

BIOLOGICAL CONTROL OF ARMORED SCALES

Entomogenous Fungi.—For many years so-called “friendly” fungi were thought to kill scale insects in Florida. Watson and Berger (58) dwelt on this idea at great length. Ziegler (61), at a meeting of the Florida Entomological Society in 1935, presented information to show that the red-headed fungus (*Sphaerostilbe aurantiicola* (Berk. & Br.) Petch and pink-headed fungus (*Nectria diploa* B. & C.) were in all probability saprophytes rather than parasites. Subsequently Fisher (5) carefully reviewed the entire problem and concluded that such was the case, but that there are at least two species of fungi which attack and kill purple scale. Red and pink fungi on scales indicate only that the scales are dead. The incidence of these fungus species often increases greatly following an oil spray.

In 1947 Fisher (5) described a species of chytrid, *Myiophagus* sp. Thaxter, which attacks second and third stage purple scale. The scale changes from a pearly white through a pinkish stage to a cheesy golden color. While this species of fungus can be seen only through a hand lens, there can be no question that it is a major factor in the reduction of many purple scale infestations.

Fisher (6) also reported a fungus, *Hirsutella Besseyi* Fisher, which was associated with dead crawlers and first-stage purple scales. She stated that it either killed the scales or was a specific indicator of some other causal agent. Its presence is often associated with heavy mortality among young scales. This species of fungus cannot be identified by the grower in the field.

Entomogenous fungi are major factors in the biological control of purple scale, but they are probably of minor importance on Florida red scale.

Predaceous Insects and Mites.—Three species of ladybeetles have been recorded by Muma (24) as primarily predaceous on citrus armored scale insects. On occasion, all three have been found in abundance among scale infestations. The most common species on citrus is the twice-stabbed ladybeetle, *Chilocorus stigma* (Say) (Fig. 14), which reaches a population peak in the spring and summer (24). The adult, from 1/6- to 1/8-inch long, is black with a pair of small red to orange spots in the middle of the back. Its orange eggs are often found under scale armors. The larvae are black and quite spiny. The pupae