ALUMINUM PHOSPHIDE AS A FUMIGANT FOR NATURAL RAISINS

Howard D. Nelson

Dried Fruit and Tree Nut Insects Investigations
Market Quality Research Division
Agr. Res. Serv., USDA
Fresno, California

In recent years a new fumigant has been introduced in the United States from Germany. It is composed of aluminum phosphide and ammonium carbamate. This fumigant is manufactured in tablet and pellet form and sold under the trade name Phostoxin. Upon exposure to the atmosphere, the tablets or pellets break down to form phosphine (hydrogen phosphide), ammonia, carbon dioxide, and aluminum hydroxide. Phosphine is a gas that is slightly heavier than air and has an odor like carbide. It is effective against insects.

In 1967 a residue tolerance of 0.01 p.p.m. was established by the Food and Drug Administration for the use of this fumigant on processed foods.

In view of this established tolerance, a series of studies were made to determine the effectiveness of this fumigant against insects that attack stored raisins. A number of stacks made up of natural raisins stored in sweat boxes and covered with two layers of sisalkraft paper were used. The exposed surface of the outer layer of sisalkraft was coated with a thin layer of white plastic to repel water. One of the stacks contained 15,000 cu.ft. and each of the other stacks contained 700 cu.ft. of space. These stacks were constructed out-of-doors and located on blacktop pavement.

Aluminum phosphide tablets were used in this study. These were placed on paper plates, which were then located on top of the stacks. The test

insects used were adult merchant grain beetles and Indian-meal moth and raisin moth larvae. Some of the insect samples were buried in the mass of raisins and others were placed in the air space on top of stacks and between the pallets. The exposure period was six days. Dosages used were 45, 35, 30, 25, 20, 15, 10, and 5 tablets/M cu.ft. Forty-five tablets/M cu.ft. is the recommended dosage. Drager tubes were used to measure the gas concentration at intervals during the exposure period. Temperature was also recorded.

Under the conditions of these tests, all test insects were killed at each dosage. The peak, or maximum, concentration of phosphine was reached during the third day of the exposure period. There was no difference between the amount of phosphine measured within the raisin mass and that in the space between the pallets or in the space above the top of the stacks. Temperature of the raisins ranged from 41° - 78° F. during this study.

The results show that the paper covering was tight enough to retain the phosphine gas in sufficient concentration to be effective against three species of insects that attack raisins in storage.