

Physical Control — Session Summary

Convener: J. Darby

Four presentations covering three physical control topics were made at this session. Mr David Rees of the Stored Grain Research Laboratory, CSIRO Division of Entomology, Australia presented a study on the use of grain turning as an insect control measure. Mr Neil Heather of the Queensland Department of Primary Industries, Australia presented work on the heat treatment of horticultural produce and its relevance to durable commodities such as grain. Professor Stanislaw Ignatowicz of the Department of Entomology, Agricultural University of Warsaw, Poland presented studies on the electron-beam irradiation of live insects and plastic packaging for food.

A trial investigating the effectiveness of 'turning' grain infested with psocids (*Liposcelis* spp.) and flat grain beetles (*Cryptolestes* spp.) was presented. The turning process studied was to move the infested grain from one concrete vertical cell 32 m in height into an identical adjacent cell using the conventional handling equipment of bucket elevators and conveyor belts. This process did not reduce the numbers of either insect pest by a sufficient degree to be regarded as a control measure. Bin turning did disperse the insects throughout the bulk and so can give the impression of dramatically reducing their numbers at one measurement location. The dispersed insects of these species re-established themselves to their 'pre-turned' locations within 2–3 weeks. The authors of this study stated the conclusion made above that bin turning was not an effective insect control measure.

Studies investigating the disinfestation of horticultural produce with 'wet' or 'vapour' heat treatment were presented. A prime motivation for the use of heat treatment was the development of a non-chemical or 'clean' disinfestation technique for highly discriminating lucrative markets such as Japan. Details of the heat treatment of tomatoes infested with fruit fly were discussed. Effective disinfestation was achieved without any detrimental effects on the tomatoes when careful control of the uniformity and maximum value of the environment temperature was implemented. The margin for error between effective disinfestation and the causing of quality loss was stated as being quite small. The use of heat disinfestation for the bulk grain industry was discussed in the associated forum with considerable attention given to the cost competitiveness of such techniques with conventional fumigant methods. It was noted by several that the operating costs of proposed bulk grain heat disinfestation processes have been claimed to be less than US\$1/t but this has yet to be realistically proven in an industrial plant.

Two presentations were made on the use of electron-beam irradiation for the disinfestation of plastic food packaging and the effect of such irradiation treatments on insect pests of cereal foods. Cardboard boxes containing PVC bags in a package up to 50 mm thick were satisfactorily disinfested with an electron beam dose of 2–3 kGrays while moving on a conveyor line. It was stated that this form of irradiation easily penetrated plastic. Used jute bags were also satisfactorily disinfested although penetration of the irradiation was not as effective as in the plastic. Electron-beam irradiation was used as it was believed to be the most economic form. Forum discussion referred to concerns about quality loss and genetic alteration incurred with the use on grain or seeds in general. The possibility of treated foods becoming contaminated during treatment was also raised. It was stated that this had been proven to not be a concern when appropriate controls were implemented. Furthermore, the spice industry uses irradiation as a standard method without these concerns being experienced.

Trials investigating the irradiation of stored-product beetles demonstrated a result that was stated as potentially useful for detecting the level of exposure to irradiation. Adult beetles incurred a loss in locomotion capacity that was directly proportional to the level of irradiation that the insects experienced. Locomotion refers to the insects being able to move a predetermined distance within a set time. Adult beetles were stated as being the most resistant to irradiation. This finding was presented to the audience as an option that has yet to be taken up.