INSECT POPULATION DYNAMICS AT THE SURFACE OF REFRIGERATED WHEAT BULKS OF UP TO 15,000 TONNES

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Introduction

Grain for export from Australia must meet stringent standards of freedom from live insects which are being achieved largely by applying contact insecticides to the grain when the handling authority receives it from the grower. With developing resistance by insects and limitations on the amounts and types of insecticides permissible, alternative methods of achieving the standards are being sought. Refrigeration of silos for the long-term storage of grain in country areas is one of the physical methods proposed. High-temperature disinfestation is also proposed as a complementary method for rapid kill of any infestation found in moving grain at terminals destined for transhipment or export (Thorpe and Evans, 1983).

Grain refrigeration trials carried out in a variety of storage-types in Australia have been summarized by Elder et al (1983). This paper is confined to discussing the entomological aspects of three trials conducted over four seasons in a 15,000 tonne capacity steel shed at Gravesend (latitude 29° 35'S) in the northern wheat-growing area of New South Wales.

The objective of the project was to control insect infestation in the grain to meet export standards using a commercial prototype grain refrigeration system.

Three trials were conducted over four seasons from 1977 to 1981; the second studied insect infestations in wheat carried-over for two seasons. The quantities involved in each trial and an outline of the results are shown in Table 1.

The Refrigeration System

The storage shed of 15,000 tonnes capacity comprised a concrete floor, steel grain retaining walls and a corrugated iron gable roof. The openings at the eaves were closed off by fitting sheets of iron vertically from the top of the 6 m high grain retaining wall to the roof along the side walls, and at an angle to shed grain from the gable ends. The whole structure was insulated all over externally with 25 mm of polyurethane foam on the roof and 50 mm on the retaining walls.

Six commercial air-conditioning units modified for the purpose were installed along the south-west wall to draw air from above the grain surface and deliver it cooled to air ducts around the periphery of the floor as shown in Fig. 1. The coil of each unit had a cooling capacity of 39 kW with air entering the coil at 10°C, as the target control temperature chosen to avoid icing of the coil. The power absorbed by