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SHORT NOTE

A FARMER-FRIENDLY TRAP FOR THE MANAGEMENT OF THE FRUIT FLY *Bactrocera* spp. (TEPHRITIDAE: DIPTERA)

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The fruit fly *Bactrocera* spp. is an important pest of fruits, especially mango. The adult female lays eggs in maturing fruits. The maggots develop in the fruit and cause fruit drop and rotting. The best way to prevent fruit fly infestation is to follow an integrated approach of traps (at least 30 days prior to harvest) + sanitation (removal and destruction of all fallen fruits, 40 days prior to harvest) and soil raking below the tree (once or twice starting a month prior to harvest, if possible). The trap consists of methyl eugenol (ME), a para-pheromone (mixed with a toxicant), which attracts only the males of certain species of *Bactrocera*, and therefore is called male annihilation technique (MAT). In the absence of males, females fail to procreate, and hence fruits will be free of infestation.

There are about two hundred species of fruit flies that are currently known from India (Kapoor 1993). However the main species of contention in India, the Oriental fruit fly (*Bactrocera dorsalis* Hendel), originally described from Taiwan, is one of the most destructive fruit fly pests of East Asia and the Pacific. It occurs in the major mango growing belts of South India as a pest of late varieties. The other species to reckon with is *B. zonata,* a minor late pest on mango in North India. A third species *B. correcta* is presumably reported on guava and is only of minor significance. All these three species are attracted to methyl eugenol.

The ME traps can be used for both monitoring and management. The latter, however, is more relevant to the farmers. Of the several parapheromones (Payne *et al.*1973) reported, only methyl eugenol is an available lure for *B. dorsalis B. zonata* and *B. correcta* in India. The other source of methyl eugenol is leaf extracts of *Ocimum sanctum* L. (Shah and Patel 1976, Reghunath and Indira 2000, Madhura 2001), a low male attractant, hence cannot be used in management. Methyl eugenol is the most powerful of all the male lures attracting Oriental fruit fly, *B. dorsalis* and others (Drew 1974, 1989, Drew and Hancock 1994, Drew and Hooper 1981, Hardy 1973, 1974, 1979, Kapoor 1971). It has been successfully used in management programs due to its apparent olfactory, as well as phago-stimulatory action to which some species of *Bactrocera* get attracted. Methyl eugenol trap when used along with an insecticide (any soluble formulation) acts as male annihilation technique (MAT). Likewise if methyl eugenol is substituted with cuelure, it serves as male annihilation for the melonfly, *B. cucurbitae* Coq.

Pre-harvest use of lures should begin at least one month prior to harvest. MAT @ 4 traps/acre (plywood impregnated with methyl eugenol and dichlorvos) + sanitation (removal and destruction of fallen fruit every week) appreciably brought down *B. dorsalis* infestation in mango (Verghese *et al.*, 2006). They also showed that an additional cover spray of Deltamethrin 2.8EC 0.5ml/l +

Azadirachtin (0.03%) 2ml/l given three weeks prior to harvest gave 100% control of fruit fly in mango. As the cover spray is only half the recommended dose, residues are not expected because at one ml of deltamethrin (the earlier recommended dose) the waiting period was only one day (Awasthi, 2001). Use of botanical (azadirachtin) was synergistic with 1/2 the dose of deltamethrin, and may be recommended if fruit fly infestation is expected to be high. Sprays at all cost should be avoided closer to harvest.

Male annihilation using methyl eugenol traps has also been found to be very effective in controlling fruit flies (@ 4 traps/ acre in mango and guava in different parts of India, in a three year study under the Integrated Management of Fruit Flies in India (IMFFI) programme (Stonehouse *et al.*, 2005). The concept of using plywood blocks as dispenser of methyl eugenol came through IMFFI. Many private companies are selling fruit fly traps at exorbitant rates. So, the objective of this research was to make MAT cost-effective, user-friendly, and to enable farmers to fabricate their own traps.

As a result of this investigation, a simple bottle traps (used mineral water bottle) was developed with plywood dispensers. The procedure of making the trap and placement in field are described below.

IIHR bottle trap (Fig. 4) is made of disposable (used) one-liter capacity mineral water bottles (similar plastic bottles can also be used). It consists of a methyl eugenol plywood dispenser, suspended vertically (Fig. 3) inside the bottle, alligning with the four vents, that allow entry of fruit flies. The plywood is impregnated with 1 ml of methyl eugenol + 1 to 2 ml/gm of any water soluble formulation of insecticide before it is suspended in the bottle. In our studies we have found that dichlorvos, carbaryl, malathion, or chlorpyrifos could be used. From our experiences we have observed that dichlorvos seem to have a greater field residual life. However any water soluble insecticide can be used.

The method of trap preparation and placement are as given below:

A. Bottle preparation: Take a mineral water bottle (used), clean and dry. Make square holes (vents) of 2 cm^2 on four sides of the bottle just below the shoulder of the bottle (i.e. $1/3^{rd}$ from top) as shown in Fig 1. The holes are made by slitting along three sides of a square (i.e., two on the sides and one along the bottom). The cuts given in this manner enable the slit to be lifted as a hood to form a 'rain guard'. Alternatively round holes of 2 cm diameter can also be made on all four sides (Fig. 2). A warm pen knife or soft drill facilitates the slitting/drilling of a vent/hole. In addition, four random holes of 3-4 mm diameter may be punched at the bottom with warm needles to allow drainage of water that may get collected in the bottle due to rain.

B. Plywood (dispenser) preparation : Take a plywood 3 cm x 1.5 cm x 1 cm and drill a hole at the upper end (Fig. 3) and loop through a metal wire of 30 cm long. Impregnate the plywood with methyl eugenol and insecticide as recommended. Suspend the ME plywood inside the bottle in such a way that the block is vertically hanging along the vents (Fig. 4), by making a hole on the cap and passing the metal wire through it. Adjust the block along the open vents and loop or twist the wire above the cap to adjust the proper suspension of the block in the bottle.

C. Field placement : Using the metal wire, the bottle can be fastened to a mango tree approximately 1-2 m from ground level (Fig.5). Usually the base of the bottle can be rested on a branch or tied to keep it vertically steady and shake-free even in strong winds. Recharge the block if necessary, after 20 days with methyl eugenol (1 ml) + insecticide (1-2 ml/gm) using an ink-filler or small spatula. If the catch is very high, periodically empty the trap.

If the ME is substituted for with cuelure, the traps can be used in cucurbit fields (@ 4 traps/ acre) against *B. cucurbitae*. The traps should be hung below the *pandal* or at a height of one meter, more closer to the borders than centre. If cucurbits are trailing on the ground, traps may be staked just above the canopy.

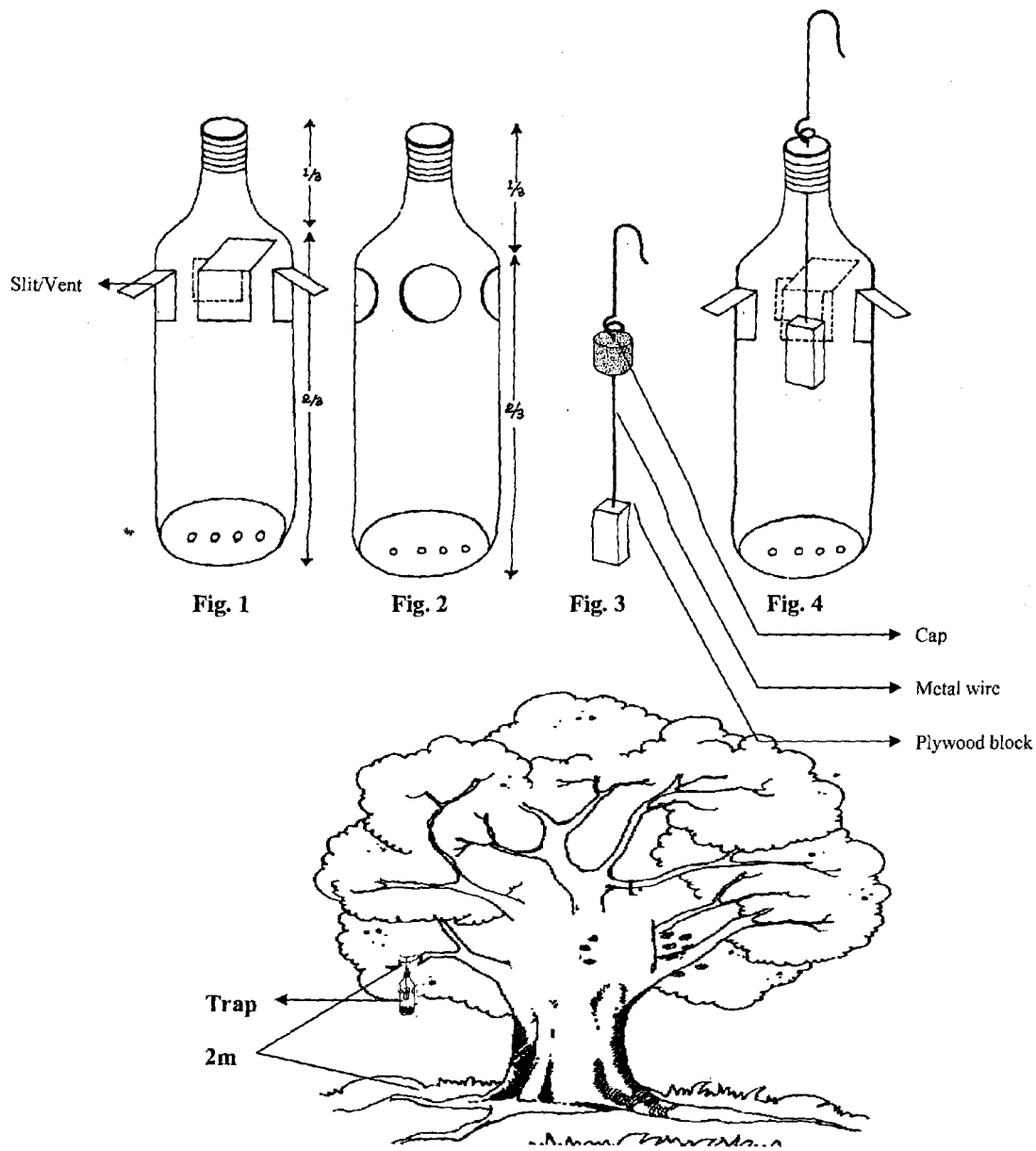

Fig. 1 Fig. 2 Fig. 3 Fig. 4

Fig. 5

Figs.1-5 IIHR Bottle Trap

Water trap

Studies at IIHR have also shown that the plywood dispenser can be replaced with 250 ml of water to which the same dose of lure and toxicant are added. This is more farmer-friendly and perhaps cheaper as it dispenses the use of plywood, and equally serves well for the farmer.

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