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Dehydrated Delights: Storage of Dried Fruits

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Fruits properly dried and stored at the right degree of humidity keep well, but are subject to the attacks of insect pests. The most troublesome of these are the Indian Meal Moth (*Plodia interpunctella*), the Saw-toothed Grain Beetle (*Silvanus surinamensis*), and the Dried Fruit Beetle (*Carpophilus hemipteris*). The Fig Moth (*Ephestia cantella*) also causes damage similar to that of the Meal Moth. These insects all multiply rapidly, and not only penetrate and devour the fruit, but also render it unsightly through the debris to which they give rise. The moths are special offenders in this respect, since they spin copious webs.

In order to combat these pests, it is necessary to exercise scrupulous cleanliness and vigilance in all warehouses and packing sheds. Fittings, plant and machinery and all constructional work should be so arranged that it is readily accessible for cleaning; sharp angles, crevices, etc., should be avoided, and there should be no dark, neglected and unwholesome corners. It is highly probable that the processes of sulphuring, dipping and drying, in the case of artificially dehydrated fruit, kills all insects and their eggs; hence it follows that, if fresh insects can be prevented from gaining access to the fruit until it is packed in insect-proof packages, no trouble is likely to arise. The doors of storehouses, packing-houses, etc., should therefore be kept closed, gauze should be fastened over all windows and openings, and the rooms should be so constructed that they can be fumigated if necessary. If trouble is experienced several remedies may be adopted, viz.:-

1. Fumigation
2. Heat treatment
3. Insect-proof Packages
4. Cool Storage
5. Dusting with Inorganic Powders
6. Organic Powders

Fumigation

Fumigation is a partial remedy for defects in food products, but it should not be neglected. The main fumigants used include carbon bisulphide, carbon tetrachloride, hydrocyanic acid or methyl cyanide, methyl bromide, sulphur dioxide, and ethylene oxide. Carbon bisulphide is potent but inflammable and poisonous to humans. Carbon tetrachloride is less effective against insects than carbon bisulphide. Hydrocyanic acid is dangerous and should only be used with care in special buildings by experienced persons. Methyl bromide is absorbed by milled grains and fatty foods but has been successfully used for fruits. Sulphur fumes can only be used for fruits normally sold in sulphured state. The methods for using carbon bisulphide are similar to those for fumigating grain, with the volatile liquid placed in shallow containers at the top of the bin or storehouse. Hydrocyanic acid gas is a powerful insecticide but not as penetrating as other materials. It involves bringing the material into a sealed room and generating the gas by contacting sulphuric acid with sodium or potassium cyanide. Methyl cyanide is now replacing hydrocyanic acid and is more convenient to use.

Sulphur dioxide is used to treat sulphured fruits like apricots, pears, and peaches for four to twelve hours in fumes of burning sulphur. Vacuum fumigation is used by federal and state authorities in the United States, where the fumigant, usually carbon bisulphide mixed with carbon dioxide, remains in

contact with the fruit for a specified period. Ethylene oxide is considered the ideal fumigant for foodstuffs and is not dangerously explosive or flammable at the above concentration.

Heat Treatment

Some dried fruits, like prunes, peaches, raisins or figs, are placed on a conveyor dipping in boiling

water or in a boiling solution consisting of salt solb., sodium bicarbonate 3 to 4 lb., and water 150 gallons. A dry heat of 125 °F to 150 ° F. for several hours is said to kill all insects likely to attack dried fruits. This means that the goods can be passed again through a dehydrator or heated in a chamber fitted with steam coils. Sterilized products must be allowed to cool and must then be packed immediately, preferably in containers which have also been sterilized to free them from the eggs of insects.

Insect-proof Packages

It has already been pointed out that packing-rooms should be guarded as far as possible with gauze, etc., to exclude insects. Care should also be exercised in the choice of packages. Sealed tins exclude insects perfectly and are moisture-proof, but material must either be thoroughly dry (i.e. in equilibrium with air well below 80 percent relative humidity) before being packed in them or the package must be sterilised; otherwise, it will form an admirable chamber in which moulds can develop. Ordinary wooden or cardboard boxes are not insect-proof, but can be made 80 %, a large to extent, by using a lining of waxed paper which is sealed after filling. Such packages, however, are not quite moisture-proof, and there is danger of molds developing in them in damp storehouses.

Cool Storage

A means of arresting the growth of insects, although it does not necessarily destroy their eggs and larvæ is cool storage: most insects are inactive below about 50 °F. and begin to die off at about 40 °F. Cool storage is, however, attended with difficulties, when the material is removed from the store to a higher temperature, owing to the condensation of moisture upon it.

Dusting with Inorganic Powders

The toxicity of inorganic powders depends mainly on their degree of fineness. Very finely ground and sifted siliceous dusts are effective in contact with insects; bentonite, calcium sulphate and magnesium carbonate have also been recommended. The powders are removed from dried fruits, e.g. currants by the usual cleaning processes. For some purposes (i.e. where they will not actually be in contact with foods) inorganic dusts have been used as carriers for insecticides like nicotine, rotenone, arsenic, etc.

Organic Powders

Insecticidal powders like derris and pyrethrum are sometimes sprayed or sprinkled in rooms infested with insects and can be effective. They have to be swept up afterwards, however, which is a drawback, especially if repeated applications are required.

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