



Psocids are becoming increasingly important as pests in food processing and distribution especially as contaminants in or on packaging. They are potential safety hazards causing slippery floors, potential allergens, and can potentially taint infested food ingredients. Management of psocids is complicated by the occurrence of eight common species in food processing environments with dramatically different characteristics, and infestations often involve multiple species. Psocids are often overlooked due to their small size, but are increasingly noticed by alert inspectors in pallet shrink-wrap or on bags or packages. Packaging supplies stored in a poorly ventilated, humid structure are at risk for becoming contaminated with psocids. Knowledge is limited on effective insecticides, and options further limited by lack of product registrations or appropriate application techniques for surfaces needing remedies. Non-chemical management techniques are often not practical or timely to implement for psocid relief in an industrial setting.



Psocoptera: Liposcelididae
Liposcelis bostrychophila Badonnel
Most widespread psocid species and one that reproduces without males.

RECOGNITION

- Psocids are minute, about 1 mm in length, color ranging from white to brown or grey.
- The body is flattened dorso-ventrally, somewhat stubby in proportion, and about 3 times longer than wide.
- The head is wider than the thorax and may seem a bit too large in proportion to the rest of the body. Antennae are long and thread-like.
- May or may not have wing buds or wings held roof-like over abdomen.
- May be noticed as isolated individuals, or as millions coating extensive surfaces.
- An excellent picture key to species and literature review: <http://entopl.okstate.edu/labs/go/psocid>

PSOCID BIOLOGY

Psocids, otherwise known as booklice or barklice, are usually associated with high humidity, slight dampness, and mold spores. They feed on starches and molds. Stored grain and milled products are good substrates, but normal deposits of dust can also support huge populations and outbreaks. "Dust," of course, could be a variable mixture of airborne particulates including mineral and organic materials with nutritive value. Psocids have simple metamorphosis and development from egg to adult can take as little as 18 days. Adults can live up to 3 months. At least two species, *Liposcelis bostrychophila* and *Lepinotus reticulatus* can reproduce parthenogenetically.

MANAGEMENT SUGGESTIONS

- Facilities with psocid histories or located in climates with routine or occasional humid weather should inspect for psocids in the humid seasons. Activity can be spotted on floor sanitation lines behind storage racks where air movement is limited. Inspect bags and packages containing starchy products that may have attractive coatings of dust.
- The classic recommendation to correct the moisture situation is much easier said than done in industrial facilities, which usually lack environmental controls of this kind. Portable heaters, fans, dehumidifiers and other means to move air and promote drying of humidity or dampness may be viable for certain areas.
- The most susceptible supplies or products should be stored above floor level on racks where air circulation will be best.
- Avoid wood pallets to the extent possible, or take special care to select pallets that are clean and dry.
- Psocids can be controlled with heat. Optimum temperatures for psocid development may be in the 80's and 90's, but susceptibility to heat mortality increases dramatically above 104 F.
- Fumigants vary in performance depending on psocid species and life stage. Part of the psocid problem is thought to be from development of tolerance to phosphine grain fumigations targeted at beetle pests. Eggs are particularly tolerant to phosphine. Sulfuryl fluoride can control psocids but effective rates of application vary widely by species and targeted life stage. Methyl bromide includes psocids on the label but rates of application are higher than normal.
- Several insecticides have been tested with variable results.
 - Pyrethrin or esfenvalerate are not effective.
 - B-cyfluthrin (Tempo® products) and chlorfenapyr (Phantom®) are effective as surface treatments, but not viable options for many broadcast type treatments. Total release aerosol products such as Pro Control Plus (Whitmire MicroGen, EPA 499-462) or comparable products containing pyrethrin plus cyfluthrin might be an option for getting cyfluthrin treatments onto surfaces in packaged product areas, or for treating truck trailers.
 - Organophosphate grain protectants are effective. This suggests that another OP, vapona aerosol treatments might be a viable tactic for treating large surface areas and finished products. Anecdotally, vapona was effective when used in this manner in Australia.
 - Methoprene insect growth regulator is partially effective. Methoprene might serve well as a tank mix partner with other insecticides targeted for extensive surface areas and finished products.
 - Diatomaceous earth (DE) is not effective. Surprisingly, as a desiccant on a soft-bodied insect, DE requires low humidity to be effective, which will not be the circumstance with psocid outbreaks. Psocids also have a cuticular lipid concentration that helps them tolerate dusts and desiccants. DE would also be inappropriate to spread in most food processing and distribution places needing relief from psocids.

Jerry Heath, Board Certified Entomologist, serves a broad range of technical service needs for IFC's food industry clients. With nearly forty years of experience, Jerry's career has focused exclusively in the fields of entomology and pest management in academic and several industrial settings. Since 1937, IFC is the only national pest management company focused solely on the food industry. For more information, visit www.indfumco.com or call 800-477-4432.

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