RESULTS REGARDING BIOLOGICAL CONTROL WHICH REPLACED CHEMICAL CONTROL IN GREENHOUSES WITH TOMATO

REZULTATE PRIVIND COMBATEREA BIOLOGICĂ CE POATE ÎNLOCUII COMBATEREA CHIMICĂ, ÎN SERELE DE TOMATE

SIAKAVELIS K. [1]***, PETRESCU R.***[1]***, ROSCA I.***[1]
e-mail: ioanrosca_usamv@yahoo.com

Abstract. *Practical results, obtained in the SC Leoser SA, are presented, replace chemical control with biological control. Thanks to the technology of cultivation substrate "coco peat" and "rockwool", there are no problems of soil pests (wireworms, white worms, gray worms). In recent years we have successfully used products: NESIDIOcontrol (Nesidiocoris tenuis) MACROcontrol (Macrolophus pygmaeus), SWIRScontrol (Amblyseius swirskii) ENCARcontrol (Encarsia formosa), APHIcontrol (Aphidius coleman) PHYTOcontrol (Phytoseiulus persimilis) DIGLYcontrol (Diglyphus isaea) ORIcontrol & MAJUScontrol (Orius laevigatus and O. mayusculus) MONcontrol (Amblyseius montdorensis). Evolution of main pests are presented corelated with biological control measures. Tuta absoluta was successfully controled by mass capture and killing using pheromone traps. The evolution of pest flight expressed by the number of males captured/trap is presented. Presented technology has shown non negative influence on the use of bumblebees for pollination. In case of punctual situation, appearance of problems due to pests, was imposed application of pesticides.*
Key words: biological control in greenhouses tomatoes

Rezumat. *Rezultatele practice, obţinute în SC Leoser SA, sunt prezentate, înlocuirea controlului chimic cu controlul biologic. Datorită tehnologiei de substrat de cultivare "Cocopit" şi "Rockwool", nu există probleme cu dăunători de sol (viermi sarma, viermi albi, viermi gri). In ultimii ani am folosit cu succes produsele: NESIDIOcontrol (Nesidiocoris tenuis) MACROcontrol (Macrolophus pygmaeus), SWIRScontrol (Amblyseius swirskii) ENCARcontrol (Encarsia formosa), APHIcontrol (Aphidius coleman) PHYTOcontrol (Phytoseiulus persimilis) DIGLYcontrol (Diglyphus isaea) ORIcontrol & MAJUScontrol (Orius laevigatus şi O. mayusculus) MONcontrol (Amblyseius montdorensis). Evoluţia principalilor dăunători sunt prezentate in corelatie cu controlul biologic. Tuta absoluta a fost controlată cu succes prin captarea în masă şi ucidere, folosind capcane cu feromoni. Evoluţia zborului dăunătorului, exprimată prin numărul de masculi capturaţi/capcană este prezentat. Tehnologia prezentată nu a arătat o influenţă negativă asupra bondarilor utilizati pentru polenizare. În cazul unor situaţii punctuale, apariţia unor probleme din cauza dăunătorilor, s-a impus aplicarea pesticidelor.*
Cuvinte cheie: combaterea biologică la tomate în seră

[1]University of Agricultural Sciences and Veterinary Medicine of Bucharest, Romania

INTRODUCTION

Pest management should be based on the proper identification of pests and knowledge of their biology. Regarding pests, for example, below are only part of the issue of pest identifying and using of parasites and predators, highlighting the fact that there is a wide spectrum of pests of tomato, not all with the same importance [nematodes (root nematode - *Meloidogyne incognita*); molluscs (gray slug - *Deroceras agreste,* other species of snails without shells); mites (twospotted spider mite - *Tetranychus urticae,* broad mite - *Polyphagotarsonemus latus*); insects (mole cricket - *Gryllotalpa gryllotalpa,* potato aphid - *Macrosiphon euphorbiae,* green peach aphid or the peach-potato aphid - *Myzodes persicae,* glasshouse whitefly or greenhouse whitefly- *Trialeurodes vaporariorum*, tobacco whitefly - *Bemisia tabaci,* common thrips or onion thrips - *Thrips tabaci,* wireworms and false wireworms or click beetles - *Agriotes* spp. and other members of Elateridae family, the Colorado potato beetle - *Leptinotarsa decemlineata,* bollworm - *Helicoverpa armigera,* tomato leafminer-*Tuta absoluta*, serpentine leafminer - *Liriomyza trifolii*)] (Roşca *et al*., 2011). Parasites are organisms that live and feed at the expense of another organism, which often causes him harm, disease or even death, are locate on the host body, on the surface (ectoparasites) or inside (endoparasites). Parasites are usually much smaller than the host, reproduce faster than this. The parasite, strictly senso, do not kill the host (with exceptions), parasitoid usually cause the death of the host (often before maturity) or parasitic castration. Predators are pursuing and capturing prey organisms (alive), which are killed, they are higher than prey. Parasites and predators have an important role in mentaining biological balance into agricultural culture. Tomatoes cultivated in greenhouse are ideal crop in which biological pest control is possible to be applyied.

MATERIAL AND METHOD

In the greenhouses belonging to SC Leoser SA based on market demands (considering that over 80% of production of tomatoes of society is valued on foreign markets or through the process of conservation, with particular restrictions on the use of pesticides and their residues in fruit) in recent years has been applied a successful biological pest control program which led to the elimination of chemical treatments. Allover to cycle of vegetation observations were made on the occurrence of pests and parasites and predators release effectiveness. There are presented main biological products, considering target pest as whitefly, aphid, spider mite, leaf miner, and thrips.

RESULTS AND DISCUSSIONS

Usually the tomatoes culture (45 ha at S.C. Leoser S.A.) were visual inspected for the presence of pest and symptoms of pest atack beweekly by care staff who was previously trained to recognize key pests attack and their

symptoms, any problem is solved by the technician responsible for plant protection, asking whether to impose a specific parasite or predator. In table 1 is presented the importance of main pest in the last two years.

Table 1

Importance of main pest in the greenhouses belonging to SC Leoser SA

Pests	Pest species	Importance of pests
Witefy	*Trialeurodes vaporariorum, Bemisia tabaci**	h.i., q.p.
Aphid	*Macrosiphon euphorbiae, Myzodes persicae*	l.i., l.i.
Spider mite	*Tetranychus urticae, Polyphagotarsonemus latus*	h.i., h.i.
Leaf miner	*Liriomyza trifolii*, *Tuta absoluta**	h.i., q.p.
Thrips	*Thrips tabaci*	h.i.
Caterpillar	*Helicoverpa armigera*	l.i.

h.i. = high importance; l.i. = low importance; q.p. = quarantine pest

Thanks to the technology of cultivation substrate "coco peat" and "rockwool", there are no problems of pests soil (wireworms, white worms, gray worms, mole crickets) (fig. 1). The greenhouses are not monitorised with stiky traps (yellow or especially blue) because in all tomatoes greenhouses are used Koppert's NATUPOL© bumblebees (from hive class C to A, 2 hives/ha.) and traps may attract pollinators which perform best results for pollinating when they are used with natural enemies to control pests, taking into consideration that not all chemical agents can be combined with bumblebees (fig. 2). In accordance with legal regulations on protective measures against the introduction and spread of organisms harmful to plants or plant products in Romania, (www.madr.ro....html). to depict the vector *Bemisia tabaci* were inspected 200 plants, plants randomly chosen. Inspection is to examine the lower part of the leaves, taking into account that adults and eggs freshly deposited are found usually on new growth of plants, the first and second stage nymphs on the leaves wrinkled near the ground and between these floors meet stages 3 and 4 nymphs. Identification Laboratory is best done on four biological stage nymphs (last nymphal stage, sometimes called a pupa, although whiteflies don't have a true complete metamorphosis). For another quarantine pest *Tuta absolute* for screening were used pheromone traps, (2-4/ha), and when catches alert applies specific parasites. After pest detection, synthetic sex pheromones are principally used to monitor population levels and trigger applications of chemicals or other control methods (Salas, 2004). In greenhouses belonging to SC Leoser SA are used water traps for monitorising of tomato leafminer (fig. 3). There were no problems with quarantine pests and this aspect maybe be due to using of parasites and predators. For control of pests it

were used products, spreaded on leaves (fig. 4) from company Agrobio (http://www.agrobio.es/).

Fig. 1 Cultivation substrate

Fig. 2 Koppert's NATUPOL© bumblebees

Fig. 3 Water pheromonal traps for tomato leafminer

Fig. 4 On leaves release traces of parasites and predators

For control of whitefly it were used (as it is recommended) four products: NESIDIOcontrol (bottle of 500 predator bugs, *Nesidiocoris tenuis*, adults and nymphs) which can control other pests like leafminers, thrips, red spider mite or Lepidoptera eggs. They prefer to eat eggs and larvae, release dose from 0.5 to 1.5 ind./m^2; MACROcontrol predator bugs *Macrolophus pygmaeus* (nymphs and/or adults), which can control other pests like thrips, red spider mite or Lepidoptera eggs; SWIRScontrol (bottle of 25,000 predator mites *Amblyseius swirskii* which eat eggs and larvae of white fly, larvae of thrips, red spider mite and broad mite), type of treatment (preventive**)**, dose 50 ind./m^2, with ENCARcontrol (bottle with parasitic wasp *Encarsia formosa* pupae from which

5,000 adults will emerge) for control of *Trialeurodes vaporariorum*), preventively, release of 1.5 ind/m^2, weekly introductions until a high level of parasitism is reached (80-90%). For control of aphids it was used (as it is recommended) only one product, APHIcontrol (bottle with mummies of parasitic wasp *Aphidius colemani*, from which 1,000 adults will emerge), used to control *Aphis gossypii* and *Myzus persicae*, once found hot spots of aphids, there were released 0.5-1 ind./m^2. For control of spider mite it was used only PHYTOcontrol (bottle of 2000 predatory mite *Phytoseiulus persimilis* which eat all the stages of *Tetranychus urticae* the red spider mite, although it prefers young spiders), releasing 20 ind./m^2 directly over the hot spot. For control of thrips were used (as it is recommended) three products: SWIRScontrol; MONcontrol (bottle of 25.000 predatory mite *Typhlodromips montdorensis* which feeds on thrip, white fly, mites, small arthropods and pollen) releasing dose 20-50 ind/m^2 as a preventive treatment and ORIcontrol (bottle of 1,000 predatory bug bugs *Orius laevigatus*, adults and nymphs, which eats thrips and pollen), released when appeared first flowers at 1.5 ind./m^2 in different moments of vegetation especially at the beginning. Finally it was used for control of leaf miner, DIGLYcontrol (bottle of 250 parasitic wasp adults, *Diglyphus isaea* that controls, growing faster than the leafminers' population**)**. Releasing dose of 0.25 ind./m^2**,** the first release must be done where the first leafminers appear, weekly for two consecutive weeks. Due to this technology, in all greenhouses belonging to S.A. Leoser S.C., in tomatoes, there are no problems regarding main pest of tomatoes in the last years, but there are treatments against diseases because fungicides will not kill insects or mites. The cost of biological control, applying of this technology is between 2,500-3000 €/ha in each vegetation cycle, but there are no problems with rejecting (due to quality or pesticide residues) of tomatoes fruit from the market (domestic and especially foreign). By applying technology of using parasites and predators, shown above, it was reached on all the happy situation where tomato acreage in S.C. Leoser S.A. not applied chemical treatments for pest. In order to appreciate the succes of applying parasites or predators we consider „signs of success" (Elliott, 1997), for spider mite (predators on all infested plants), for whitefly (few hot spots. 85% parasitism few hot spots. 85% parasitism), for thrips (reduced leaf damage), for aphids (aphids eliminated).

CONCLUSIONS

1. By applying technology of using parasites and predators, shown above, it was reached on all surface where tomato were cultivated, the happy situation, when in S.C. Leoser S.A. chemical treatments for pest were not applied.

2. There were no problems with quarantine pests and this aspect maybe be due to using of parasites and predators.

***Acknowledgments**: Thanks, in this way, to the company S.C.Leoser S.A., for its support in realizing experiments and permission to use the data obtained. This paper is a part from PN II project No. 121/2012 „SIOPTEF”.*

REFERENCES

1. Elliott D., 1997 - *New England Vegetable and Berry Growers Conference and Trade Show*. Proceedings. Dec. 16-18, 154-157.

2. Roşca I., Oltean I., Mitrea I., Talmaciu M., Petanec D.I., Bunescu H.S., Istrate Rada, Talmaciu Nela, Stan C., Micu Lavinia Madalina, 2011 - *Tratat de Entomologie Generală şi Specială*. Ed. ALPHA MDN, 1055 p..

3. Salas J., 2004 - *Capture of Tuta absoluta (Lepidoptera: Gelechiidae) in traps baited with its sex pheromone*. Rev. Colomb. Entomol., 30 (1), 75-78.

4. www.agrobio.es/.

5. www.madr.ro/protectia-plantelor-si-carantina-fitosanitara/legislatie-nationala - fitosanitar. html.