ABSTRACT

A study was conducted during 2009-10 to assess the toxicity of chloroform extracts of *Pogostemon parviflorus* (Benth.) and *Polygonum hydropiper* (L) against red spider mite (*Oligonychus coffeae*, Neitner) under laboratory condition using leaf detached method. Both the plant extracts possessed the acaricidal properties on developmental stages of red spider mite. The treatment with both plant extracts exhibited prolonged developmental period which affected the population build up of the pest in subsequent generation. The efficacy of extracts was found to be dose dependent. However, except in deutonymph the duration was found to be reduced at lower dose with *Pogostemon parviflorus* extracts then the normal but, the result was not significant. It is also observed that high toxicity to the mite was exhibited by *Polygonum hydropiper*.

**Key words:** *Pogostemon parviflorus, Polygonum hydropiper, Oligonychus coffeae, Developmental stages.*

Red spider mite (RSM) *Oligonychus coffeae*, Neitner (Acarina: Tetranychidae) is a major arthropod pest that attacks most of the tea cultivars of North-East India. The economic loss caused by the RSM in North-East India may range from 50% to 75% of total crop yield (Subramaniam, 1995 and Gurusubramanian, 2005). To check the crop loss several kinds of acaricides have been evaluated under chemical control strategy. Among the synthetic pesticides dicofol and ethion are recommended as acaricides. In spite of all types of synthetic pesticides such as Organochlorines, Organophosphates and Synthetic pyrethroids the red spider mite remains a serious problem of tea and is difficult to control.

Management of *O. coffeae* has become a challenge apparently due to higher tolerance to synthetic insecticides (Das, 1959). Also the indiscriminate use of the synthetic insecticides evokes pesticide residue (pollution in the environment). Thus, the trend on awareness to health and environmental ecosystem has driven the attention of researcher to search for an alternative effective pesticide with low rates of toxicity to mammals and plants. The use of bio-rational product i.e. botanical pesticides which are important alternatives to synthetic pesticides will be the right alternative since they possess an array of beneficial properties including repellence, antifeedant activity, growth regulatory activity and toxicity to insect and mite pests (Prakash et al., 2008). An attempt was made in the present study to evaluate the potential of chloroform extracts of *Pogostemon parviflorus* (Benth.) and *Polygonum hydropiper* (L.) at specific concentrations on developmental stages of red spider mite.

**Preparation of Plant extracts:** Leaves of *Pogostemon parviflorus* (Benth.) and *Polygonum hydropiper* (L.) were collected from Upper Assam. The leaves were shade dried and powdered. The dried powdered materials (2 kg) were kept in 2.5 L of Chloroform for 3 days. After 3 days the solvent was filtered out to get the chloroform extract.
Culture of red spider mite (RSM): A culture of red spider mite was maintained at 25±2°C and 70-80% RH on a susceptible tea clone TV1 by following the detached leaf culture method of (Helle and Sabelis(1985) with slight modification at Dept of Entomology, Assam Agricultural University, Jorhat.

Toxicity on developmental stages: To evaluate the toxicity of plant extracts on the developmental stages of tea red spider mite the experiment was conducted with sets of 30 leaf disc treated with each doses of both the plant extracts. Another set of 30 untreated leaf disc were placed on the wet cotton bed in petridish as control. The adult female red spider mites were allowed to oviposit on the leaf disc. After egg laying the female red spider mite were removed and a single egg per disc was kept in all the petridishes and were covered keeping a slight gap to check excessive evaporation. All eggs were carefully checked once every day and the life stages of red spider mite up to adult emergence were recorded. The leaf disc in treated and control batches were changed with fresh disc of treated and untreated ones after every 3-4 days. The experiment was carried out from May-July during 2009-2010 in Laboratory at 20-23°C.

Incubation period: The evaluation of toxicity of plant extracts on incubation period of red spider mite revealed that the embryonic development of the eggs laid by the mite fed with tea leaf treated with P. parviflorus and Phydopiper chloroform extracts was delayed in comparison to the eggs laid by mite on the untreated leaf. The chloroform extracts of P. hydropiper was found to be more toxic than the chloroform extracts of P. parviflorus. The P. hydropiper prolonged the incubation period of RSM with the increase in concentration of extracts i.e. at highest concentration of 2.0% the incubation period was recorded 3.10±0.15 days (Table1).

Larval period: Evaluation of toxic affect of plant extracts on larval period shows no significant affect on larval development. However, the P. hydropiper chloroform extracts at highest dose of 2.0% increased the larval period than that of control from 0.91±0.07 days in control to 1.90±0.07days in treated.(Table1)

Protonymphal period: While evaluating the protonymphal period of red spider mite, the maximum protonymphal period was achieved with P. parviflorus treatment (1.94±0.01) and at 2.0%concentration in treated leaf with Phydopiper (1.77±0.06). Efficacy of both the extracts on lengthening the protonymphal period of RSM was found significant (table1&2). The lengthening of protonymphal period was observed more in Pogostemon parviflorus treatment than with the Polygonum hydropiper. Similarly, the increased in dose increased the protonymphal duration significantly as compared to control.

Deuteronymphal period: The chloroform extracts of both the plant showed potency in lengthening the Deutonymphal period significantly, but at lowest (0.5%) dose of Polygonum hydropiper the deutonymphal period was 2.37±0.10days than the other two doses i.e. 2.30 and 2.15 days at 1.0 and 2.0% concentration. But, the results are not statistically significant. Similarly, the effect of P. parviflorus revealed that the increase in doses increased the deutonymphal period than the normal. The increased in the deutonymphal period of RSM due to treatment with P. parviflorus extracts was more pronounced than the Polygonum hydropiper against the control.

<table>
<thead>
<tr>
<th>Doses Conc. (%)</th>
<th>Incubation Period (days)</th>
<th>Larval period (days)</th>
<th>Protonymphal period (days)</th>
<th>Deutonymphal period (days)</th>
<th>Egg-Adult (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>2.00±0.11a</td>
<td>0.91±0.07a</td>
<td>1.31±0.11a</td>
<td>2.39±0.07a</td>
<td>7.00±0.12b</td>
</tr>
<tr>
<td>0.5</td>
<td>2.66±0.08b</td>
<td>0.90±0.12a</td>
<td>1.45±0.07c</td>
<td>2.37±0.10a</td>
<td>8.21±0.04b</td>
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<tr>
<td>1.0</td>
<td>2.67±0.11b</td>
<td>1.00±0.11a</td>
<td>1.68±0.04c</td>
<td>2.30±0.12a</td>
<td>8.00±0.06b</td>
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<tr>
<td>2.0</td>
<td>3.10±0.15d</td>
<td>1.90±0.07a</td>
<td>1.77±0.06c</td>
<td>2.15±0.04c</td>
<td>8.65±0.22c</td>
</tr>
</tbody>
</table>

Means with same letter do not differ significantly
TABLE 2: Effect of Pogostemon parviflorus chloroform extracts on developmental stages of Tea Red Spider Mite, Oligonychus coffeae.

<table>
<thead>
<tr>
<th>Doses Conc.(%)</th>
<th>Incubation Period</th>
<th>Larval period</th>
<th>Protonymphal period</th>
<th>Deutonymphal period</th>
<th>Egg-Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>2.00±0.11a</td>
<td>0.90±0.07a</td>
<td>1.31±0.11a</td>
<td>2.39±0.12a</td>
<td>6.59±0.15a</td>
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<tr>
<td>0.5</td>
<td>2.70±0.086b</td>
<td>1.20±0.06b</td>
<td>1.55±0.14b</td>
<td>2.25±0.11b</td>
<td>7.55±0.06b</td>
</tr>
<tr>
<td>1.0</td>
<td>2.75±0.01b</td>
<td>1.40±0.10c</td>
<td>1.70±0.08c</td>
<td>2.36±0.12a</td>
<td>7.65±1.18c</td>
</tr>
<tr>
<td>2.0</td>
<td>2.92±0.09a</td>
<td>1.45±0.14c</td>
<td>1.94±0.01c</td>
<td>2.58±0.10a</td>
<td>7.69±0.24c</td>
</tr>
</tbody>
</table>

Means with same letter do not differ significantly.

**Egg to adult development stage:** Total developmental period (egg-adult) was affected by the plant extracts compared to control. The effect was more pronounced in *P. hydropipers* by extending the period of egg to adult development.

Thus, it is seen from the above observation that both the tested plant extracts exhibit equipotentiality in inhibiting the normal development of the *O. coffeae* that could help in reducing population built up of the pest in tea plantation. The present results support earlier work on the effect of plant extracts on developmental stages of two spotted spider mite by flower juice of *Calotropis procera* and seed dust of *Nerium oleander* (Islam et al., 2008). Neem based pesticides and other plant extracts have been reported to show adverse affect such as oxicidal and on development and reproduction of *Oligonychus coffeae* and *Tetranychus urticae* Koch. (Roobkumar et al., 2010, Dimetry et al., 1993, Sundaram and Sloane, 1995).

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**REFERENCES**


