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Cryopreservation Technique, As a Massal Rearing Method for Egg Parasitoid of Pentatomidae Complex Species

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Opinion

The biological control programs for insects-pest using parasitoids, have gone through an evolution, from the seventies to the present in Latin America. In this way and in consideration to the challenges encountered in the sustainable agricultural production, the implementation of biological control in insects-pest stands out as an alternative for the sustainable management of agricultural ecosystems, promoting a reduction in the use of insecticides of synthetic origin. This biological alternative consists of different stages for its implementation:

1) The systematization of parasitoid production under controlled abiotic conditions;

2) The quality control of parasitoids produced under abiotic conditions;

3) The release of these control agents and the population reduction of insects-pest in crops production areas.

The studies conducted by Prof. Parra from the University of São Paulo (ESALQ-USP), Brazil [1] and the recent creation of the research center SPARCBIO (São Paulo Advanced Research Center for Biological Control), strengthening the scientific foundation of biological control, in Latin America. Previous studies confirmed that the main stage of these programs is the systematization of the massal rearing of insect-pest by means of artificial diets, key aspect in the production of parasitoid eggs. The knowledge of the biological and reproductive cycle, in insects-pest as well as in parasitoids, is crucial for the success of biological control programs. The behavior observed in eggs parasitoids of Pentatomidae species, particularly in *Telenomus podisi*, these complete their biological cycle inside the eggs. Consequently, the adaptation of the protocols for the eggs parasitoids production, are conditioned to the quality of these macroorganisms (parasitoids), which later will be release in the crops.

The agricultural ecosystems in the tropics of Latin America, present global challenges such as "climate change", demonstrating the temperature increase, affecting the ¨Insect-pest-Parasitoid-Plant¨ trophic interaction. In the last decade, research has been conducted confirming the adaptation of the Pentatomidae complex species to an elevated number of cultivated and non-cultivated plants. This condition is attributed to the bioecological and nutritional adaptation capacity of Pentatomidae complex in plant species belonging to different taxonomical families [2]. The biological adaptation and the nutritional plasticity of *Euchistus heros*, specie is considered dominant in the south of Brazil, and is reported in crops of economic importance [3]. In a similar manner, *Euchistus nicaraguensis* and *Oebalus insularis*, both species are reported in rice crops in Panama [4], also it has been observed feeding from weed from the Piperaceae family, in surrounding areas of cultivation parcels [5].

The versatility of the parasitism capacity of *Telenomus podisi* and control efficiency in different species of Pentatomidae [4,5], has justified its use in biological control programs implemented recently, in Brazil and Panama. Consequently, the criopreservation technique as a conservation measure for egg parasitoids of Pentatomidae, is a warranty for the sustainability of biological control programs. Some adverse effects such as the reduction of the parasitism capacity and the female proportion in *T. podisi*, is a result of the inbreeding of this parasitoid, reared under controlled abiotic conditions, for an extended period of time. Also, other variables such as the nutritional quality of the host could influence the emergence rate of *T. podisi,* considering their multiplication at reduced temperatures. Thus, the effect of storage time has been determined in the Pentatomidae eggs parasitized by *T. podisi* [6]. In this sense, the storage period can vary in function of the sugar concentrations (fructose, glucose, dextrose), finded inside the

parasitized eggs of the insect. The storage temperature variable between 9 and -20ºC; as well as the use of liquid nitrogen (-196ºC), allows maintaining the biological and reproductive characteristics of the parasitoid for extended storage periods. The storage of *E. heros* eggs parasitized by *T. podisi,* at reduced temperature for periods up to 6 months, does not affect the viability of the emerged parasitoid [6]. In Panamá, the storage effect of *O. insularis* eggs parasitized by *T. podisi* at -196ºC, highlighting the viability and quality of the parasitoid, up to a period of 45 days.

The cryopreservation tecnique, used for the maintenance of parasitoids and specifically T. *podisi* in eggs of different Pentatomidae species, offers a viable alternative for the sustainability of biological control programs. Thus, it is important to highlight the input of this technique in multiplication of *T. podisi*, parasitizing different species of Pentatomidae. Nevertheless, a possibility to assess the feasibility of this technique for the multiplication of this parasitoid egg species, considering the production costs.

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