INSECTS AND MITES - PESTS OF BEE-BREAD STORED IN HONEY COMBS

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Summary

Majority of 116 analysed bee-bread samples (over 90%) were infested and contaminated with synanthropic arthropods, insects and mites (33 identified species), commonly known as stored products pests and invaders of honey bee nests, colonizing hive debris and often infesting their provisions.

Among insects the most often and numerous observed were wax moths (Achroia grisella (F.), Galleria mellonella (L.), black flour beetle (Tribolium castaneum (Charpentier)), dermestid beetles (Dermestes lardarius L., D. maculatus De Geer) and some psocid species (Psocoptera).

Mites infesting bee-bread were mainly acaroid species belonging to Acaridae, Glycyphagidae and Carpaglyphidae families, e.g. Acarus immobills Griffiths, Tyrophagus cestv Oud., Tyrophagus longior (Gerv.), Glycyphagus domesticus (De Geer), Carpglyphus lactis (L.); predators: Cheyletus eruditus (Schr.), Melichares tarsalis (Berl.); parasitic bee mite (dead females) - Varroa destructor Anderson et Trueman; representatives of other mite groups (e.g. Oribatida, Tetranychioidea) were sometimes observed as accessory and incidental contaminations only.

Keywords: Acarina, bee-bread, honey combs, Insecta, stored-product pests.

INTRODUCTION

Bee-bread is a product of lactic fermentation of bee-collected pollen (pollen loads) and stored in cells of honey combs. It is a main source of high-protein diet for bees conditioning their good condition and consequently productivity of bee-colonies and influencing profit of beekeeping. This product is recommended as very valuable ecological nutrient for children, convalescens, sportsmen and older people. It is useful as component for production of medicines and cosmetics.

Honey combs in bee nests are usually full of bee-bread, especially during the season of substantial pollen crops. Beekeepers remove them from beehives, put them to empty hives, boxes or other containers in storehouses, where they are stored as a reserve of food for bees under unfavourable periods of spring and autumn. During storage periods, especially under primitive conditions (high humidity, temperature, unfit tight boxes and other containers), bee-bread as an attractive food product is often infested with synanthropic arthropods, e.g. insects and acaroid mites occurring also in apiaries, colonizing hive debris, accompanying bees in their nests, infesting and feeding their provisions (Banaszak 1980; Chmielewski 1971, 1975, 1985, 1992, 1995a,b, 1998, 2002a, 2003a; Grobov 1991; Haragsim et al. 1987). They often damage stored bee products or even destroy them completely and therefore they are considered as pests of economic and sanitary importance.

MATERIAL AND METHODS

Investigations were conducted during 5 years (1998-2002) in acarological
laboratory of Department of Bee Products, Apiiculture Division, Research Institute of Pomology and Floriculture (Pulawy, Poland). Bee-bread was collected from honey-combs full of this product, stored in stationary, experimental apiaries, localized in the neighbourhood of Pulawy.

Two methods of collecting of material were used. At the beginning of experiments bee-bread samples were collected as pieces of honeycombs (ca. 10 x 10 cm), which were analysed at first macroscopically (bigger arthropods) and next under stereoscopic microscope (mites and smaller insects). Another method was tested using a kind of exhaustor (small care vacuum-cleaner), which was adapted to collecting dust material from combs containing bee-bread and from area under stored combs full of this product (Chmielewski 2000a). Insects and mites were picked up from collected samples, prepared and identified (microscopic analyses). Intensity of infestation and contamination was established accordingly to procedures used in similar studies conducted on the other hive products. It was expressed by numbers of collected objects calculated per 100g of bee-bread, after the following 3-degree scale: 1-st - 1-2, II-nd - 3-5, III-rd infestation degree - >5 specimens per 100g of the product (Chmielewski 1971b, 1975, 1985, 1992, 2000a,b).

RESULTS AND DISCUSSION

Macroscopic and microscopic (stereoscopic and phase-contrast microscope) acaro-entomological analyses of collected material (generally 116 samples) show that 90.5% of them were infested and contaminated with arthropods (imagines, various development stages of living, dead specimens and their body fragments, cocoons, exuvia, excrements, etc.). Infestation of material expressed in degrees was as follows: 56.9% of samples was infested in the lowest - 1-st degree; 18.1 and 25.0% was infested in the II-nd and III-rd degrees, respectively. The highest intensity of infestation was observed mainly in the cases of occurrence of acaroid stored product mites; their numbers amounted often some hundreds, or even thousands of specimens calculated per 1kg of bee-bread. Insects infest bee-bread usually in comparatively lower degree. Besides, some samples were contaminated also with body fragments of dead adult worker bees (wings, segments of legs, antennae, pieces of exoskeleton) and brood.

Among 33 identified arthropod species the most frequent and numerous insect pests were first of all caterpillars of lesser wax moth (Achroia grisella (F.)) and greater wax moth (Galleria mellonella (L.)), larvae and imagines of black flour beetle (Tribolium madens (Charpentier)), larder beetle (Dermestes lardarius L.), hide beetle (Dermestes maculatus De Geer), adults of whitemarked spider beetle (Pitius fur L.), various instars of booklouse (Liposcelis divinatorius Müller) and cosmopolitan grain psocid (Lachesilla pedicularia L.). Other insects, e.g. moths from Pyralidae and Tineidae families (Ephestia, Plodia), dermestids (Dermestidae), Mycetophagous beetles and earwigs (Forficula) were sometimes or even sporadically observed.

The mites (Acarina) composed very significant part of biological contaminations of bee-bread. The most numerous of them were some species belonging to families Acaridae (Acarus farris (Oud.), A. immobilsis Griffiths, A. siro L., Tyrolichus casei Oud., Tyrophagus longir (Gerv.), T. putrescentiae (Schr.), Carpoglyphidae (Carpoglyphus lactis (L.)), Glycophagidae (Glycophagus domesticus (De Geer)).

Acaroids are commonly known as pests of stored products, inhabitants of houses and invaders of honey bee nests. They colonize very often beehive debris, infest and contaminate also provisions of their hosts and stored hive products (honey, bee-collected pollen, old honeycombs, propolis) including bee-bread in storehouses.
Representatives of some mite families, among others Ameroseiidae, Macrochelidae, Parasitidae, Tarsenemidae, Tydeidae, were observed not very often, but sometimes in great numbers.

Some samples of bee-bread infested with pests were also occupied (seated) with predatory mite species from families Cheyletidae (Cheyletus eruditus (Schr.) and Aceoseiidae (Melichares tarsalis (Berl.)), which are natural enemies of acaroids, insects and other small arthropods usually accompanying bees in their nests. Some percent of samples were also contaminated with parasitic bee mite (mainly dead females), Varroa destructor Anderson et Trueman, which belongs to the commonest parasites of honey bees, but in bee-bread and other provisions of bees it was found from time to time as an element of biological impurity or pollution of this product. Typical soil mites, representatives of Orbatida and Gamasida groups and plant feeding species, pests of park or forest trees and various plant cultivars (Tetranychoidae) were also sporadically observed as incidental visitors of bees and contaminants of their provisions.

List of identified insect (Insecta) and mite (Acarina) pests (families and species) found in bee-bread was as follows:

**INSECTA:**
- Lepismatidae: Lepisma saccharina L.
- Atropodidae: Lepinotus inquilinus Heyden
- Liposcelidae: Liposcelis divinatorius Müller
- Pterolichidae: Lachesilla pedicularia L.
- Forficulidae: Forficula auricularia L.
- Lathrididae: Enicmus minutus L.
- Lygaeidae: Rhyparochromus vulgaris (Schill.)
- Ptilidae: Ptilus fur L.
- Derestidae: Derestes lardarius L., D. maculatus (L.), Anthrenus verbasci L.,
- Tenebrionidae: Tribolium madens (Charpentelier), Tenebrio molitor L.
- Pyralidae: Achroia grisella (F.), Galleria mellonella (L.), Ephesia elatella Hübner, Plodia interpunctella (Hübner)

**ACARINA:**
- Acaridae: Acarus farris (Oud.), A. immobils Griffiths, A. siro L., Tyrolichus casei Oud., Tyrophagus longior (Gerv.), T. putrescentiae (Schr.)
- Carpodphagidae: Carpodphagus lactis (L.)
- Glycophagidae: Glycophagus domesticus (De Geer)
- Ameroseiidae: Ameroseius plumigerus (Oud.), A. plumosus (Oud.)
- Tarsenemidae: Tarsenemus fusarii Cooreman
- Macrochelidae: Macroleles muscaedomesticae (Scop.)
- Parasitidae: Parasitellus fucorum (De Geer)
- Aceoseiidae: Melichares tarsalis (Berl.)
- Cheyletidae: Cheyletus eruditus (Schr.)
- Varrooidae: Varroa destructor Anderson et Trueman

Some strongly damaged or destroyed arthropods collected from bee-bread samples, especially juvenile instars and dead mite specimens, were unidentified. Comparison of the presented review of insect and mite species occurring in bee-bread with data from literature show that the majority of these arthropods are
known not only as invaders of bee nests, hive products or honey bee’s provisions, but also as common pests of human stored food and houses. They have an economic and sanitary importance (Boczek, Czajkowska 2003; Chmielewski 1971a; Golębiowska, Nawrot 1976).

Results of earlier biological studies conducted on some pests of hive products, i.e. acaroid species, under laboratory conditions and on bee-bread offered them as a mite-food, give experimental evidence that this natural medium is very attractive and effective for them (Chmielewski 1995b, 1999, 2000c,d, 2002b,c,d, 2003b,c, 2004). These experiments explain also in part the phenomenon of very common occurrence of these pests in bee-hives and cases of heavy infestation of bee-bread and other hive products with them.

CONCLUSIONS

— Bee-bread stored in honeycombs was very often infested and contaminated with stored products pests, commonly inhabiting also bee hives.

— Some acaroid mites (T. casei, T. longior, C. lactis, G. domesticus) and insect species (T. madens, D. lardarius, D. maculatus, A. grisella, G. mellonella) were typical pests of bee-bread; some of them belong to dominant species in infested bee-bread; damage and contamination degrees of this product with them were usually very high.

— Species composition of acaro-entomofauna infesting bee-bread was sometimes very close to this, which found in propolis and bee collected pollen (fresh pollen loads taken from pollen traps) and similar to this associated with bee nests and colonizing hive debris.

REFERENCES


OWADY I ROZTOCZE - SZKODNIKI PIERZGI PRZECHOWYWANEJ W PLASTRACH PSZCZELICH

Chmielewski W.

Streszczenie

Badania prowadzono w latach 1998-2002, w rejonie Puław. Ich celem było poznanie składu gatunkowego i nasilenia występowania szkodliwej akaro-entomofauny w zapasach pierzgi zgromadzonej i przechowywanej w plastmach pszczelich.

W ciągu całego okresu trwania doświadczeń przebadano łącznie 116 prób materiału. W 90,5% z nich stwierdzono obecność i określono 33 gatunki stawonógów; były to głównie owady i roztoce syntropijnne, powszechnie znane szkodniki magazynowe. Nasilenie występowania szkodników, określone według 3-stopniowej skali, przedstawiało się następująco: 56,9% próbek porazonych było w I stopniu (1-2 szkodniki w przeliczeniu na 100g produktu), a w 18,1 i 25,0% prób stwierdzono odpowiednio II (3-5 osobników) i III (ponad 5 osobników w 100g próbki).
stopień porażenia pierzgi. Największe liczebności szkodników, sięgające często kilkuset, a nawet kilku tysięcy osobników w przeliczeniu na 1kg produktu, obserwowano zwykle w przypadku wystąpienia rozkruszków magazynowych (Acaroidea).

Najczęściej i najliczniej spotykany w pierzdze owadami były trojszyki (Tribolium madens (Charp.), skórnik (Dermestidae), barciaki (Achroia grisella F., Galleria mellonella L.), psotniki (Psocoptera), a z roztoczy - rozkruszki magazynowe, Acaroidea (Carpoglyphus lactis (L.), Glycyphagus domesticus (De Geer), Tyrolichus casei Oud., Tyrophagus longior (Gerv.) i kilka innych). Szkodniki tworzyły często kolonie mieszane, a towarzyszyły im zwykle gatunki drapieżne, np. Cheyletus eruditus (Schr.) i Melichares tarsalis (Berl.), które są ich wrogami naturalnymi, spotykany powszechnie w przechowalniach produktów spożywczym i w pasieках. Pozostałe gatunki stawonóg znaleziono w pierzdze spotykane były rzadziej i stanowiły przeważnie przypadkowe jej zanieczyszczenia.

Słowa kluczowe: Acarina, Insecta, pierzga, plastry pszczele, szkodniki magazynowe.