STUDY OF THE EFFICACY OF MALATHION IMPREGNATED COTTON CORDS IN HOUSEFLY CONTROL

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(*Received* 1 *July* 1971)

A comparative study on the efficacy of malathion impregnated cords of 13 mm and 22 mm circumference in housefly control has been carried out. The results have shown that 13 mm cord is more economical weight for weight, but both afford protection from four to five months. Other factors like temperature and humidity which influence the efficacy of cords are discusssed.

The use of cotton cords or strips impregnated with various insecticides for the purpose of a season long control of houseflies is well recognised[1–4]. Varma *et al*[5] (1967) reported the efficacy of locally purchased cotton cords of 15 mm circumference (3 mm dia) impregnated with malathion in providing seasonal control of houseflies in cattle sheds of dairy farms. However, in view of economic considerations it became necessary to study the efficacy of 13 mm and 22 mm circumference malathion impregnated cotton cords for giving fly control in Military Dairy Farms as these were abundantly stocked by Ordnance Depots, in contrast to 15 mm circumference cotton cords used earlier[5].

The object of this paper is to describe the comparative efficacy of 22 mm and 13 mm circumference malathion impregnated cotton cords for providing housefly control in a dairy farm.

MATERIALS AND METHODS

Insecticide: Fifty per cent malathion emulsifiable concentrate obtained from ASC Supplies was used in the experiment.

Linecotton undyed: Cotton cords having 22 mm circumference (*H2 IHB-0193*, linecotton undyed) and 13 mm circumference (*H2 IHB-0192*, linecotton undyed) obtained from Ordnance Depot were used.

Xylene pure: This was obtained from Nigra Chemicals, Bellanganj, Agra.

Apparatus for impregnation: This was the same as described earlier by Varma *et al*[5]. The cotton cords were impregnated by immersion in a 25 per cent malathion-xylene solution.

Test insect: Houseflies, *Musca nebulo* Linn obtained from the field were used.

Assessment procedure: The efficacy of treatment was ascertained by recording fly densities at regular intervals of time as described earlier by Varma *et al*[5] and by carrying out bio-assays of treated cords exposed in the dairy farm periodically.

The bio-assay of treated cords was done by taking a small sample of such cords exposed in the dairy farm at regular intervals of time. Flies collected from the field were first confined to a mosquito net cage acclimatized and then exposed to the cords for assessment of its residual contact toxicity, inside a transparent plastic conical chamber (8·5 cm in diameter at the base, and 5·5 cm high, Fig. 1). Twenty of these healthy and active flies were then drawn from the cage in a glass aspirator tube (Fig. 2), and gently transferred to the plastic conical chamber. The time of their knockdown and subsequent kill was recorded.

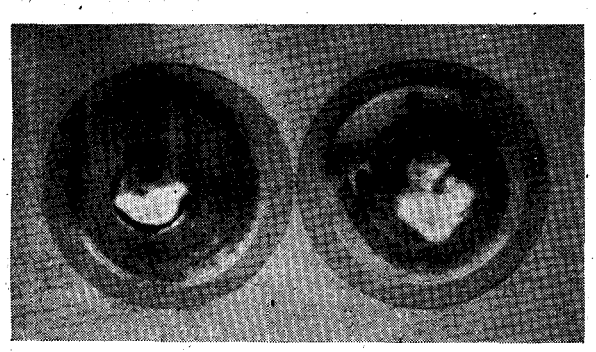

Fig. 1—Plastic conical chamber containing coiled cord samples.

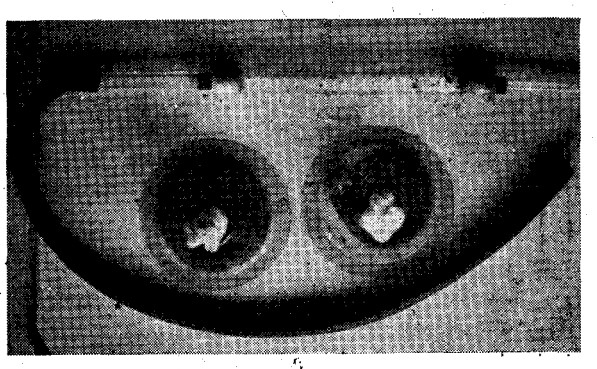

Fig. 2—An assembly showing aspirator and the coiled cord samples.

TABLE 1

COMPARATIVE EFFICACY OF MALATHION IMPREGNATED CORDS

Month	22 mm cord†			13 mm cord††		
	Day of test	Number knockdown in minutes	Mortality rate (30 mt. after knockdown) (%)	Day of test	Number knockdown in minutes	Mortality rate (30 mt. after knockdown) (%)
	Initial	5 7 8 (1) (2) (3)	100	Initial	1 5 8 3 3 (1) (2) (3) (4) (5)	100
Jun	15	7 7 6 (1) (2) (3)	100	15	6 8 3 3 (2) (3) (4) (5)	100
Jul	40	10 8 2 (15) (17) (30)	100	40	6 8 2 4 (30) (45) (60) (65)	100
Aug	60	4 6 6 4 (20) (30) (50) (135)	100	60	2 4 4 4 2 (30)(45)(120)(150)(170)	100
Sep	100	2 4 4 6 4 (5) (15) (20) (25) (30)	100	100	2 6 4 4 4 (5) (10) (15) (20) (35)	100
Oct	130	4 8 4 4 (35) (40) (45) (56)	100	130	4 6 2 4 4 (40) (45) (50) (55) (60)	100
Nov	160	8 8 4 4 (35) (40) (45) (50)		160	10 6 4 (50) (55) (65)	100
Dec	170*	2 4 6 4 4 (35) (40) (55) (75) (85)		*	1 2 3 2 2 (50)(65) (70) (90) (105)	

† = 1 kg cord = 60 m (approximately)

†† = 1 kg cord = 90 m (approximately)

Figures in parenthesis indicate minutes and figures above actual knockdown

*Tests discontinued

There were two replicates in each assay. The temperature and humidity during the trial ranged between 80±8°F and 75±20 per cent RH. The trials were started in June and continued till December.

RESULTS AND DISCUSSION

The results indicated that freshly treated malathion cords produced a 100 per cent knockdown of flies with 22 mm and 13 mm cords in 3 and 5 minutes respectively (Table 1). The knocked down flies died after 5 to 30 minutes subsequently. This level of effectiveness was retained by the cords for a duration of about 15 days. Thereafter, the efficacy of the cords rapidly declined, the time taken for a 100 per cent knockdown ultimately rising to 135 and 170 minutes respectively for the two cords at the end of two months. However after a period of 100 days of initial exposure there was a sudden and distinct revival of activity in both the cords—the knockdown period again reverting to 30 and 35 minutes respectively.

The subsequent tests performed after 130 and 160 days revealed that the cords maintained their activity to a reasonable extent and produced a complete knockdown within 56 and 50 minutes respectively with the 22 mm cords and 60 and 65 minutes respectively with the 13 mm cords. Based on these observations it appears that both the cords continued to maintain their residual contact toxicity to the test insect reasonably for a period of five months after exposure. This has been the experience of earlier workers also who found the cord effectivity to last for about four months[5].

A point which needs further elaboration at this juncture is that as mentioned earlier both the cords showed a rapid deterioration in their contact toxicity within almost 2 months of exposure, but subsequently regained their activity and continued to retain it for almost as long as 5 months (Table 1). This was indeed very perplexing as such a variation in cord activity could not be readily understood while the trials were in progress. The explanation for such an observation became apparent on examining the temperature

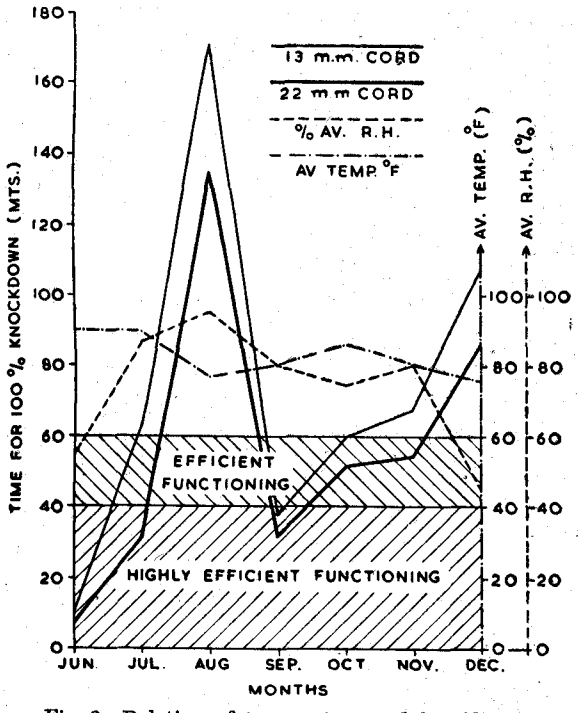

Fig. 3—Relation of temperature and humidity to knockdown.

and humidity trends during the period of investigation (Fig. 3). This showed that at the time of commencement of the trials in June when the cords were most effective the RH was 54 per cent only. Later with the onset of the monsoons there was an increase in the average RH reaching a peak of 94 per cent in August which influenced the knockdown period. Both the 22 mm and 13 mm cords registered a corresponding decrease in their effectiveness, *i.e.*, increase in knockdown period to 135 and 170 minutes respectively to attain a cent per cent knockdown. Again in September there was a sudden revival of cord activity corresponding to the lowering of average RH to 80 per cent during the month. Thereafter the cord activity again gradually declined with the corresponding increase in the RH during the last two months of October and November. This shows that there was a distinct association between the efficacy of the cords and the relative humidity, the higher the humidity the lower the cord efficacy and vice versa to a certain degree.

Similarly it was found that when the average temperature in June and July was 87°F the period required for complete knockdown was fairly low (making allowances for the freshly treated cords), as compared to that in August when the period of knockdown was the highest reached, and temperature then recorded being the lowest, *i.e.*, 73°F only. Again with a steady rise in temperature from September onwards, the knockdown period was influenced accordingly. This clearly shows that a relationship exists between the temperature and humidity, prevailing at any particular time, which ultimately influences the knockdown period of flies in the field. The lower the temperature and higher the humidity, the greater the time period required for complete knockdown, the reverse also holding good within certain limits (Fig. 5).

A relevant inference drawn from these observations is that the cords impregnated with malathion function ideally at an average temperature of 82±2°F and RH of 65±15 per cent. Any appreciable variation in the above requirements will influence the performance of the cords in the field accordingly. In addition, the maximum permissible period for a cent per cent knockdown should not exceed a duration of 40 to 60 minutes. Any results exceeding this upper time limit can be considered to be indicative of loss of toxicity of the residual insecticide on the cords, which is partly due to the deposition of fly excreta on the cords (Fig. 4 & 5). Any further use beyond this period would perhaps unduly lead to the development of resistant strains in course of time.

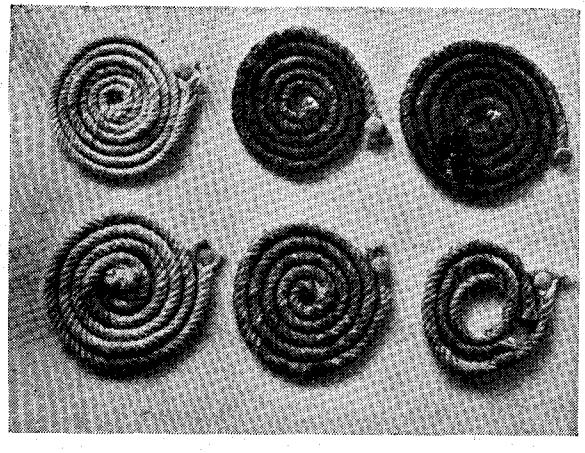

Fig. 4—Cord samples drawn at regular intervals of time showing progressive fouling (faecal deposit).

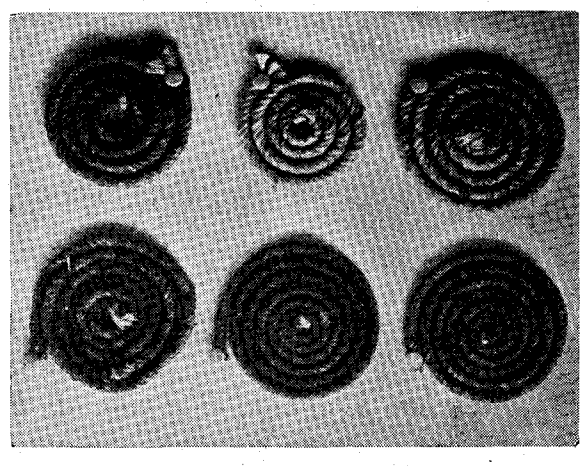

Fig. 5—Cord samples showing more severe fouling.

As far as the assessment of the two cords is concerned, it is apparent that although the initial performance of 22 mm cord in respect of both knockdown and kill of flies is much better than that of 13 mm cord, this is only as a result of greater absorption of the insecticide coupled with bigger surface area available for exposure to the flies on the former cord, area for area. It is, however, clear that the 13 mm cord is more economical for use as compared to the 22 mm cord as weight for weight 1 kg cord of the 13 mm cord is one and a half times the length of the 22 mm cord and absorbs only 3/5th the quantity of insecticide for the same weight yet gives an almost similar long range effectivity extending from four to five months.

CONCLUSION

The optimum temperature and humidity conditions for use of malathion impregnated cords have been ascertained to be $82°\pm2°F$ and 65 ± 15 per cent RH, respectively.

The comparative evaluation revealed that although the initial performance of a 22 mm cord in both knockdown and kill of flies was much better than that of a 13 mm cord but from economical considerations 13 mm cord is preferable for general use in cattle-shed than 22 mm cord as weight for weight it is not only one and a half times longer but also absorbs 3/5th the quantity of insecticide, yet remains effective equally long.

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