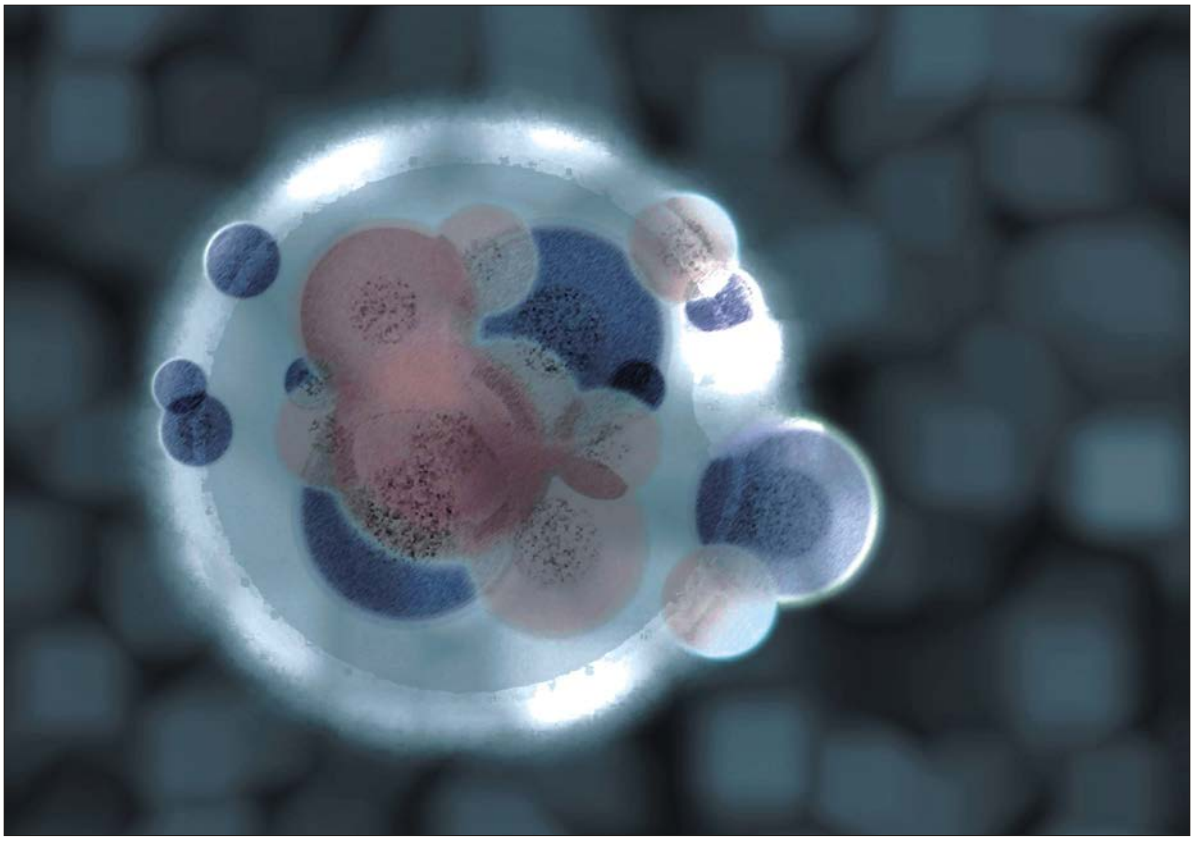

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Evaluation of Soaked Wooden Killer Blocks for Male Annihilation (MA) on Fruit Fly *Bactrocera* Spp. (Diptera: Tephritidae)

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Abstract: The replacement of plastic traps with wooden blocks soaked in lure mixed with insecticide was assessed. Blocks are cheaper, simple and less likely to be blown down or stolen compared with plastic traps. Square and oblong are more effective against round and hexagonal. Plywood is best for block construction. About 92% flies caught were *Bactrocera zonata* Saunders and the remaining was *B. dorsalis* Hendel. Incase of mixture composition, 6:4:1 is more important than other ratios. Spacing of 20 m between blocks appeared to be optimal, so it could be recommended 10-blocks/acre.

Key words: Evaluation, soaked wooden blocks, male annihilation (MA), male fruit fly (*Bactrocera* Spp.)

Introduction

Pakistan's population has grown at a faster rate than that of any other Asian nation (Rosen and Conly, 1996). To meet the food requirements of such a huge population it is imperative to make hectic efforts to enhance the agricultural production per unit area. It demands to shift from low value crops to higher value ones such as fruits (Stonehouse, 1997).

Tephritid fruit flies are serious pests in much of the Asia-Pacific region (Singh, 1988). Among the fruit flies in Pakistan *Bactrocera zonata* and *B. dorsalis* Henel are serious pests of guava and mango (Ghouri, 1960). Among the fruit flies in Pakistan *B. zonata* and *B. dorsalis* are serious pests of guava and mango (Ghouri, 1960).

Syed *et al.* (1970) reported of 25-50% damage to guava crops by *B. zonata,* alone particularly in the summer season. The fruit flies *Bactrocera spp.,* are principal problem of some fruit and vegetables. Since 1962, there have been many reports of quantified fruit fly loss in Pakistan (Stonehouse, 1997).

Khan (1994) reported heavy damage to mango fruit due to fruit flies. Guava fruit was heavily attacked by *B. zonata* in Singh province during the summer that the farmers do not bother to maintain their orchards, as they are unable to recover the cost of inputs (Syed *et al.*, 1970).

The control of fruit flies by Male Annihilation Technique (MAT) exploits the attraction of males to "Para pheromone" lures (Cunningham, 1989). The flies in Pakistan are attracted to methyl eugenol (ME), and are currently controlled in some areas by traps containing soaked wicks of this liquid, to which the males are attracted and then die of overheating (Mohyuddin and Mahmood 1993).

Materials and Methods

This research was conducted in village Punj-giran near Islamabad (33° 41'N, 73° 6'E) in the northern half of Punjab, and in village Mulan-wali Bhakkar (31° 36'N, 71° 4'E), Pakistan.

Following recommendations from the Mauritian National Fruit Fly Program, blocks were soaked in a 6:4:1 (v: v: v) mix of ethanol: methyl eugenol: Malathion for approximately 10 days and then dried naturally for approximately five days.

The effectiveness of blocks was assessed by daily counts of dead flies found in open-mouthed cotton bags suspended beneath them. These bags provided at least in theory only relative, not absolute, estimates of mortality, as it is possible

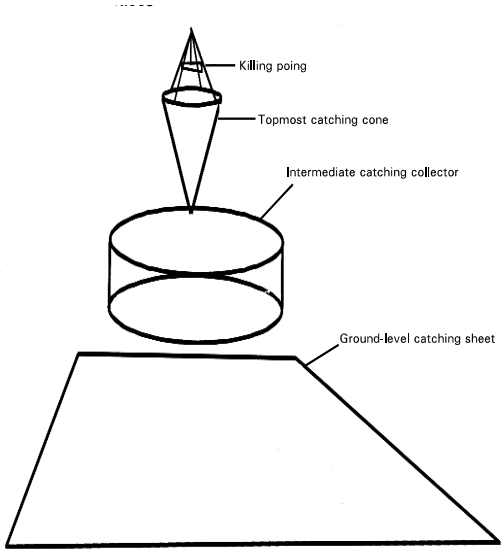

Fig. 1: Evaluation of killing point by tiered expansion of collecting surfaces

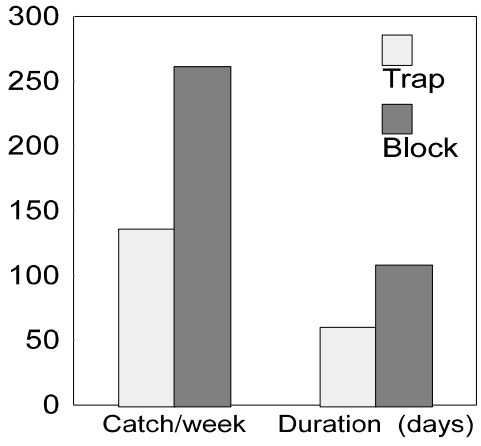

Fig. 2: Trap/soaked-block MAT catch

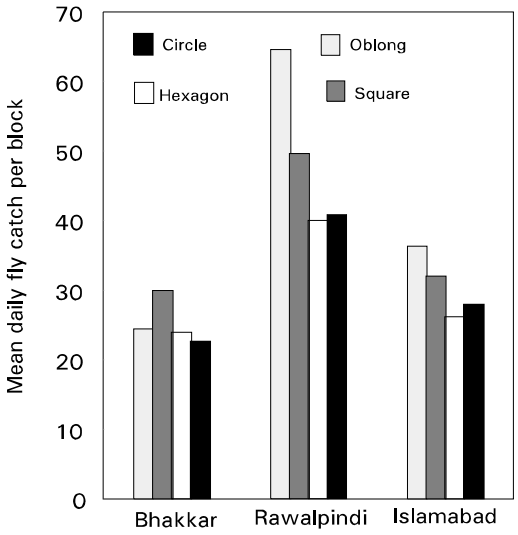

Fig. 3: Catch by 4 shapes in 3 zones

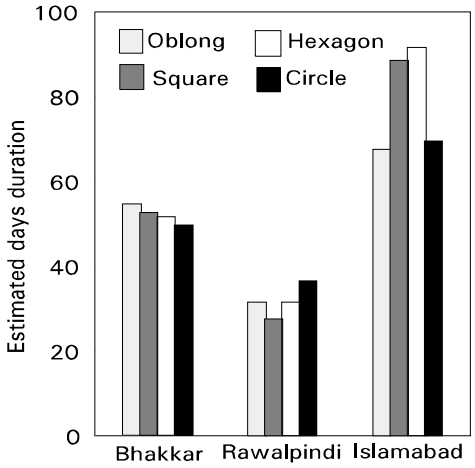

Fig. 4: Catch duration by 4 shapes

that poisoned and dying flies may fly or blow outside the range of the opening and so fall to the ground unrecorded. Traps, on the other hand, do probably contain all the flies they kill, at least in the case of Pakistani traps, which have a baffle to prevent exit, and so a count of their contents may be inferred to be an accurate tally of mortality. As a result, of the comparison of traps and blocks the ability of the bags to estimate mortality by the latter was calibrated by the arrangement shown in Fig. 1 the evaluation of killing point by tiered expansion of collecting surfaces. This allowed the estimation of the slope and shape of the curve by which numbers of dead flies decrease with increasing distance from the soaked block or similar killing point, and thus the modeling of what fraction of the total population killed by each block is represented by those caught in the central bag. In fact the catches by the central bag was typically over 95% of those found below each block, and were concluded to represent the great majority of victims.

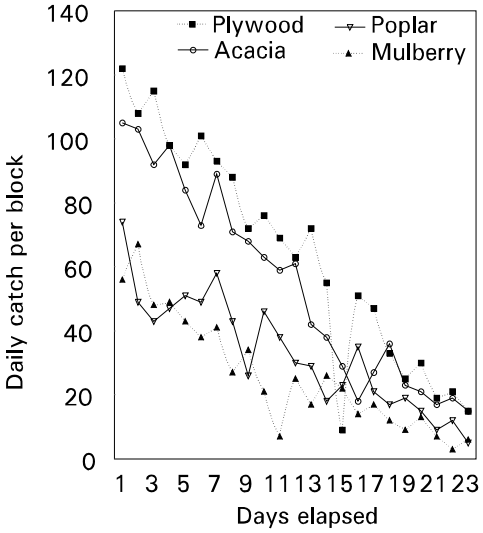

Fig. 5: Actual catches of 4 blocks

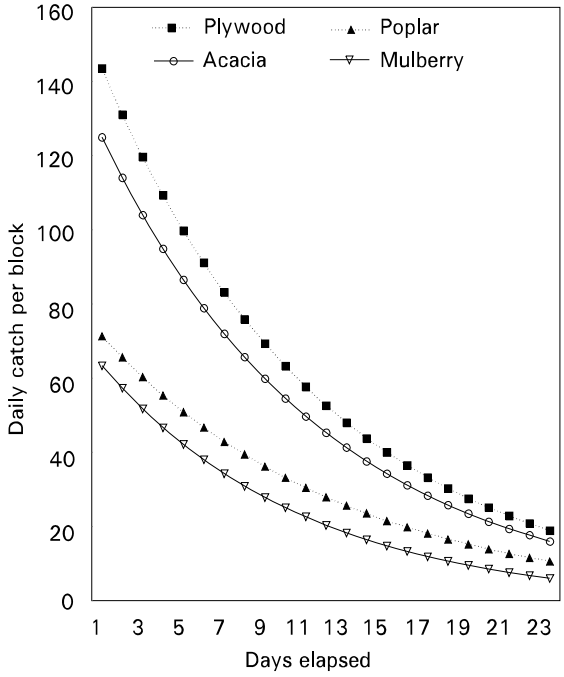

Fig. 6: Modelled catches of 4 blocks

Subsequently, bags were used to compare the effectiveness of blocks of different shapes and woods. Bags below blocks were checked daily for at least 16 days, typically until catches decayed to 10% of initial. Comparisons were of two variables – the total catch (or average per day), and the projected life time of the block as an indicator of durability (this was estimated by obtaining a regression model of the decay of catches of each block with time), assuming an exponential decay, and then extrapolating this model onwards until its estimated daily catch fell below one fly-the time period corresponding to this was labeled its "duration". Catch data were also plotted graphically for visual examination.

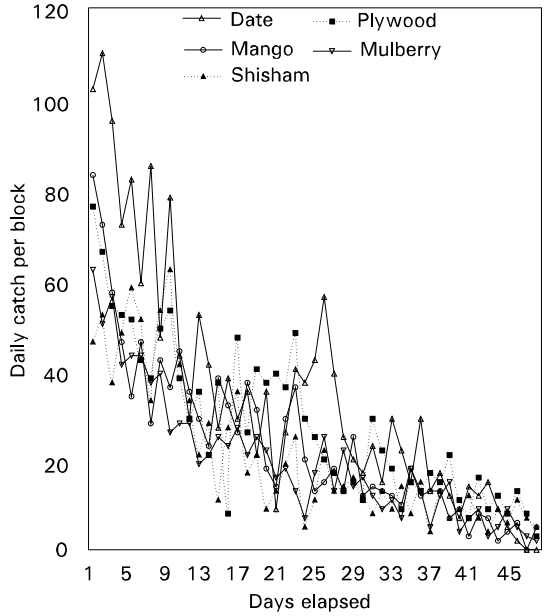

Fig. 7: Actual catches of 5 blocks

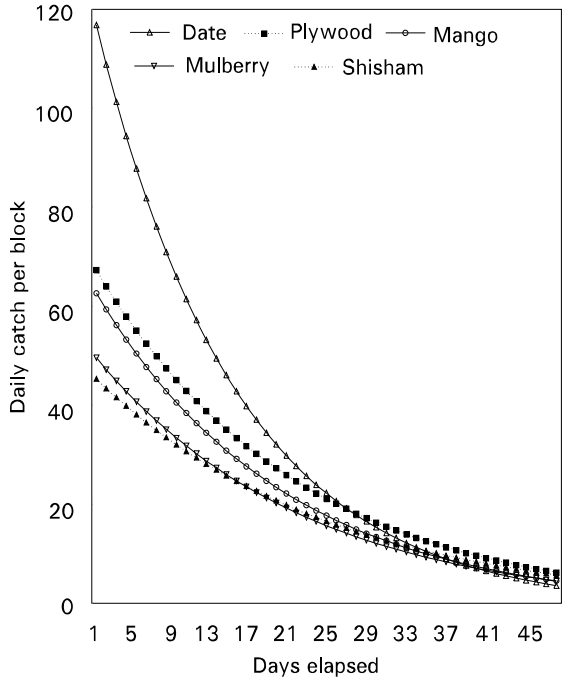

Fig. 8: Modelled catches of 5 blocks

Results and Discussion

Most flies caught were *Bactrocera zonata*, although up to 10% admixture of *B. dorsalis* was also found. Figure 2 (trap/soaked-block MAT catch) show catches by blocks and traps in terms of both absolute numbers and estimated duration: each block caught many more flies than a trap and lasted considerably longer. In the light of their superiority for most other reasons, they are to be preferred to traps in all cases of population suppression, and particularly to be recommended to farmers, except where fly identification is required (*i.e.* experimentation and monitoring) and in the minuscule sector where the tiny insecticide component of the block mixture may forestall a price advantage from a particularly sensitive purchaser.

The results of the comparison of catches by plywood blocks of different shapes, but the same face surface area, are given in Fig. 3 (catch by 4 shapes in 3 different zones), showing absolute catch numbers and the Fig. 4, showing projected duration by block shapes. Despite large differences between zones (which differed in time of year as well as location of comparisons), it appeared that catches were greatest for oblong blocks, then square, hexagonal and round. It is noted that this sequence corresponds with decreasing edge length, and this may be the significant characteristic as edges of plywood sheets may be more porous than their faces. The estimated duration of effect of these blocks did not appear to differ.

The results of two long-running comparisons of wood types are shown in Fig. 5-8. Figure 5 (i.e the actual catches of 4 blocks) shows the decay in catches by blocks of four different woods and Fig. 6 (i.e Modeled catches of 4 blocks) regression models of these same data, assuming an exponential decay. Plywood appeared slightly more effective than the alternatives. Figure 7 (i.e actual catches of 5 blocks) similarly shows catches by five blocks – the impenetrability and confusion of this figure showed how useful it is to replace them by graphs of modeled fits to the data as shown in Fig. 8(i.e Modeled catches of 5 blocks). Khan (1994) suggested that the suppression of Fruit Fly *Dacus Spp.* by Male Annihilation in guava orchard. Lakshmanan *et al*. (1973) showed the effect of methyl eugenol in the control of oriental fruit fly *Bactrocera dorsalis* Hendel on mango. This suggests that date wood, spongier and more porous than the others initially caught more flies than the others did but then catches declined faster, so that it persisted less long. This apart, plywood appeared again the best in general. It appeared that for all suppression activities soaked blocks are greatly to be preferred to the traps in current use in Pakistan. Tentative findings suggested that plywood oblongs may the most suitable material and shape.

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