VIRIN-ABB-3-AN EFICIENT LEVER FOR ECOLOGICAL AGRICULTURE

VIRIN-ABB-3-O PÂRGHIE EFICIENTĂ A AGRICULTURII ECOLOGICE

STÎNGACI AURELA
Institute of Plant Protection and Ecological Agriculture, Chisinau, Republic ofMoldova

Abstract. *Advancement of strategies of ecological agriculture it is lost in thought without application of biological preparations occupy a separate place among the other biological means for plant protection. One important element in the technological process of insecticide virus production is an elaboration of a new preparation form of the virus insecticides as well as their commercialization. This work contains testing of biological preparation Virin ABB-3 -for elimination of Hyphantria cunea Drury in laboratory and field conditions. The preparation is based on viruses of nuclear polyhedrosesis and granuoses with* cumulative and synergetic action. *Presently the investigation are being carried out the elaboration of other virus insecticide for control in the systems of integrated plant protection of different agricultural, ornamental and forest crops.*

Rezumat. *Implementarea strategiilor de agricultură ecologică este imposibilă fără aplicarea largă a producere şi aplicare a mijloacelor biologice pentru protecția plantelor. Preparatele biologice ocupă un loc distinct printre altele mijloace biologice de protecție a plantelor. Un element important al procesului tehnologic de producere a insecticidelor virotice este elaborarea formei preparative şi comercilizarea lor. Această lucrare conține testarea preparatului Virin –ABB-3 pentru distrugerea (combaterea) of Hyphantria cunea Drury în condiții de laborator şi de câmp. Preparatul este bazat pe virusurile poliedrozei cu acțiune cumulativă şi sinergistă. În prezent au loc investigații în elaborarea unui alt insecticid virotic pentru lupta în sistemele integrate a protecției plantelor în diferite sisteme agricole, ornamentale, forestiere.*

INTRODUCTION

In the 70-80th years of the last century, the strategy of the agricultural production in the Republic of Moldova was mainly based on the continuous increase in the utilization of the plant protection agents. This abusive use led to a situation that in 1985, the total volume of the pesticides was more that 30725 tones on the reactant, at the same time, the area of the cultivated land reached 85% of the territory of the republic. The assortment composition included up to 135 denominations. The traditional agriculture based on the utilization of the chemical agents put forward a series of problems, associated with the aggravation of the ecologic crisis and namely the unrestricted use of pesticides.

The radical changes, which came over in the economic life of the country after 1991, led to the sharp retrogression of the level of pesticides use. (Volnyanskaya A.V., Stratulat T.G., Syrku R.F., 2004; Popushoy I., Voloshchyuk L., 1994; Ehler L., Bottrell D., 2000).

Long term researches in this field contributed to the formation of a well-balanced conception, emphasizing the dialectics of the counterbalances between the plants protection

and the environmental protection, which permitted to crystallize the ecological point of view in the light of the integrated systems of plant protection. (Boller E., Malovolta C., Jorg E., 1997; Goldstein V., Boinchan B., 2000). In the Republic of Moldova, investigations are pursued for the selection and identification of baculoviruses, which affect a big variety of destructive insects. The wide application of the virus preparation against the destructive insects, proved a high technologic (Ignoffo C., 1973; Tarasevich L.M., 1985; Chyuhriy M.G., 1988) and economic efficiency (Orlovskaya E.V., Shumova T.A. 1980; Bozhko N.A., 1988), as compared with other microbiological methods of plants protection. It was possible because of the organization of the production and mass raising insects. The modern scientific and technical achievements became the base of the ecological products growing which the last years are widely applicable in the developed countries. (Solkolov M.S., Filipchuk O.D., 1998, Voloshchyuk L., 2003). A series of problems in the field of plants protection and the growing of ecological products can be solved using three big biological agents: insects, microorganisms (viruses) and bioactive substances (Cross J., Dickler E., 1994; Voloshchyuk L., 2003). Recognition of the necessity for application the entomopathogenic viruses and baculoviral preparations elaborated on their basis is determined by the qualitative originality of the pathogenic agents, among which their specificity and epizootic character constitute the main advantages compared with the chemical insecticides. Manifestations of the purpose of rational utilization of these efficient levers it is necessary a profound knowledge of the mechanisms and conformity to natural laws which determine the regulation of the pest insects populations under the action of the baculoviruses(Tanada J. Kaya H., 1993).

Though in anterior investigation the development scheme of the family *Baculoviridae* (Granulosis Virus and Nuclear Polyhedrosis Virus) has been determined, nevertheless many aspects concerning the relations between pathogens and host-cell, as well as active transmission of the infection remain uknown. The aspects concerning the baculoviruses resistance to action of different environmental factors are not established (Bojco N.A., 1988; Muller L.,1997). Departing from the fact that epizootology – as a sciene about the causes, forms and conformities to the natural laws of the phenomena of the infection mass spreading among the animals – touches not only upon the pure theoretical aspects of the baculoviral infection development, but role of investigations in this domain increases rapidly (Fuxa J.R., Tanada J., 1987; Beckage N.E., Tompson S.N., Federici B.A., 1993). It becomes obvious that the entomologists do not limit themselves only establish the spreading levels in the case of mass reproduction of different insect species. We are sure that knowledge more profound of the conformities to the natural laws of spreading of viral infections conditions to a great extent increasing of the efficiency of the microbiological preparations in biological plant protection. The starting moment of the epizootic phenomena are in a tight dependence on the state of host-insect, pathogene and environmental factors. Investigation of the system ”virus-host” has allowed to elucidate the main conformities to the natural laws of interaction between the pathogene and the insects, and to establish the optimal conditions for development the process of the pathogenesis and regulation the host-insect mortality. It was demonstrated the transmission transphasic and transovarial of pathogens, the fact that determines the virus transmission from one generation to anogher and provides long preservation of infection in the frame of the population, so regulating its density (Tarasevici L.M.,1985; Fuxa J.R., Tanada J., 1987;Huber J., 1990).;

At present, it is recommended to use against the *Hyphantia cunea* Dryry, the ecologic clean virus preparation Virin –ABB-3, which is not connected with the laboratory raising of insects. For achieving these aims natural populations of insects shall be used. It is profitable from economic point of view, because the natural food is used. The obtaining of the virus preparation directly on the insects hosts creates the conditions for the obtaining of the native virus. On the basis of our experiments and those of the other specialists, we ascertained that raising insects hosts creates the conditions for obtaining of native virus.

In these cases, the challenges as the relationship between the virus and the host, the persistence of the virus infection, the transmission of viral infection among the insects population are solved by the nature itself. To this effect, it is necessary to have special, isolated plantation preferred by the insects against which the virus preparation is used. The aim of the presented work is to study the mechanisms of manifestation of the specific features of Virin-ABB-3 and to search the possibilities of use in a view to increase the biological activity of the strains for its production.

MATERIAL AND METHODS

The researches have been realised on the caterpillars of 2-3 ages of the *Hyphantria cunea* Drury. In the study, we used the Nuclear Polyedrosis Virus, selected and indentified in the laboratory of the insects' viruses. For the contamination of the laboratory insects, we used the dosed feeding, which contains respectively 10 polyhedrons for each caterpillar. The monitoring of the insects population and the estimation of the dead caterpillars has been carried out daily, beginning from the 3 rd day of the contamination. The effectiveness of the virus action was established according to the Abbot formula, which provides the insects ' natural death:

$$E\,ab = \frac{Me - Mo}{100 - Mc} * 100$$

Where Eab- – is the death rate, %; Mo – the number of dead specimens in the experiment; Mc- - the number of dead specimens in the control, J_o - the number of alive specimens in the experiment. The caterpillars *Hyphantria cunea* Drury were kept under laboratory conditions at 27 C°.

The mathematical treatment was registered on the 15th day after contamination (Dospekhov, 1985), the statistical treatment was made according to Gar K.A.(1963).

RESULTS AND DISCUSSIONS

Integrated Pest Management is today a widely accepted strategy to reduce over-dependence on chemical insecticides and their potentially negative environmental and economic effects. Biotechnology has considerable potential to contribuite to sustainable biological elements of Integrated Pest Management. The experiments with the preparation Virin-ABB-3 on the contaminated caterpillars (larvae) of *Hyphantria cunea* Drury on different plants became an acute necessity for the determination of the percentage of the mortality of specimens with the same concentration and the same number as well as the biological effectiveness. The results of the experiments are presented in the table 1

Table 1

The infection population of *Hyphantria cunea* Drury Virin-ABB-3 of different plants

Plants	No. of caterpillars	Solution Conc.	No. of the death caterpillars					The percentage of the mortality			Biologic Efficacy to the Abbot , on the 15 days, %
			3	5	7	10	15	on the 5th	on the 10th	on the 15th	
Mulberry	40	10^6	0	12	19	34	39	30,0	85,0	97,5	97,3
Maple ash	40	10^6	0	8	16	29	38	20,0	72,0	95,5	95,2
Walnut Opex	40	10^6	0	6	9	28	38	15,0	70,0	85,0	84,2
Cherry tree	40	10^6	0	5	10	27	32	12,0	65,0	80,0	78,9
Acasia	40	10^6	0	2	5	16	30	5,0	40,0	75,0	73,8
Control	40	10^6	0	0	2	4	4	0	5,0	5,0	-

According to the table, on the 5th day, the death rate of caterpillars of *Hyphantria cunea* Drury on different plants are modified on the average of 2%, on the 10th days on the average of 7%, on the 15th day on the average of 3,5%. The highest mortality rate of the caterpillars has the mulberry – 97,5%, the lowest mortality rate has acacia – 75,0 %. The biological effectiveness according to Abbott on the 15th day represented 73,8%. The mortality rate in the control on the 10th – 15th day was 5%. As follows from the table 2, the highest efficiency in the first variant has the mulberry – 82,52%, in the second variant the cherry tree- 84,5%, in the third variant the mulberry – 87,5%. In the control, the highest efficiency has the maple ash – 51,5%. Thus, for the contamination of the caterpillars of *Hyphantria cunea* Drury with various preparations the best variant is the caterpillar powder + the powder of sawdust has the mulberry – 89, 53%.

Table 2

The contamination of the caterpillars of *Hyphantria cunea* Drury with various preparations

Preparations	Plants	Number of trees	Treatments	Biologic efficacy,%
1. the caterpillar powder + the powder of sawdust	Cherry tree	100 trees	2	65,0
	Maple ash	100 trees	2	72,25
	Mulberry	100 trees	2	89,53
2. the caterpillar powder+ melasses + flour	Cherry tree	100 trees	2	73,0
	Maple ash	100 trees	2	82,85
	Mulberry	100 trees	2	68,9
3. the caterpillar powder + the vegetable rest powder	Cherry tree	100 trees	2	69,8
	Maple ash	100 trees	2	86,9
	Mulberry	100 trees	2	84,9

Table 3

The keeping VG şi VPN a *Hyphantria cunea* Drury for foliate surface after baculovirus treatments

Days	No. of larva	Conc.	Numărul larvelor Moarte		S-au format pupe		The percentage of the mortality		Biologic Efficacy to the Abbot , %
			No. of larva	%	No. of larva	%	No. of larva	%	
Control (fără tratare)	300	0	38	12,66	262	87,33	48	16,0	-
Ziua a doua după tratare	300	10^6	300	0	0	0	300	100	98,9
Ziua 4	300	10^6	295	98,33	5	1,66	300	100	98,9
Ziua 6	300	10^6	239	79,66	61	20,33	259	86,33	83,7
Ziua 8	300	10^6	217	72,33	83	27,66	233	77,66	73,3
Ziua 10	300	10^6	185	61,66	115	38,33	215	71,66	66,2
Ziua 12	300	10^6	67	22,33	233	77,66	93	31,0	17,8

As follows from the table 3, baculoviruses in different preparative forms keep activity for 8-10 days. The first 4 days biologic efficacy safe of 100%. The mortality rate on the 12th day was of 31%.

CONCLUSIONS

The comparison of viral pathogens with conventional chemical pesticides is usually solely from the perspective of their efficacy and cost. In additional to efficacy, the advantage of use of microbial control agents are numerous. These include safety for humans and other non-target organisms, reduction of pesticide residues in food, preservation of other natural enemies, and increased biodiversity in managed ecosystems.

Even if the baculovirus preparations are proposed to be used as biological methods against harmful insects, they are not widely applied today because of the long incubation period.

One of the most important elements of the technologic process of the virus insecticides is the elaboration of the preparative form. According to the presented experiments, the control of the preparation Virin-ABB-3 with different preparative forms in laboratory and field conditions, demonstrated that the most efficient form is the caterpillar powder + the powder of sawdust has the mulberry – 89, 53%

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