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TOXICITY OF PETKOLIN AGAINST CATTLE TICK, BOOPHILUS DECOLORATUS KOCH (ACARINA: IXODIDAE)

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Acaricidal action of Petkolin, a petroleum based chlorinated insecticide, has been studied against cattle tick, *Boophilus decoloratus* Koch. Results were compared with DDT, Endrin and BHC. It was found that Petkolin-M was more toxic than DDT, Endrin and BHC.

Introduction

Ticks are important both from medical and veterinary points of view. They transmit some of the most virulent diseases in man and animal. Several species are responsible for transmission of veterinary diseases, such as equine encephalitis, bovine and canine babesiosis, others cause damage to animal skins or debilitate animals through the volume of blood withdrawn or by initiating wounds that develop into ugly secondary sores. They also carry pathogenic viruses, rikettsiae and protozoans. In some cases the pathogenic agent is transmitted to the progeny of the infected female tick through the eggs, and ticks which have never fed on an effective host may thus carry infection. Apart from their role as vectors of disease the ticks inject salivary secretions when feeding and in some species these have a neurotoxic constituent which causes, tick paralysis, in man and animal, especially when feeding site is near the brain or spinal cord.

Boophilus ticks are one of the most important pests of cattle throughout the world. In Pakistan quite a considerable damage to cattle is caused by these ticks. Many workers[1–10] have tried to control cattle ticks by applying various acaricides, but in Pakistan no attempt has been made so far in this direction. Numerous investigators have developed laboratory techniques for evaluating insecticides against Boophilus ticks. One of the earlier published descriptions of a laboratory procedure is that of Whitnall and Bradford[11] in South Africa, in which engorged female *Boophilus decoloratus* Koch that had been manually removed from cattle were immersed in the test material for 5 min and then held for 1 hr on a cotton pad that had been dampened with the same insecticide. While conducting similar studies in Jamaica with *B. annulatus microplus*, Arnold[12] concluded that there was no difference in effect between an immersion period of 3 sec and one of 15 sec. In later work[13] he used a technique very similar to that of Whitnall and Bradford. Hitchock,[14] working in Australia, used adult females of *B. a. microplus* that had dropped from cattle after engorgement and were therefore assumed to be in a uniform physiological state. Norris and Stone,[15] Stone,[16] Stone and Meyers[17] and Stone and Webber[18] have continued to use Hitchoch's technique, with a few added refinements. In recent work by Stone and Webber,[18] an injection technique was compared with the immersion procedure. Kitaok and Yajima,[19] working with *B. a. microplus* in Japan, have made one of the few attempts to establish the relative toxicity of a large number of compounds to Boophilus ticks. A laboratory immersion technique was compared with topical applications of 15 among 35 compounds tested. Effectiveness was calculated in terms of an oviposition ratio arrived at determining the relation between weight of eggs and weight of engorged females in both treated and untreated ticks. They noted that the median oviposition-inhibiting dosages obtained by topical application were very similar to those Stone and Webber[18] obtained with an injection technique.

In the light of the foregoing facts, the present investigation was undertaken with a view to evaluate the acaricidal potentialities of Petkolin against cattle tick, *Boophilus decoloratus* Koch.

Materials and Methods

Males and engorged nymphs were brought to the laboratory from cattle colony, Landhi, Karachi. The adults mated and eggs were laid. After hatching, the larvae were placed on rats for engorgement. It has also been observed that engorged female ticks may live without food for 20 days. A detailed laboratory rearing method has already been described by Allred, *et al.*[20]

Test Against Adults (*Fig.* 1).—Engorged females have been preferred for the testing because of their greater resistance to insecticides and more uniform response. In order to have an accurate result ticks were weighed by means of an analytical balance before testing and only specimens of 150 mg or more were used. The effect of Petkolin on the females has been measured in terms of failure to produce viable eggs rather than in terms of mortality, because it is extremely difficult to separate dead and moribund females under *in virto* conditions. Petkolin-A and Petkolin-M were tested at 3 concentrations 0.01%, 0.1%. and 1% 50 ml of candidate insecticide was kept in a 100 ml beaker into which the 10 large active females were dropped. The dilute insecticide and the ticks were stirred continuously for 30 sec and then poured through a screen that retained the ticks. After a short period on the screen, ticks were placed on filter paper towelling to remove excess liquid and allowed to air-dry for 2–5 min. They were then transferred into small petri-dishes with nylon-gauze covers and held in laboratory conditions (temperature 80±5°F and 70 to 80% R.H.). The ticks were examined at 10 to 14 days after treatment to determine the number that had oviposited and the approximate size of the egg masses. After 30 or more days they were again to note further oviposition and hatching percentage.

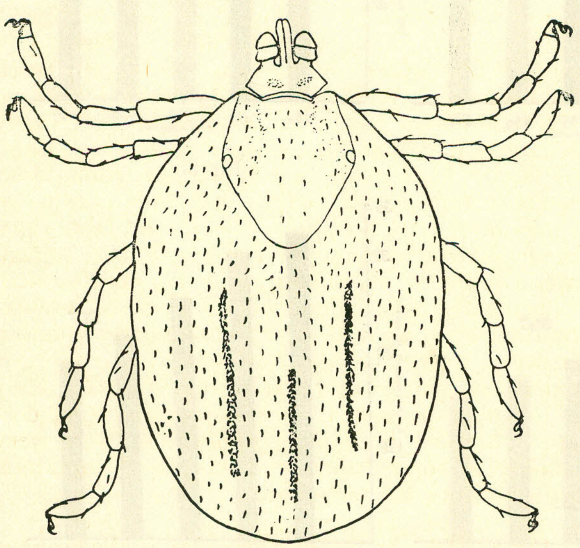


Fig. 1.—*Boophilus decoloratus* (Koch, 1844) (Female, dorsal).

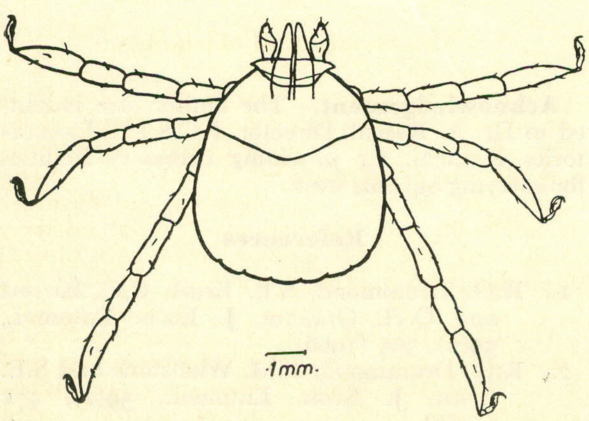


Fig. 2—*Boohilus decolarus* (Larva).

Test Against Larvae (*Fig.* 2).—The solutions of different concentration of Petkolin-A and Petkolin-M, ranging from 1 to 5%, were prepared in acetone. A measured amount of 0.6 ml was sprayed from each formulations. Spraying was done by means of the S.T-4 laboratory spray tower by Burkard Manufacturing Company Ltd. Constant pressure was obtained by using Handiair No. 2 Air Compressor and large reservior supplied with the apparatus. After spraying the whole amount at constant pressure and distance, the sprayed material alongwith ticks was removed from the spray table and held at a constant temperature at 80±5°F and 70 to 80% R.H. Time for 50% and 100% mortality was noted. Ticks larvae were considered dead if they failed to crawl forward when prodded with needle.[21,22] Controls were also run for each experiment and the reading were taken after 24 hr. Results were compared with DDT, BHC and Endrin.

Results and Discussion

Adult females that were dipped in 1% Petkolin-A and Petkolin-M died, while those treated with 0.1% and 0.01% survived and oviposited. A more typical response at the lowest effective concentration was the production of a small, abortive egg mass, often consisting of less than a dozen eggs, none of which hatched. No such abortive egg mass was produced in control.

In case of larvae, the lowest concentration (1%) of Petkolin-A and Petkolin-M gave 50% mortality in 18 and 14 min whereas BHC, DDT and Endrin took 18, 20 and 21 min, respectively.

Similarly 1% solution of Petkolin-A and Petkolin-M gave 100% mortality in 31 and 28 min while BHC, DDT and Endrin took 30, 32 and 35 min, respectively. No revival was noted after 24 hr. The complete results of laboratory tests with Petkolin-A and Petkolin-M and other imported insecticides are shown in histograms (Figs. 3–12).

As a result of the present studies, it may be concluded that Petkolin-M is more toxic than BHC, DDT and Endrin, while Petkolin-A is as effective as BHC and more than DDT and Endrin.

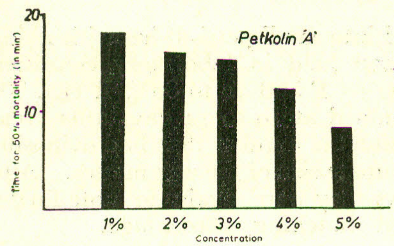
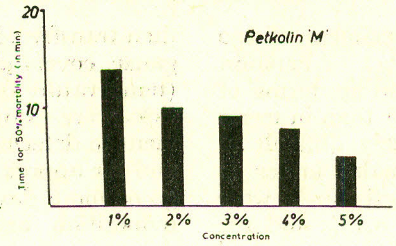


Fig. 3.



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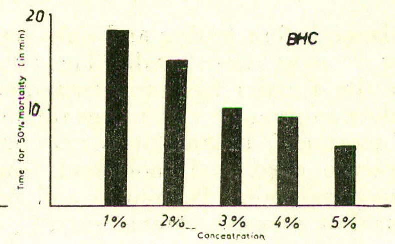

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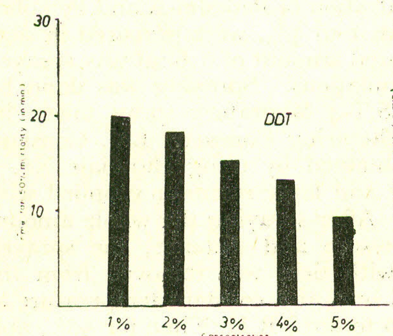

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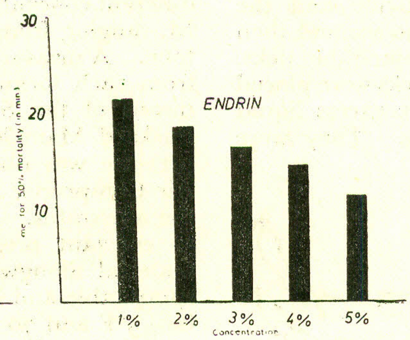

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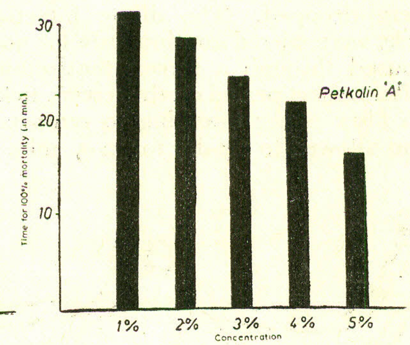

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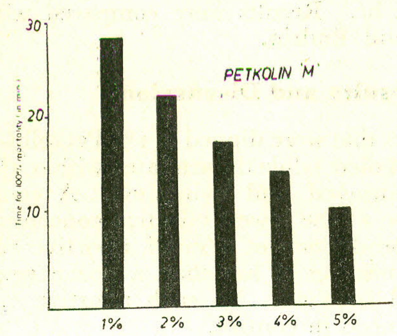

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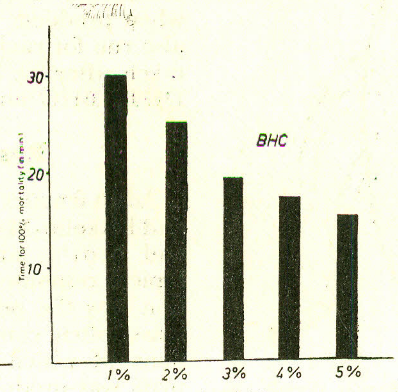

Fig. 10.

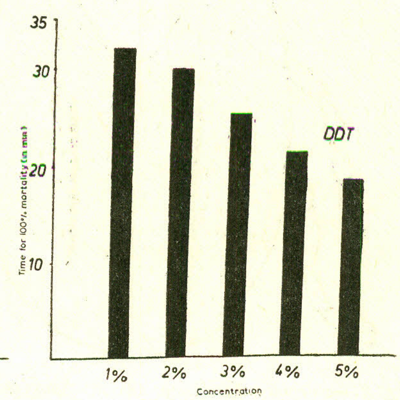

Fig. 11.

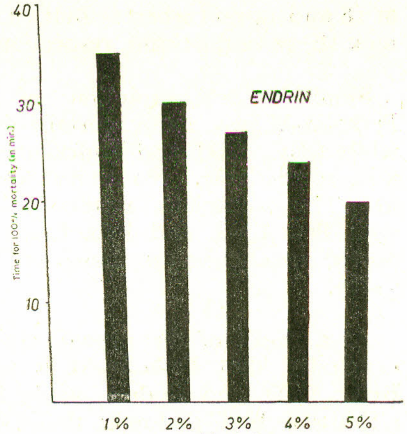

Fig. 12.

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