NEW REMEDIES FOR BEES

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REMEDII NOI PENTRU ALBINE

Au fost elaborate tehnologii de producere a unor preparate sanogene de o nouă generație *Apispir* și *BioR*^{Sp} având ca sursă primară biomasa de *Spirulină*. Pe lângă efectul stimulator asupra prolificității, cantității și calității produselor apicole, aceste preparate fortifică statusul imun, contribuind astfel și la depășirea incidențelor provocate de Colapsul familiilor de albine (CCD)

Key words: *Spirulina*, biotechnologies, feed additive, remedy, bees.

Introduction

The apiculture is an important branch of national economy in the aspect of crops (more than 90) pollination and agriculture products obtaining.

In recent years the apiculture suffers because of the big lost in production, caused by the infectious diseases that contribute to the diminishing of fertility and productivity, increasing the rate of bees' mortality. Among the most widely spread infectious diseases are: european and american foulbrood, septicemia, mycosis and virosis, which conduct to the bees death [7,11].

Starting from 2006 the most actual problem without solution is CCD - Colony Collapse Disorder, an anomaly that attains the accidental proportions, the decreasing of bees family number from 2,4 million to 900 thousand was registered in USA, disappearing of 10 million in Taiwan, – by 25% in Germany, and in some cases the loss was up to 80% [1,3-6].

Diverse feed additives are used in bees nutrition for the maintaining of their families and for the productivity increase [7,10]. The products are expensive, contain synthetic amino acids and can be rapidly exposed to the oxidation of proteic and lipidic components that cause bees diarrhea after its consummation and affect the honey quality.

The antibiotics, antifungicides and antiviral drugs are used in the eradication of families' bees' infections in the exceptional cases. There are some disadvantages of these remedies: synthetic nature, the possibility of accumulation in honey and the danger of penetration into the human body, lower effectiveness and higher cost [7].

Thus the main principles of application of technological procedures in the apiculture include the elaboration of the new methods for ensuring and promotion of vitality and bees families' health, prevention of infection's appearance and increasing of bees families resistance against it.

The aim of the investigation was to elaborate some new sanogenic products for apiculture through biotechnological exploration of cyanobacteria *Spirulina platensis* biomass.

Material and Methods

The strain of cyanobacteria *Spirulina platensis* CNM-CB-02, from the National Collection of Non-Pathogenic Microorganisms of the Republic of Moldova, Institute of Microbiology and Biotechnology of the Academy of Sciences of Moldova, is used as a source for obtaining of *BioR*^{Sp} preparation and feed additive *Apispir*. *Spirulina* was cultivated in the regime of accumulation, on SP-1 nutritional medium [8]. Cultivation lasted for 144 hours, respecting the cultivation parameters as following: temperature—30ºC, light intensity—3000 lx during first 72 hours and respectively - 35ºC, 4000 lx in the next 72 hours of the cultivation process.

The physico-chemical properties and composition of *BioR*^{Sp} preparation and feed additive Apispir were determined by the methods, described in [2,8].

In the experimental investigations *BioR*^{Sp} preparation and feed additive *Apispir* were used according to the scheme:

0,5 ml *BioR*^{Sp} preparation (10mg dry substance/ml) have been added to 500ml of sucrose syrup (1:1) and used as supplement for autumn bees families nutrition.

1-2ml *Apispir* (10mg dry substance/ml) feed additive have been added to 1000ml of sucrose syrup (1:1) and used as supplement for spring bees families nutrition.

Obtained Results

The methodology and strategy of our investigations allow using of *Spirulina* biomass for obtaining of two sanogenic products for apiculture – feed additive *Apispir* and *BioR^{Sp} preparation* (Fig.1).

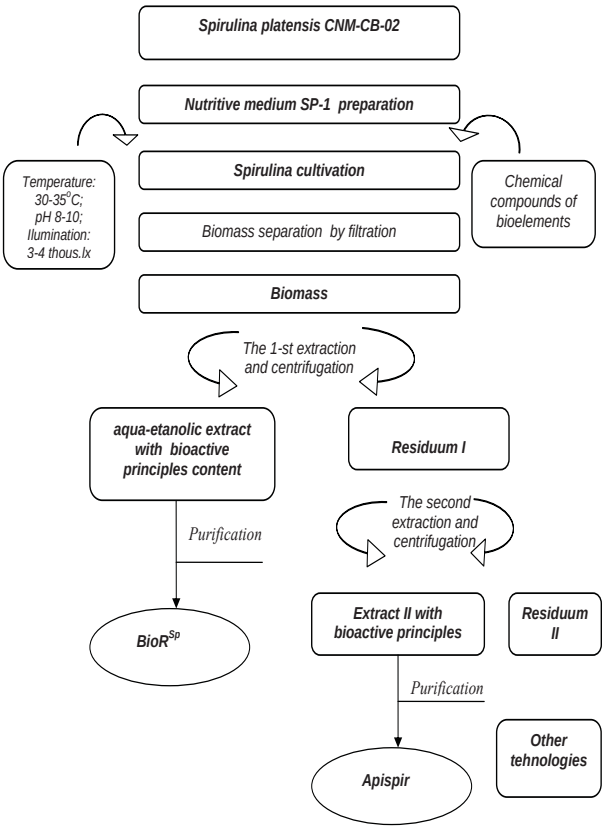


Fig. 1. Integrate technologic scheme of BioR^{Sp} preparation and feed additive Apispir obtaining.

BioR^{Sp} preparation contains substances with low molecular mass such as: free amino acids and oligopeptides (up to 10kDa), carotenoids, pheophytin, intermediary compounds of carbohydrates and lipids metabolism, macro- and microelements with antioxidant action. The preparation demonstrates the antioxidant properties and the capacity to stabilize the cellular and lissome membranes by the normalization of glutathione metabolism. The presence of amino acids and oligopeptides, as well as such microelements as Mn, Fe, Zn, Cu, Se, Cr stimulates the process of regeneration of tissues and has a positive effect on cellular and humoral immunity.

APISPIR contains proteins, carbohydrates (including sulfated polysaccharides), and microelements. The action mechanism of this product can be attributed to the properties of the constituent substances. The proteic composition offers the total essential amino acids content with a high efficiency (up to 87%) and utilization (92%). There are the following amino acids with immunostimulative and antioxidant action): aspartic and glutamic acids, alanine, cysteine, glycine and serine, threonine, triptophan and valine.

The utilization of *BioR^{Sp}* preparation during autumn nutrition for honey reserves supplementing for bees wintering, provides an activation of physiological and biochemical processes in the organisms of working bees (Tab.1).

Table 1. Dynamics of some biochemical indices on bees after *BioR^{Sp}* autumn administration (in %).

Variant	Biochemical indices					
	ALT	**AST**	**LDH**	**Al. Ph**	**A. Ph**	**T.Pr.**
Before supplem.	100,0	100,0	100,0	100,0	100,0	100,0
Control (pure syrup)	97,8	100,0	102,1	71,6	23,2	77,5
BioR^{Sp}	126,1	200,0	174,0	93,1	57,1	102,6

***ALT** – alaninaminotransferase (mmol/h.l); **AST** – aspartataminotranspherase (mmol/h.l); **LDH** – lactatdehydrogenase (mmol/s.l); **Al. Ph.** – alkaline phosphatase (nmol/s.l); **A. Ph.** – acide phosphatase (nmol/s.l); **T.Pr**. – total proteins.*

The active components of preparation increased the physiologic capacities of working bees. The bees' families were in good condition after wintering, without any signs of diarrhea at bees or nutrition oxidation and fermentation.

The utilization of *Apispir* as feed additive for spring nutrition has stimulated the cowering spawn of queen, increasing of new generation growth and the quantity of collected honey. The remedy was consumed by the bees, increasing up to 18-29% the number of young generation, the honey quantity, collected after acacia pollination, up to 22-53% (Fig.2).

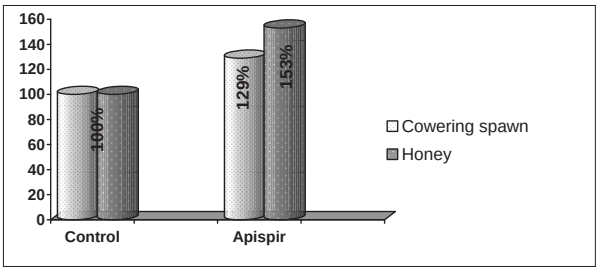
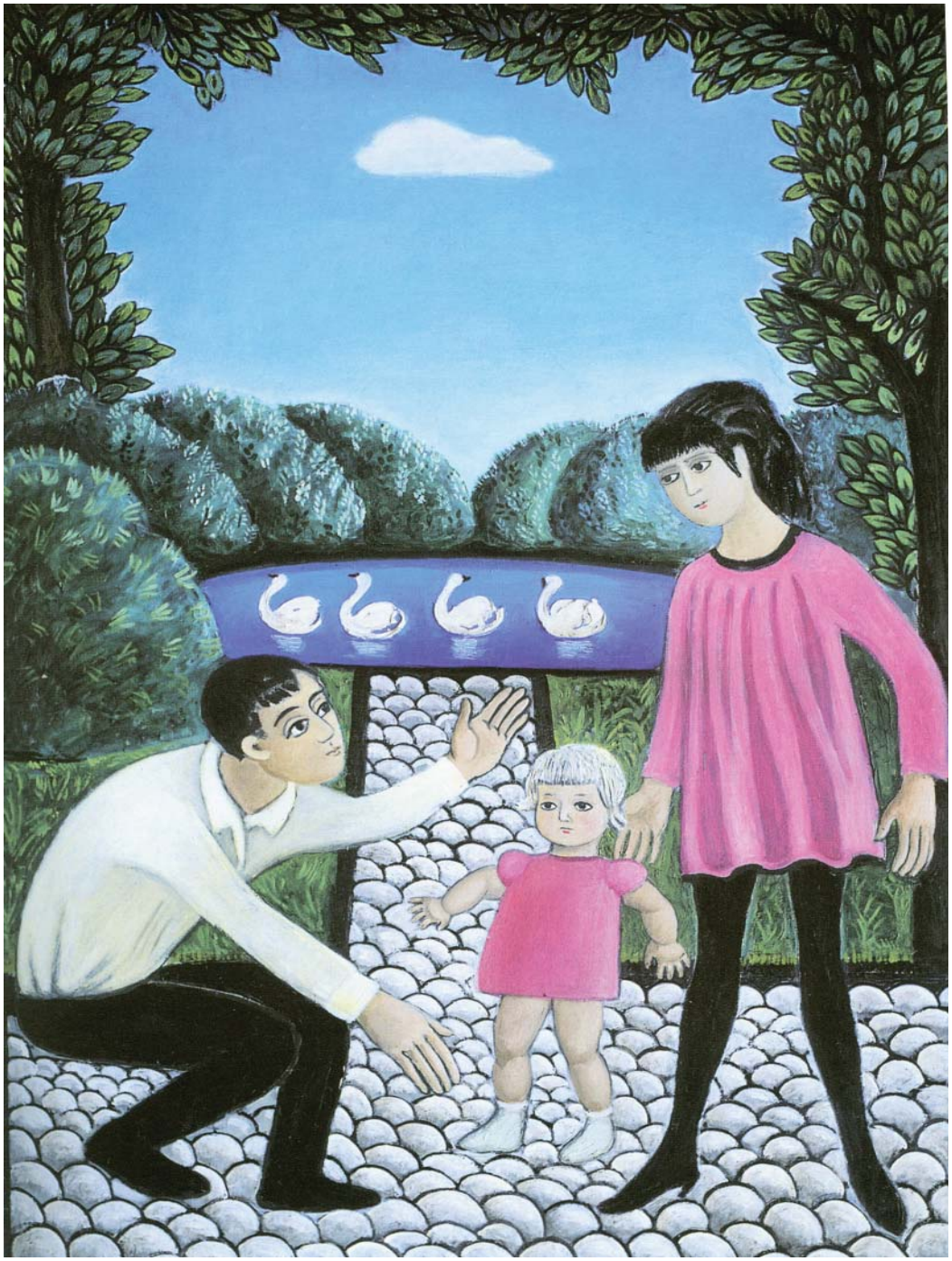


Fig. 2. The cowering spawn and honey quantity obtained after APISPIR in spring administration.

In conclusion, *APISPIR* and *BioR^{Sp}* represent the new sanogenic, ecological products, without adverse effects with high efficacy that could be used in lower quantities due to the production technology and bioactive components. The remedies can be used in the apiculture for stimulation of bees families' growing, increase of apiculture products quantity, enhance of bees immune status, and CCD (Colony Collapse Disorder) eradication.

References:

1. Botany et Zoology. *Science news* 2007; 172(25/26):408-9.
2. Farmacopeea Română ed X. Bucureşti: Editura medicală, 1998, 1315p.
3. McMillan, W. Bees's killer. *Science news* 2007; 172(25/26):408-9.
4. Milius S. Eastern farms native-bee insurance. *Science news* 2007; 172(21):333-4.
5. Milius S. Hive scourge? *Science news* 2007; 172(10):147.
6. Milius S., Not so elementary bee mystery. *Science news* 2007; 172(4):56-8.
7. Pavaliuc P., Mantoptin A., Cebotari V., Condratiuc Ş. Apicultura ecologică şi producerea apicolă pură. *Mediul ambiant* 2005; 1(18):6-9.
8. Rudic V., Gudumac V., Bulimaga V., Dencicov L., Ghelbet V., Chiriac T. Metode de investigare în ficobiotehnologie. Elaborare metodică. Chişinău: CE USM, 2002, 60p.
9. SU No.1037904A,1986.
10. Г. Ф. Таранов Корма и кормление пчел.- Москва: Сельхозиздат, 1986, с.130-132.
11. Гробов О.Ф., Смирнов А.М., Попов Е.Г. Болезни и вредители медоносных пчел. Москва Агропромиздат, 1987, 336с.



Valentina Rusu-Ciobanu. ***În parc. 1966.*** Ulei pe pânză.