Acaricidal activity of herbal extracts against cattle tick  
(*Rhipicephalus microplus*)

**A Varadharajan and R Gnanasekar**

**Abstract**

Tick infestation poses a major threat to the lifestyle of livestock. The main tick species found in domestic animals of India is *Rhipicephalus* [*Boophilus*] *microplus*. Several plants have the ability to inhibit the growth of the ticks in domestic animals. The present study aimed to evaluate the acaricidal activity of five plants against the cattle tick, *Rhipicephalus* [*Boophilus*] *microplus*. For that, leaf extracts from *Azadiracta indica*, *Mangifera indica*, *Polyalthia longifolia*, *Annona squamosa*, and *Ficus benghalensis* were prepared and studied for their usage in the growth inhibition and the mortality rate of the cattle tick *Rhipicephalus microplus*. The results of the present study imply that all the studied herbs are having an appreciable mortality rate for the ticks compared to the separate usage of these plant extracts, the combination of all shows quick response to the mortality rate of the ticks.

**Keywords**: Cattle tick control, *Rhipicephalus* [*Boophilus*] *microplus*, herbal extracts

**Introduction**

In the recent past, tick-borne diseases are posing a major threat to the lifestyle of the live stocks. This leads to a demand to develop a new economical technique for the control of ticks. Among the different tick parasites, *Rhipicephalus microplus* is a hard tick and can affect cattle, horses, donkeys, goats, deer, picks, dogs and some wild animals. *Boophilus* ticks are certainly the most damaging and cause stress and weaken the host. It has been estimated that infestation with 20 to 30 ticks has a negative impact on cattle (reduced weight gain, decreased milk production, higher susceptibility for diseases or other parasites, etc.). More specific calculations indicate that, an infestation with 50 or more engorged *Boophilus* female ticks can cause an annual weight reduction of 0.5 kg per tick. Especially, the milk producing units face the annual decline in the milk production by 200 liters per animal owing to the tick related problems. Furthermore, the impact on tick-borne diseases sometimes causes more mortality in cows. The use of tickicide for control of tick populations is a serious problem which causes environmental pollution and disturbs the non-targeted species. This condition creates the need for alternative tick control methods of lesser problems with the environment (Patel et al., 2014) (16). Scientific research on plant based products that are toxic to ticks is intensifying. This is primarily a result of the recognition of plants as the potential sources of anti-tick agents by many scientists (Abdel Shafy and Zayed, 2002; Franciscio et al., 2003; Kaur et al., 2015) (11,5,8). One of the commonly cited advantages that may result from the use of botanicals for tick control is their biodegradability (Liang et al., 2003; Kaur et al., 2017) (11, 9). This would make botanical acaricides to be less toxic to the environment and non-targeted species. So far, promising results have been obtained from some plants screened for anti-tick properties. The sticky secretions of some tropical pasture legumes of the genus *Stylosanthes*, which immobilize and kill ticks reported by Nithya et al., (2018) (15). Nchu et al., (2005) (14) and Greeshma et al., (2018) (17) demonstrated the toxic effects of dichloromethane extracts from garlic (*Allium sativum*) bulb on adults of *Hyalomma marginatum* rufipes and *Rhipicephalus pulchellus*. However, many plants are still scientifically untested for antitick properties. In an attempt to contribute to this need, we examined the effects of the five plant leaves aqueous extracts against adults of *Rhipicephalus* [*Boophilus*] *microplus*. The visible engorged adult female causes harm and transmit tick-borne diseases and hidden larvae and nymphs also cause severe infestation. Therefore, present investigation will add great relevance to control ticks and simultaneously helps for tick borne diseases.

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Materials and Methods
Preparation of plant extracts
Five different plants i.e. Azadiracta indica, Mangifera indica, Polyalthia longifolia, Annona squamosa, Ficus benghalensis have been collected from different locations of Cuddalore district, Tamil Nadu, India. The collected leaves were brought into the laboratory and washed with distilled water and dried. After complete drying, the plant materials were powdered by kitchen blunder. The powders of five different plants were separately processed and then their extracts were prepared using Soxlet apparatus. The prepared aqueous extracts were used for further experimental studies.

Collection of ticks
Live R. microplus ticks were used for evaluation of acaricidal activity. Adult blood engorged female ticks were removed and collected from the body of naturally infested cattle and identified. Ticks were maintained in the laboratory in glass humidity chambers at 25 ± 2°C and 75 ± 5% RH in the Division of Animal Husbandry, Faculty of Agriculture, Annamalai University.

Antiacaricidal activity tests
For testing the antiacaricidal activity nine different groups of test series were prepared. Each group contains five ticks. The group -1 was taken as control, while other eight groups were taken as experimental groups. The aqueous extract of each plant leaf powder (10mg/ml) was used for antiacaricidal activity. The drop wise addition of plant extracts on ticks was notified. The time taken for 100% mortality was notified. The antiacaricidal activity of the extracts was tested separately and in different combination of mixing as described by Pascual-Villalobos and Robledo, 1998; Nchu et al., 2005 [17,14].

Results and Discussion
The time taken for 100% mortality in each group has been recorded and the obtained results are presented in table -1. The results indicate that extracts from different combination show quick response to the mortality of the ticks as compared to single plant extract. The combination of all 5 different plants extract shows 100% mortality within 30 seconds, whereas, extracts from separate form consume 45 seconds. The plants include in this study were selected on the basis of their reported acaricidal activities and frequency of usage in traditional veterinary medicine. The A. indica is one of the commonly grown indigenous plants used by majority of the farmers. It poses a wide range of biologically active compounds and has been evaluated for acaricidal, insecticidal and molluscidal activities. The antiacaricidal studies shows combined extracts of leaves of A. indica seeds of A. squamosa were found promising. Extracts of Azadiracta indica inhibit egg production of immsesal B. microplus ticks and weekly spraying with neem seed extracts decrease the number of ticks. The rate of ticks was lowered in animals receiving higher doses of azadirachtin. Magano (2008) [13] studied the anti-tick properties of the root extract of Senna italica subsp. arachoides against adults of Hyalomma marginatum rufipes. The results of the present study are exactly matched with the results reported by Ghosh et al., (2015) [6] and Kaur et al., (2016) [10].

Table 1: Effect of aqueous extract of different plants on acaricidal activity and percent mortality in time (Minute) at concentration 10 mg/ml

<table>
<thead>
<tr>
<th>Groups</th>
<th>Name of plant</th>
<th>Concentration 10mg/ml</th>
<th>Time of 100% mortality (Time in Second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Control</td>
<td>Distilled water</td>
<td>No mortality</td>
</tr>
<tr>
<td>II</td>
<td>Azadiracta indica</td>
<td>10mg/ml</td>
<td>180 ± 0.03</td>
</tr>
<tr>
<td>III</td>
<td>Mangifera indica</td>
<td>10mg/ml</td>
<td>210 ± 0.01</td>
</tr>
<tr>
<td>IV</td>
<td>Polyalthia longifolia</td>
<td>10mg/ml</td>
<td>170 ± 0.04</td>
</tr>
<tr>
<td>V</td>
<td>Annona squamosa</td>
<td>10mg/ml</td>
<td>180 ± 0.06</td>
</tr>
<tr>
<td>VI</td>
<td>Ficus benghalensis</td>
<td>10mg/ml</td>
<td>210 ± 0.30</td>
</tr>
<tr>
<td>VII</td>
<td>Azadiracta indica + Annona squamosa + Polyalthia longifolia</td>
<td>10mg/ml</td>
<td>38 ± 0.04</td>
</tr>
<tr>
<td>VIII</td>
<td>Ficus benghalensis +Mangifera indica + Polyalthia longifolia</td>
<td>10mg/ml</td>
<td>42 ± 0.40</td>
</tr>
<tr>
<td>IX</td>
<td>Azadiracta indica + Annona squamosa + Polyalthia longifolia + Ficus benghalensis + Mangifera indica</td>
<td>10mg/ml</td>
<td>30 ± 0.02</td>
</tr>
</tbody>
</table>

The effects of combined plant extracts against the tick infection has been exploited by Rajapakse and Van Emden (1997) [18], investigated the arthropodical effects of botanical oils as well as combined effects with other plant products. However, Liu (2003) [11, 12, 13] suggested that isolated compounds may either lose their bioactivity or may not behave the same way as the compound in a whole mixture. Studies to evaluate anti-tick property of different plants has been carried out by various workers, but the field is still in nascent stages and still more research needs to be done in the area to explore more and more plants and plant products with the aim to develop a low-cost, effective and potent acaricide with little or no side effects. In the present study combined effect of all the 5 plants shows the tremendous mortality (100 % mortality) of ticks within 30 seconds. This finding is in accidence with the earlier reports of Avinash et al., (2017) [2] and Diaha-Kouame et al., (2017) [4].

Conclusion
The results of the present study imply that all herbals are having an appreciable mortality rate for the ticks compared to the separate usage of these plant extracts, the combination of all shows quick response to the mortality rate of the ticks. However, A sustainable approach like integrated tick control strategy is highly required which involve variety of tick control methods like brushing of the animal at regular intervals, use of chemical acaricides, vaccination as well as herbal treatment of livestock for the removal of ticks. It is of utmost need to control the indiscriminate and frequent use of chemical acaricide so that the chances of development of resistance should be checked.

References
2. Avinash B, Santhipriya CH, Kondaiah PM. Evaluation of


