

Thermal Control of Stored Grains Insects by Utilizing Solar Energy

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ABSTRACT

Storage insect-pests are the major cause of damage and losses in food grain. For prevention of damage and losses by insects infestation, all insects present in the stored product must be eliminated at any stage of their development. Preservation methods which applied to food products for insect pests control, as chemical method, resulted in several problems and hazard for consumers. Heat treatment is one of the safe alternative measures for storage insects control but it is costly and requires special facilities for application. Therefore, the aim of this study is to utilize solar radiation as source of heat for thermal control of storage insects, in an attempt to find out a safer effective control measure at minimal cost. To study the effect of material, black paint, and transparent cover on heat observation, four groups of containers were made from different materials (plastic, polythene, metal and jute). Two containers from each group (out of three) were painted black and one from these two black containers was covered with transparent polythene . All containers were filled with equal amounts of sorghum grains and kept out door for exposure to direct sun radiation. Temperature measurements were taken at two hours time interval from 8:00 a.m. to 1:00 p.m. for the first period and from 1:00 p.m. to 5:00 p.m. for the second period. Five structures of different geometrical shapes made of black galvanized metal were used to study the effect of geometrical shape on heat absorption. All containers (pyramid, cylindrical, triangular, rectangular, and cubic) were filled with sorghum grain and temperature measurements were taken as mentioned above. Highest maximum temperature were observed in black plastic container (64.7 °C), black polythene container (64.2 °C) and black metal container (58.3 °C) when covered with transparent polythene. These temperatures were found to be greater than the lethal temperature (45 °C) for all developing stages of storage insects . The structures with inclined surface like pyramid and triangular recorded the highest maximum temperatures compared to vertical structures. Generally, it could be concluded that solar energy could be utilized for control of storage insects with simple treatment of the containers tested in this study under Al-Ahsa conditions throughout the year.