

## CONTROL OF THE COLEOPTERES IN STORED AGRICULTURAL PRODUCTS BY NOT-CHEMICAL METHODS

## COMBATAREA COLEOPTERELOR PRODUSELOR AGRICOLE DEPOZITATE PRIN METODE NECONVENȚIONALE

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### ABSTRACT

The actual chemical control of harmful species from Coleoptera Order is acceptable only in some and very limited situations, and unacceptable in the majority of cases. This, from the point of view of residual toxicity, in the present and future, the development of the not-chemical means of protection are strongly necessary. The paper presents a synthesis of present status of knowledge about these not-chemical means of agricultural stored products protection, and its perspective in the future.

**KEYWORDS:** insects, coleoptera, stored agricultural products, not-chemical control

### REZUMAT

În condițiile actuale combaterea chimică a insectelor dăunătoare din ordinul Coleoptera este acceptată numai în câteva situații limitate și inacceptată în majoritatea cazurilor. Aceasta, din punct de vedere a reziduiilor toxice, în prezent și viitor, dezvoltarea metodelor neconvenționale de protecție sunt foarte necesare. Lucrarea prezintă o sinteză a cunoștințelor actuale despre măsurile de combatere nechimică în protecția produselor agricole depozitate, ca o perspectivă.

**CUVINTE CHEIE:** insecte, coleoptere, produse agricole depozitate, măsuri neconvenționale de combatere

The insects harmful to stored grains and by-products are numerous and various. Consequently, if we take into account only the main species of our country and those with similar climate conditions. By making a thorough analysis of the issue, we obtain the following situation:

#### INSECT CLASS:

- **Coleoptera order**, (with 16 families): Curculionidae (with 5 species); Tenebrionidae (with 11 species); Dermestidae (with 10 species); Anobiidae (with 4 species); Ostomatidae (with 1 species); Bostrichidae (with 1 species); Ptinidae (with 7 species); Cucujidae (with 6 species); Silvanidae (with 3 species); Nitidulidae (with 3 species); Mycetophagidae (with 1 species); Lathridiidae (with 3 species); Anthicidae (with 1 species); Notodoxidae (with 2 species); Cryptophagidae (with 4 species) and Cleridae (with 1 species).

From the species included in the families belonging to Coleoptera Order the following stand out through frequency and/or importance:

- **Curculionidae family**, species: *Sitophilus granarius* L., *S. oryzae* L., *S. zeamays* Motsch. and *Caulophilus latinasus* Say.
- **Tenebrionidae family**, species: *Tribolium castaneum* Herbst.; *T. confusum* Duv., *T. destructor* Uytt. and *Tenebrio molitor* L.
- **Dermestidae family**, species: *Trogoderma granarium* Everts. and *Attagenus piceus* Oliv.
- **Anobiidae family**, species: *Stegobium paniceum* L.
- **Ostomatidae family**, species: *Tenebrioides mauritanicus* L.
- **Bostrichidae family**, species: *Rhizopertha dominica* F.
- **Ptinidae family**, species: *Ptinus fur* L.
- **Cucujidae family**, species: *Cryptolestes pusillus* Schönh. and *C. ferrugineus* Steph.
- **Silvanidae family**, species: *Oryzaephilus surinamensis* L.; *O. mercator* Fauv.
- **Nitidulidae family**, species: *Carpophilus dimidiatus* Fabr. and *C. obsoletus* Erichs (GHIZDAVU, 2000)

### 1. Preventive measures of control

#### 1.1. Building repairs

- Closing of cracks, fissures and rodent galleries in the board floors and inside and outside the walls
- Ensuring the tightness of opening elements (doors, windows, light fittings), replacement of broken

windows and damaged gauze screens outside the window.

#### 1.2. Overall cleaning measures

- Outside: the ground is cleaned over a distance of at least 5 m at the building bottom, the storehouses built on pillars are cleaned as well as the land under them;

- Inside: sweeping, vacuuming, brushing and scraping of building elements and the equipment used for the processing and moving of stored products; the place between the non-collapsible compartments is freed from the stored products waste. The residues are burnt; followed by a disinfection with substances of a wide range action spectrum (e.g. formalin) and they are whitewashed.

**1.3. Specific preventive measures** are applied after cleaning and intend to destroy the harmful insects, which may still be found in the storehouse by means of physical methods.

#### 1.3.1. Physical treatments

- Achievement of low temperatures (below -15-20°C, cryogenics) for minimum 12 hours (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*);

- Achievement of high temperatures (above 55°C, thermotherapy), for minimum 3-4 hours (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*); (GHIZDAVU and co-workers, 1997).

- Storehouses irradiation by means of ionized radiation for obtaining the lethality (3,000,000 r for 24 hours) or the sexual sterility (150,000- 200,000 for a few weeks) (*Sitophilus granarium*) (MULTON, 1988).

#### 1.3.2. Preventive measures applied when introducing the products into the storehouse

- Reduction of seeds humidity below 13 % for preventing the development of some species (*Sitophilus granarium*, *Rhizopertha dominica*)

- Seed treatment with activated silica gel powder, in order to dehydrate the possible harmful insects present in the bulk (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*, *Cryptolestes ferrugineus*).

- Grain bulk shoveling during the storing, from one end of the storehouse to the other, for refreshing the places between the grains (spaces which lead to the development of certain anaerobic mushrooms), revealing of possible infestation focuses. The

shoveling has also the role of changing the grains layer on the bulk surface with that at the bottom, fully aware of the fact that some insects develop mainly in the first 10-15 cm on the bulk surface. By shoveling, the respective grains reach the bulk thick inside, a place which is less aired and less favourable for the developing of the respective harmful insects (BERATLIEF and BOGULEANU).

## 2. Periodical supervision measures

- Classic sampling, according to a rigorous schedule
- Pheromone traps placed in the free places of the storehouses and/or introduces into the bulk (*Acanthoscelides obtectus*); Monitoring by means of high fidelity acoustic devices of the specific noises produced by the harmful insects inside the bulk (*Sitophilus granarium*).

## 3. Curative, non-polluting measures

- Emptying the storage cells where the infestation was discovered and their disinfection selection, drying and treatment of the respective bulks by means of dehydration powders such as: activated silica-gel, diatomaceous substance, bentonite, kaolin and French chalk (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*, *Cryptolestes ferrugineus*) (BERATLIEF and BOGULEANU, 1975)
- Treatment of infested bulks by means of entheroleter, device which performs the mechanic destruction of harmful insects by projecting a centrifugal force on a hard and smooth surface which leads to the destruction of harmful insects tissues in all the stages of development (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*) (BERATLIEF and BOGULEANU, 1975);
- Mass trapping by means of pheromone traps placed in the free spaces between storehouses and/or

introduces in the bulks (*Acanthoscelides obtectus*) (GHIZDAVU and co-workers 1997);

- Use of microwave electromagnetic generators which induces the temperature increase in the harmful insects' bodies and protein coagulation (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*, *Cryptolestes ferrugineus*);
- Use of strong electric fields and "corona" discharges in alternative current, taking action directly or indirectly by generating ozone, followed by its decomposition and generation of atomic oxygen with toxic action on the harmful species (*Acanthoscelides obtectus*, *Sitophilus granarium*, *Rhizopertha dominica*, *Cryptolestes ferrugineus*) (GHIZDAVU and PORCA, 1998; MORAR and co-workers, 1996, 1997; SUARASAN and co-workers, 1996)
- Use of vegetal insecticides due to their reduced toxicity towards humans and useful animals, they do not let toxic residues and do not develop strength to insects, consequently they are of great interest both from an economic and ecological point of view (*Acanthoscelides obtectus*, *Sitophilus granarium*) (GOLOB and co-workers, 1999).

## CONCLUSIONS

1. Preventive measures of control: building repairs, overall cleaning measures, specific preventive measures, physical treatments;
2. Preventive measures applied when introducing the products into the storehouse;
3. Periodical supervision measures;
4. Curative, non-polluting measures (dehydration powders, means of entheroleter, means of pheromone traps, use of microwave electromagnetic generators, use of strong electric fields and "corona" discharges in alternative current, use of vegetal insecticides).

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