

INSECTS AND MITES OF STORED PRODUCTS IN THE NORTHEAST OF SPAIN

Jordi RIUDAVETS, Éric LUCAS, and Maria José PONS

Departament de Protecció Vegetal. IRTA - Centre de Cabrils. 08348 Cabrils (Barcelona). Spain

Abstract: Insects and mites associated with stored products were surveyed from 1999 to 2001 on the Northeast of Spain. Sixty-two samples from several cereals, dried fruits, legumes, herbs, spices and processed food products were collected in 11 localities. In total, 29 species were determined comprising 15 families in six orders, mostly in the Coleoptera and Lepidoptera. Among pests, the rice weevil (*Sitophilus oryzae* (L.)) and the lesser grain borer (*Rhyzopertha dominica* (Fab.)) were the most abundant species in stored cereals. The cigarette beetle (*Lasioderma serricorne* (Fab.)), the rust-red flour beetle (*Tribolium castaneum* (Herbst)), the sawtoothed grain beetle (*Oryzaephilus surinamensis* (L.)) and the indianmeal moth (*Plodia interpunctella* (Hübner)) were the most numerous and widely distributed species sampled in the rest of food products. One predatory mite and five hymenoptera species were considered to have potential as biological control agents.

Key words: survey, stored product pests, natural enemies, northeast of Spain

Introduction

The Catalan food industry is one of the most important in Spain. According to the official statistics of the Spanish Ministry of Agriculture, Fisheries and Food (1999) it represents the first Spanish region in capital investments, sales of products and processed raw material. Most food factories process big quantities of raw materials that they have to keep stored during some period of time. Also, finished or processed products are often stored before being packaged or distributed to the consumers. Consequently, one of the most important problems that affect these industries is the contamination due to insects and mites. The impact of pests is not only economic because of weight losses, expenses on sanitation or discredit in front of the customers, but also indirect because of toxic effects, allergy, or toxicological and environmental problems related to excessive use of chemical treatments.

The aim of this study was to determine the insect and mite fauna associated with raw material and finished products that are processed by the agrofood industry in Catalonia (Northeast of Spain).

Material and Methods

The study was conducted from 1999 to 2001. Surveys for insects and mites were conducted at 24 industries or warehouses on 10 localities widely distributed along Catalonia. Special attention was paid in two localities where the number of food industries is more abundant, accounting 30% and 27% of total samples, and in them more than one collection was made per year. Samples were taken from raw materials such as cereals (wheat, oats, rye, maize and rice), dried fruits and nuts (almonds, pistachios, dates, raisins and dried apricots), legumes (haricot beans), herbs and drugs (*Chamomilla recutita*, *Lavandula angustifolia*, *Melissa officinalis*, *Thymus vulgaris*, *Achillea millefolium*, *Opuntia ficus-indica*, *Foeniculum vulgare*, *Kola acuminata*), spices (coriander, walnut bark, red pepper, sesame) and finished or processed products such as flour, semolina, pasta, cassava, mushrooms or pet food. Specimens of insects and mites were collected by hand-picking, aspirating or sieving.

Samples were taken to the laboratory for closer examination. Specimens collected were preserved, determined or submitted to the appropriated taxonomists for identification.

Results and discussion

In total, 29 species of arthropods representing six orders and 15 families were found on a total of 62 samples in raw material and processed food products (Table 1). Orders with the greatest number of species were Coleoptera and Lepidoptera.

Twenty-one species were collected from cereals. Coleoptera accounted for more than 50% of species of arthropods collected, Hymenoptera 22% and Lepidoptera 10%. Among pests, the rice weevil (*Sitophilus oryzae* (L.)) and the lesser grain borer (*Rhyzopertha dominica* (Fabricius)) were the most abundant species in stored cereals. In addition, 4 species of Hymenoptera parasitoids were found in all cereals, among them the pteromalids *Anisopteromalus calandrae* (Howard) and *Lariophagus distinguendus* (Foerster) are known to attack several weevil species (Gordh & Hartman 1991, Brower et al. 1996, Lucas & Riudavets 2001). The predatory mite *Blattisocius tarsalis* (Berlese) was also present in wheat and rice.

The cigarette beetle (*Lasioderma serricornis* (Fabricius)) and the drugstore beetle (*Stegobium paniceum* (L.)) were the most abundant pest in dried herbs and spices. Since they are polyphagous (Arbogast 1991), they were also found infesting wheat, rye, pasta and pet food.

The sawtoothed grain beetle (*Oryzaephilus surinamensis* (L.)), was the only species recorded in dates, raisins and dried apricots. The moths *Plodia interpunctella* (Hübner) and *Ephesia* sp. were present in almonds and pistachios.

The indianmeal moth *P. interpunctella*, the rust-red flour beetle (*Tribolium castaneum* (Herbst)), *O. surinamensis*, and the rusty grain beetle (*Cryptolestes ferrugineus* (Stephens)) were found in wheat flour. The mold mite (*Tyrophagus putrescentiae* (Schrank)) was present in wheat semolina and pet food but always related with high humidity conditions. Psocids, an increasing problem worldwide (Turner 1994), were collected in semolina, pasta and cassava, but also in wheat, herbs and spices. The bean weevil (*Acanthoscelides obtectus* Say) was only found in haricot beans, where the predatory mite *B. tarsalis* was also present.

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Table 1. Species of insects and mites associated with different stored food products in the Northeast of Spain

Arthropod* ¹	Cereals* ²	Dried herbs & Spices* ³	Dried Fruits* ⁴	Processed & Stored Food* ⁵
ACARINA				
Acaridae				
<i>Tyrophagus putrescentiae</i> (Schrank)				Ws, Pf
Ascidae				
<i>Blattisocius tarsalis</i> (Berlese)	Wh, Ri			Ws, Be
PSOCOPTERA				
Psocidae				
<i>Liposcellis bostrychophilus</i> Badonnel				Ws
Other Psocoptera	Wh	He, Sp		Pa, Ca
THYSANOPTERA				
Tubulifera	Ry			
COLEOPTERA				
Anobiidae				
<i>Lasioderma serricorne</i> (Fab.)		He, Sp		Pa
<i>Stegobium paniceum</i> (L.)	Wh, Ry	He, Sp		Pa, Pf
Bostrichidae				
<i>Rhizopertha dominica</i> (Fab.)	Wh, Oa, Ry, Ma, Ri			Ca
Bruchidae				
<i>Acanthoscelides obtectus</i> Say				Be
Cucujidae				
<i>Cryptolestes ferrugineus</i> (Stephens)	Wh, Ry, Ma			Wf, Ca
Curculionidae				
<i>Sitophilus oryzae</i> (L.)	Wh, Oa, Ry, Ma, Ri			Pa
<i>Sitophilus zeamays</i> Mots.	Oa			
Silvanidae				
<i>Oryzaephilus surinamensis</i> L.	Ry		Fr	Wf
<i>Oryzaephilus mercator</i> (Fauvel)	Ma			
Tenebrionidae				
<i>Gnathocerus cornutus</i> (Fab.)	Wh			
<i>Gnathocerus maxillosus</i> (Fab.)	Ry			
<i>Tribolium castaneum</i> (Herbst)	Wh, Oa, Ry, Ma	Dr		Wf, Ca, Pf
<i>Tribolium confusum</i> Jacquelin du Val	Wh, Ry, Ma			Ca
<i>Alphitobius laevigatus</i> (Fab.)				Pf
Trogossitidae				
<i>Tenebroides mauritanicus</i> (L.)	Wh, Ry			
LEPIDOPTERA				
Tineidae				
<i>Nemapogon granella</i> (L.)				Mu
Pylalidae				
<i>Ephestia</i> sp.	Ma		Al	Pf
<i>Plodia interpunctella</i> (Hübner)	Wh, Ry	Sp	Al, Pi	Wf, Ws, Pa, Pf
<i>Pyralis farinalis</i> L.				Pf
HYMENOPTERA				
Pteromalidae				
<i>Anisopteromalus calandrae</i> (Howard)	Wh, Oa, Ry, Ma, Ri	He, Sp		
<i>Lariophagus distinguendus</i> (Foerster)	Wh, Ry, Ri	He		
Other Hymenoptera	Ry, Ma	He, Dr		

*¹ Other Psocoptera (cf. 1 species); Thysanoptera (cf. 1 species); Other Hymenoptera (cf. 3 species).*² Cereals: Wh = Wheat, Oa = Oats, Ry = Rye, Ma = Maize, Ri = Rice.*³ Dried herbs and Spices: He = Herbs, Dr = Drugs, Sp = Spices*⁴ Dried Fruits: Al = Almonds, Pi = Pistachios, Fr = Dates, raisins and dried apricots*⁵ Processed & Stored Food: Wf = Wheat flour, Ws = Wheat semolina, Pa = Pasta, Be = Beans, Ca = Cassava, Pf = Animal feed, Mu = Mushrooms.