

NON CHEMICAL TREATMENTS FOR CONTROL OF FRUIT FLY IN TROPICAL FRUIT.

Peter Leach*, Liz Hall, Sybilla Oczkowicz, Rod Jordan and John Cavallaro.

Due to the presence of fruit fly (Diptera: Tephritidae) in northern Australia, tropical fruit industries face numerous barriers to access both domestic and international markets. The most economical treatments currently available to industry include chemical treatments such as methyl bromide fumigation and postharvest insecticide dips or sprays.

Non-chemical treatment options currently available to industry include irradiation, non-host status, vapour heat treatment (VHT), cold treatments and systems approaches. Other techniques currently under investigation include hot water dipping and controlled atmosphere in combination with vapour heat treatment.

To date, Australian researchers have completed irradiation studies on four tropical fruit fly species (*Bactrocera tryoni*, *B. jarvisi*, *B. cucumis* and *B. neohumeralis*). In all cases a dose of ≤ 150 Gray (Gy) was effective in preventing adult emergence. This data has been used to develop export protocols for mango and papaya to New Zealand (250 Gy). A treatment of 150 Gy is permitted for papaya if field controls are employed for yellow peach moth, *Conogethes punctiferalis*, (Lepidoptera: Pryalidae). Technical market access submissions are also being developed for rambutan, carambola, custard apple, longan, litchi and mangosteen for access to various countries.

Vapour heat research has been undertaken on mango, tomato, cucurbit fruit (honeydew melon, rockmelon and watermelon) and cucurbit vegetables (button squash, cucumber and zucchini). VHT using a core temperature of 47°C for 15 minutes is currently approved to control fruit fly in mangoes by Japan, Korea and China. For tomatoes a core temperature of 45°C for 90 minutes is highly efficacious with no loss in fruit quality. Similarly for cucurbit fruits a treatment with a core temperature of 44°C with no holding period is highly efficacious with no loss in fruit quality. Results for cucurbit vegetables were mixed. A treatment of 45°C for 40 minutes is appropriate for button squash and zucchini. No treatment was developed for cucumber due to unacceptable levels of internal and external injuries.

Controlled atmosphere in combination with VHT has also been investigated for mango and papaya. Prior to VHT treatment, oxygen levels within the unit were lowered to $0.5\pm 0.1\%$ and held at this level for two hours to allow equilibrium of oxygen levels within the fruit. At the completion of the equilibrium period the VHT was started. Fruit were maintained under low oxygen ($0.5\% \text{ O}_2$) during heating until the core temperatures of the fruit reached 41°C . At this time air was vented rapidly into the chamber to return O_2 levels close to ambient (crucial to maintain fruit quality). The remainder of the treatment was conducted as a standard VHT treatment. A range of treatment times and temperatures were trialed with a core temperature of 46.5°C for 30 minutes being the most promising in terms of efficacy and fruit quality. In mangoes, fruit quality was satisfactory with no external injury symptoms recorded. Starch precipitation in the flesh was only of low incidence, very slight in severity and within commercially acceptable limits. In papaya, problems with fruit ripening were recorded and further research is required before the treatment could be recommended for commercial use.

Further trials are planned in 2006-2007 seasons to investigate the potential of hot water dipping, non host status and cold treatments for tropical fruit.