

# RELEASE RATE CHARACTERISTICS OF TWO PHEROMONE FORMULATIONS FOR CONTROL OF ORIENTAL FRUIT MOTH *GRAPHOLITA MOLESTA* (BUSCK) (LEPIDOPTERA: TORTRICIDAE) BY MATING DISRUPTION.

S. B. Sexton<sup>1</sup> and A. L. Il'ichev<sup>2</sup>

<sup>1</sup> Biocontrol Ltd., 3 Acacia Crt. Mt. Crosby 4306, Queensland

<sup>2</sup> Department of Natural Resources and Environment, Tatura 3616, Victoria

Email: Alex.Il'ichev@nre.vic.gov.au

Email: stephen@biocontrol.com.au

## Summary

The release rates of two controlled release dispensers for mating disruption control of oriental fruit moth *Grapholita molesta* Busck. (Lepidoptera: Tortricidae) were compared using weight loss measurements. Release from dispensers of Isomate OFM Plus was consistently higher than from Isomate OFM Rosso for approximately 100 days in Warwick and 105 days in Tatura, after which the release rate of Isomate OFM Rosso was higher. Release from both Isomate OFM Plus and Isomate OFM Rosso were well above the threshold required for mating disruption for a period in excess of 200 days.

**Keywords:** gravimetric, controlled release.

## INTRODUCTION

Mating disruption is now the most widely used method for control of oriental fruit moth (OFM) *Grapholita molesta* Busck. (Lepidoptera: Tortricidae) in Australia. Isomate OFM Plus was introduced in Australia in 1989 for OFM control by mating disruption on peaches and nectarines. A modified and improved formulation, Isomate OFM Rosso, was registered and commercially introduced in 1998 for the same purposes. The Isomate OFM Plus and Isomate OFM Rosso formulations are applied at the rates of 1000 and 500 dispensers per hectare (ha) respectively. This paper compares the gravimetric release rates of the two formulations. Absolute thresholds from 5 to 6 milligrams/hectare/hour (mg/ha/hr) for mating disruption determined by Rothschild (1975) and Carde *et al.* (1977) provide a basis for assessment and comparison of commercial pheromone formulations designed to disrupt mating of OFM.

## MATERIALS AND METHODS

Isomate OFM Plus consisted of a 200 mm long extruded polyethylene capillary with 1.0 mm internal diameter. The wall thickness of the capillary is 0.75 mm. The average loading is above the nominal figure of 130 mg of active ingredient per dispenser. An aluminium wire is incorporated into extrusion to facilitate attachment to limbs of trees. The Isomate OFM Rosso is similar to Isomate OFM Plus but the capillary has a 1.2 mm internal diameter. The polythene used in Isomate OFM Rosso contains a red pigment to protect the active ingredient from degradation in sunlight. The wall thickness is 0.9 mm.

The average loading is above the nominal figure of 240 mg of active ingredient per dispenser.

Twenty of each kind of dispenser were exposed in field conditions on a wire rack in partial shade (provided by a 75% shade cloth) in Warwick, southern Queensland, for a period of 232 days beginning September 3, 1996. Dispensers in Warwick were numbered and individually weighed to an accuracy of 0.1mg. Ten dispensers of each kind were suspended on a wire rack in partial shade within an orchard in Tatura in Victoria and weighed individually at weekly intervals for a period of 206 days beginning September 23, 1996. The dispensers in Tatura were weighed to an accuracy of 1 mg. The release rates were calculated using the slope of a trend line of the absolute weights of the dispensers and from the difference in individual dispenser weights at each successive measurement.

## RESULTS

Both dispensers exhibited 'dumping' in the first two weeks of exposure after which they settled to a release rate determined by the physical characteristics of the dispenser and the environment.

Mean dispenser weights of Isomate OFM Plus and Isomate OFM Rosso dispensers for days 23 to 186 in Warwick and days 21 to 185 in Tatura are plotted in Figures 1 and 2 respectively. This allowed comparison of the release rates of the two kinds of dispensers after reaching equilibrium with the environment and before the end of season 'run out' period. Release rates derived from the weight loss data in Warwick and in Tatura are presented in

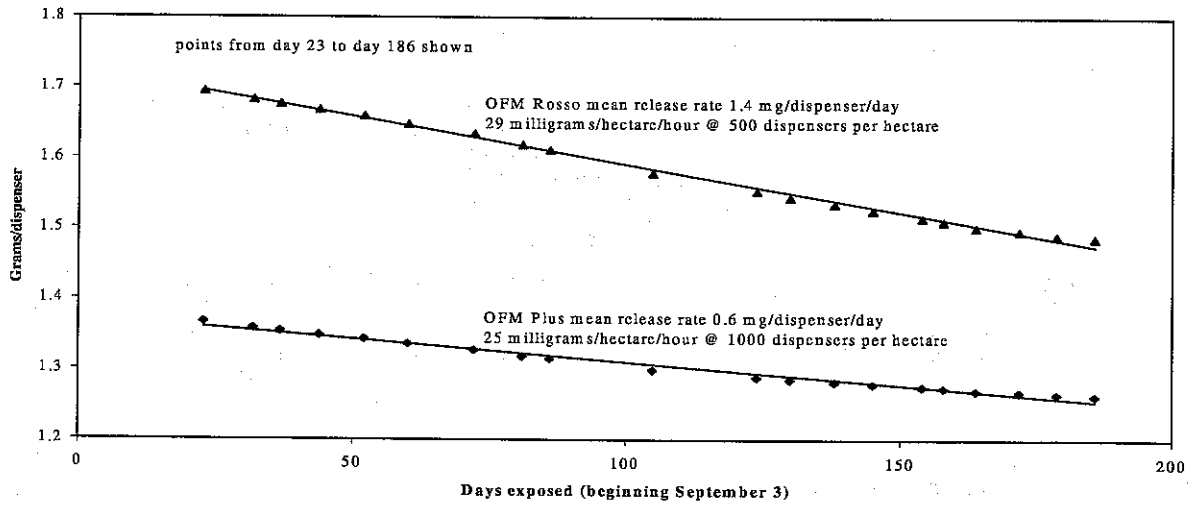


Figure 1. Mean weight loss of Isomate OFM plus and Isomate OFM Rosso - Warwick 1996/7

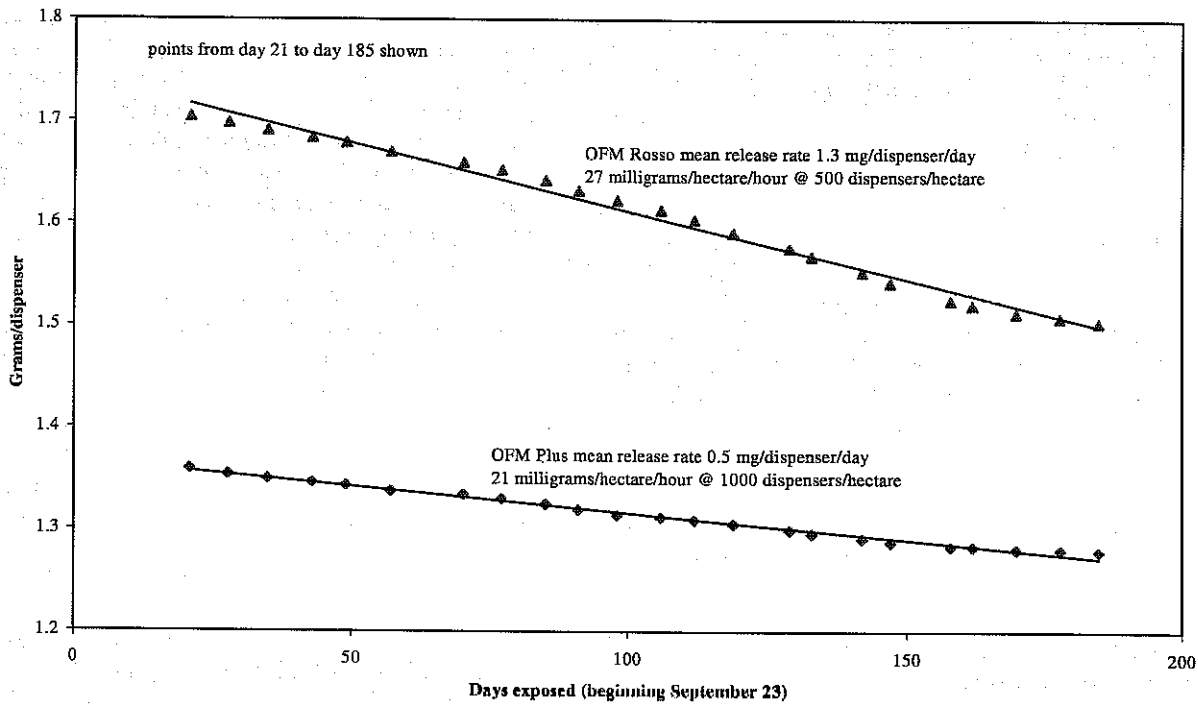


Figure 2. Mean weights of Isomate OFM plus and Isomate OFM Rosso dispensers - Tatura 1996/7

Figures 3 and 4 respectively. All dispensers showed a steady decline in weight over time suggesting that extraneous sources of random error (eg. dust, spray deposits) were minor.

Losses in the initial 'dumping' phase were higher in Isomate OFM Plus compared with Isomate OFM Rosso. The mean release rate of Isomate OFM Rosso in Warwick between days 23 and 186 and in Tatura between days 21 and 185 averaged 29 mg/ha/hr and 27 mg/ha/hr respectively compared with Isomate OFM Plus averaged 25 mg/ha/hr and 21 mg/ha/hr respectively. Losses from Isomate OFM Rosso and Isomate OFM Plus dispensers were 7% and 19% higher in Warwick compared with those in Tatura during the same periods. This is likely to be a reflection of the higher average temperatures in Warwick compared with Tatura (in the 200 day period beginning September 1, 1996; accumulated heat units base 0°C, no upper limit. Warwick 3900 degree days, Tatura 3500 degree days).

#### DISCUSSION

Both dispensers exhibited 'dumping' in the first two weeks of exposure but this was more pronounced in Isomate OFM Plus. Although excessive 'dumping' is wasteful and undesirable, high release at the start of

the season may be preferable to low release resulting from cool spring temperatures.

After the 'dumping' phase, the release rate of Isomate OFM Plus was higher than Isomate OFM Rosso until mid season (around day 100) after which Isomate OFM Rosso was higher. This is attributed to a change in the design of the Isomate OFM Rosso dispenser, which reduces the dependency of the release rate on internal liquid column length. A decline in the release rate of both dispensers was observed in Tatura from day 162 (March 4). The decline in output in the dispensers in Warwick occurred at 193 days (March 15). The accumulated heat units and output of pheromone in Warwick was higher than in Tatura. This suggests that the fall in output of both formulations observed in Tatura may have been due to cool temperatures at that time of the year rather than the exhaustion of the dispensers.

Isomate OFM Plus and Isomate OFM Rosso released active ingredient above the threshold for effective disruption during 221 days (Warwick) and more than 181 days (Tatura). Isomate OFM Rosso has the advantages and convenience of reduced labour for application and a more consistent release over the life of the dispenser.

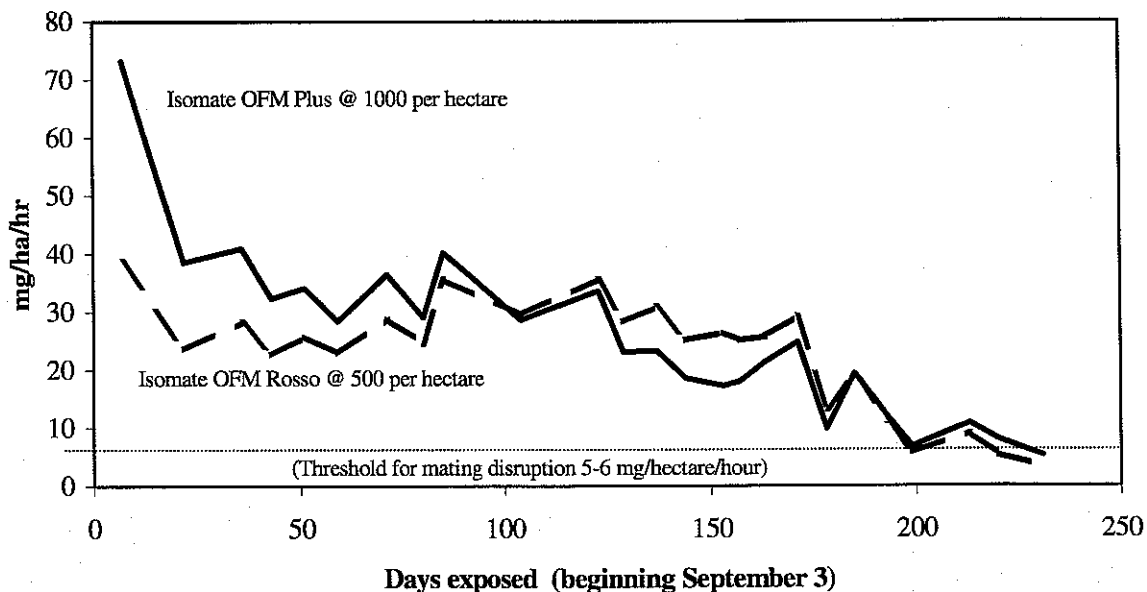


Figure 3. Mean release rate of Isomate OFM plus and Isomate OFM Rosso - Warwick 1996/7

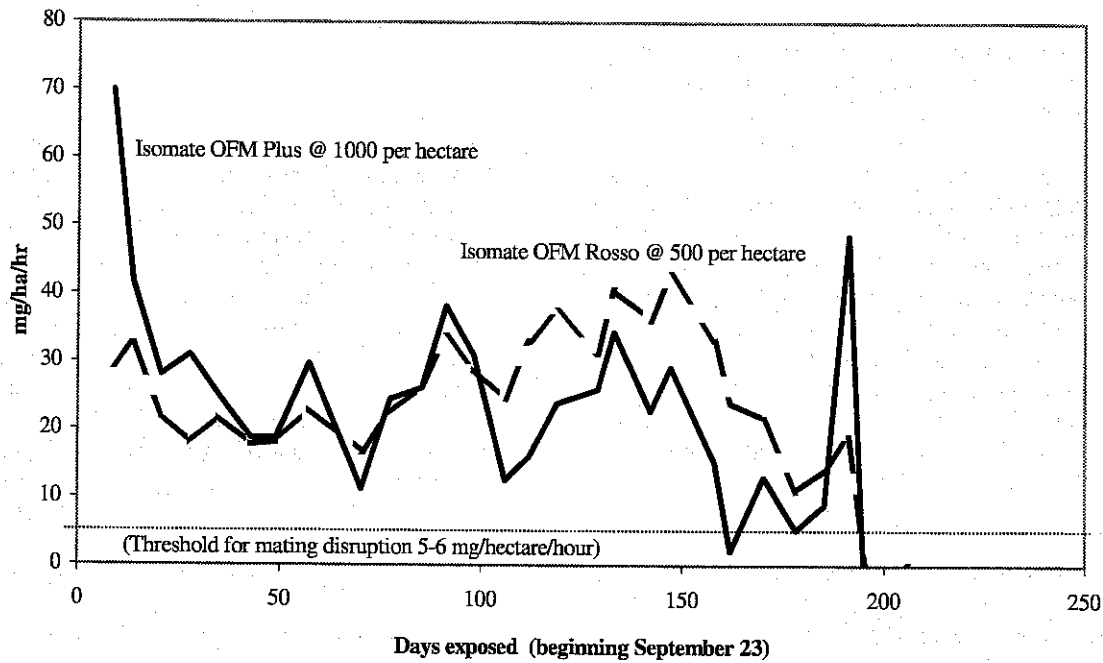


Figure 4. Mean release rate of Isomate OFM plus and Isomate OFM Rosso - Tatura 1996/7

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