousand pieces in 1 g. At the same time, the weight of one egg is different too and ranges 20 to 29 mkg.

Thus elaboration of laboratory regulations for reproduction of *A. obtectus* with the aim of mass production of *Uscana senex* allowed establishing the following: haricot bean is the most preferable among the investigated substrata (crops) by the percentage of inculcations and infections per one seed, eclosion, and fertility of the host females.

From 5 investigated varieties of haricot bean, Beltskaia-16 is marked by the biological indices of *A. obtectus*.

It was revealed the influence of the layer thickness of the haricot bean on the qualitative indices of infection, inculcation, eclosion and fertility of the host. It was determined the quantitative and qualitative index of obtaining *A. obtectus* from a substratum unit.

ABSTRACT

The laboratory regulations of *Uscana senex* rearing includes the reproduction of *Acanthoscelides obtectus* as a secondary host, based on Belitzcaia-16 bean sort wich provides a high female's biological potential, presenting a high viability and prolificacy and a large quantity of individuals obtained from a substratum unit.

REFERENCES

1. BANY A., KEEFFE L., 2004 - Response of the Lathyrus species to infestation by the pea weevil *Bruchus pisorum* L. (Coleoptera, Bruchidae). *Entomol. Exp. et appl.*, 35, no. 1, 83-87
2. КЛИМОВ Е.В., 2008 - Технология биологической защиты сои от вредителей и болезней. Реферативный журнал «Экологическая безопасность АПК». Москва, № 4, с. 10-67
3. Расничина Н.М. Горбатовский В.В., 1994 - Принципы выбора хозяина при массовом разведении энтомофагов. IX съезд Всесоюзного энтомологического общества. Киев, с.122-123
4. VOLOȘCIUC L.T., 2009 - Biotehnologia producerii și aplicării preparatelor baculovirale în agricultura ecologică. Chișinău: Mediul ambiant, 262 p

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