

It's that time of year when we need to put all our efforts forth for the invasion of Grain Mites and Psocids . . .

### **What are Mites?**

Mites are very small arachnids that typically exist as parasites on animals or plants, and in food and feed products. Mites are found in a variety of different species (grain mites, flour mites, cheese mites, sugar mites, etc.). They are so small that they are barely visible to the naked eye. There are about 20,000 species of mites and only about 10 percent of these 20,000 species have been investigated by science. We are going to look at two species that infest our ingredients and finished products – Grain Mites and Mold Mites.

These mites are from 0.012 to 0.025 inch long. Several species of mites infest stored foods and other organic debris such as grain, flour, cereals, dried fruits and vegetables, pet foods, cheese, dried milk, ham, sugar, paper, tobacco, molds, bird and animal nests, etc. These mites often prefer a moist, damp location. Sometimes the surface of infested materials appears to move due to the enormous numbers of mites (barely visible to the unaided eye). Heavy infestations of grain mites have a sweet, "minty" odor.

### **Habits & Life Cycle of the Grain Mite –**

Under highly favorable conditions a relative humidity (RH) of 87 percent and temperature of 73 degrees F the life cycle of grain mites may be completed in 9 to 11 days. A female may deposit between 100 and 500 eggs on food over 10 to 12 days. The larval and nymphal stage may be 19 to 20 days with a complete life cycle of two to five weeks. An RH of 61 percent or lower is detrimental to grain mites. Grain mite development is extremely sensitive to humidity levels outside the range of 75 to 85 percent.

The second nymphal form may be replaced by a special stage known as the "hypopus." This stage is highly resistant to unfavorable conditions, insecticides and fumigation, and may exist for several months without feeding. When the hypopi encounters favorable conditions, it sheds its skin and resumes normal growth and development. The peculiar adaptation through the "hypopus" stage makes it very difficult to eradicate this mite.

### **What is different about a Mold Mite and a Grain Mite?**

Under moist conditions and summer temperatures, a generation of mold mites can be completed in 8 to 21 days. As the temperature falls, the length of the life cycle increases greatly. The mold mite will breed readily above 86°F., a temperature lethal to the grain mite. The mold mite is less tolerant to low temperatures and cannot develop below 50°F., whereas the grain mite breeds readily well below this limit. However, in an inactive state, this mite can survive 32°F. At favorable temperatures and 90 to 100 percent relative humidity, the female will lay an average of 437 eggs. At a given temperature, larval and nymphal stages require about equal time for development. Unlike the grain mite, this mite does not produce a hypopus.

## **Prevention and Control**

Each plant, warehouse or distribution center must develop its own specific programs for mite control because of varying weather conditions, climate, type of equipment, etc.

Here are some items to remember when preventing and controlling mites –

1. Mite eggs are extremely difficult to kill, even with insecticides.
2. There are no good chemical solutions to this problem.
3. Utilize ventilation to reduce humidity.
4. Prevention is the best cure:
  - Rapid turnover of ingredients and feed will minimize infestation and propagation.
  - Routinely inspect aging ingredients, feeds and miscellaneous unidentifiable material with increased frequency when moisture content, humidity and temperature increase.
  - Protect storage areas from insects, rodents and birds that may carry mites.
  - Keep stored ingredients and feeds as dry as possible. Leave room for circulation around sacked material.
  - Mites have an affinity for molasses textured feeds due to higher moisture content. Inventories of molasses textured feeds and other high moisture products should be minimized and frequently inspected during warm weather.
  - Remove any wet accumulation of ingredients or feeds quickly as mites will propagate rapidly in this material.





## **What are Psocids?**

Booklice or psocids are frequently confused with mites although they are at least twice as large (1-4 mm) and have only six legs and 2 long antennae. Although booklice cause little damage, their large numbers make them a nuisance by their presence. These insects are not actually a type of "lice", but their shape and size is reminiscent of lice. Psocids are usually found in association with high humidity and mold, their primary food source. Psocids will migrate, sometimes in great swarms, when their habitat drops below a certain threshold relative humidity. Adults lay eggs and then die in the wintertime. Eggs and small nymphs survive the cold temperatures to become adults as warm weather approaches.

## **Habits & Life Cycle of Psocids –**

The typical psocid life cycle...

1. At 80 degrees F (27 degrees C) and 65% RH, eggs are laid 1 every 12 hours until about 75% of total are laid and then only occasionally, 3 larval molts occur, and adults live over 3 months;
2. Developmental period (egg to adult) requires about 1 month.
3. Average time to egg hatch is 21 days, 24-65 days are required to reach sexual maturity, and 24-110 days are required for the life cycle (egg to egg).
4. They can overwinter in the egg or nymphal stage. Some species are primarily parthenogenetic although males are known.
5. For each species, there is a critical relative humidity below which they lose water to the environment and eventually die from desiccation. For many species this critical range varies from 50-60% RH.
  - a. Dehydrated specimens become lethargic and have flattened and contracted abdomens.
  - b. When returned to a RH above their critical point, they readily absorb moisture and become turgid, sometimes in as little as 2-3 hours.

Psocids are typically found in areas of high relative humidity because they have trouble controlling water loss through their exoskeletons. High humidity conditions are also required for the growth of mold, the primary food of most psocids. When the humidity drops below a psocid species critical level, they migrate, sometimes in great numbers, to areas of higher RH or eventually die. Another reason their population may seem to go from zero to thousands in a few weeks is that because of their small size they are rarely noticed when their numbers are low. Also, adults usually die off in the winter but the eggs and/or small nymphs can survive the cold temperatures and can become adults in 3-4 weeks with the onset of warm weather.

In warehouses, groceries, and granaries/grain elevators, psocids are commonly found associated with damp spillage. In many warehouse situations, they are commonly associated with improperly stored wooden pallets which have gotten damp and become infested with mold.

## **Prevention and Control**

Large populations of psocids are indicators of excessive moisture. Control of these insects is, therefore, achieved by controlling the humidity!

- When possible reduce humidity to less than 50% (psocids desiccate and die). Eliminate damp basements, crawl spaces, sweating plumbing, standing water etc. Ventilate and dry areas with fans and/or dehumidifiers, or simply open screened windows/doors to improve airflow.
- Improve lighting.
- Eliminate possible food sources and harborages: spilled feed, bird nests, leaf litter and other vegetation around building foundations.
- Store cardboard boxes and paper bags off the floor.
- Seal cracks in exterior and interior foundation walls and maintain grade around buildings, roofs, downspouts, etc. to prevent water infiltrating building.
- Pyrethrin insecticides can be used to treat psocids and their habitats. However, these may only be used by a Licensed Pest Control Operator (PCO).

