REPELLENCY PROPERTY OF CERTAIN POTENT ESSENTIAL OILS AGAINST TWO SPOTTED SPIDER MITE, Tetranychus urticae (KOCH) BY DRYFILM BIOASSAY

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Abstract
Botanical extracts are broad spectrum materials used in pest control and they are safe to apply, unique in action and can easily be processed. Locally available plant materials have been widely used in the past to protect the plants from damage caused by insects. The main advantage of botanicals is that they are easily produced by farmers, cheaper and hazard free in comparison to chemical insecticides. Botanical extracts have defensive compounds which make difficult or impossible for pests to consume the plants. Among these pests, two spotted spider mite, Tetranychus urticae (Koch) cause heavy damage to the various crop. Study was carried out to evaluate the repellency property of various essential oils against two spotted spider mite by dry film bioassay technique. Treatments includes the Eucalyptus oil, Ocimum oil, Lavendula oil, Mentha oil, Rosemarinus oil, Cymbopogon oil, Syzygium oil and an untreated check were tested for its efficacy. The maximum repellency was recorded in case of Eucalyptus oil and Ocimum oil followed by Rosemarinus oil. The Mentha oil and Cymbopogon oil shows on par results, whereas the Syzygium oil recorded a moderate repellency against mite. The least repellency was recorded in Lavendula oil against two spotted spider mite after 48 hours of release. Essential oils are ecofriendly, hence leads to a safer Environment to the world.

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1. Introduction
Botanical extracts are broad spectrum materials used in pest control and they are safe to apply, unique in action and can easily be processed. Locally available plant materials have been widely used in the past to protect the plants from damage caused by insects. The main advantage of botanicals is that they are easily produced by farmers, cheaper and hazard free in comparison to chemical insecticides.

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Botanical extracts have defensive compounds which make difficult or impossible for pests to consume the plants. Thus, in many countries efforts are being made to minimize the use of harmful chemical insecticides through the use of indigenous plant products and use of biodegradable products to protect the crop plant. Our research goals were to study the efficacy of some plant-derived essential oils in controlling the two-spotted spider mite and to determine how they
would affect the reproductive rates, adverse effect of this pest under laboratory conditions.

Hence, a real need is an obligation to find other approaches that capitalize on safe natural products. Natural products are excellent alternative to synthetic pesticides, as a mean to reduce negative impacts to human health and the environment. They are more compatible with the environmental components than synthetic pesticides.

2. Materials and Methods

Dry film bioassay technique

Test organism was exposed to film of the toxicant in this technique, but this could be applied for other group of mites also. Different concentrations of essential oils were applied thoroughly on the petridishes, closed it and swirled briefly in upright and inverted positions. After open the dishes, excess solution poured off and the deposits were allowed to air dry for sixty minutes. Control dishes were treated with solvent in the same way. If not in use, dishes could be stored at 2°C and used within twelve days. Open dishes are placed briefly on chilled freezer pack. The petridish were placed inside a glass box with wood frame of appropriate size to prevent disturbance due to air circulation in the laboratory at room temperature (25 ± 2°C) and >80% relative humidity. Five pairs of mite were released in each dish with the help of a fine camel hair brush before closing them tightly, the petridish brim was smears with petrol or vaseline and firmly bind with rubber band to avoid escape of test mite, T. urticae. The repellency property of two spotted spider mite was calculated based on the movement of the test mites away from the treated source. Each individual petridish was examined under a stereo binocular microscope after 1, 6, 12, 24 and 48 hours after treatment, the repellency property of two spotted spider mite was recorded. The respective treatments were replicated thrice; this experiment was conducted as per the procedure followed by Sathyaseelan and Baskaran, (2017). The data on the mite mortality recorded at different intervals and were subjected to ANOVA to infer about the differences among the treatments.

3. Results and Discussion

The bio efficacy of essential oils on the repellency property against two spotted spider mite, T. urticae by using dry film method under laboratory condition. The results revealed that the essential oils showed a significant variation in the repellency property of mite was observed at 1, 6, 12, 24 and 48 hours after treatment (Table 1).

The maximum mite repellency was recorded in case of Eucalyptus oil (16.67%) followed by Ocimum oil (13.33%) and Rosemarinus oil (10.00%). The Cymbopogan oil (6.67%) and Mentha oil shows on par results, whereas the Syzygium oil (5.72 %) recorded a moderate efficacy against mite. The least was recorded in the Lavendula oil (3.33%) against two spotted spider mite after one hour of release.

A similar trend was observed in the mite repellency during 6, 12 and 24 hours after treatment. The maximum mite repellency was recorded in case of Eucalyptus oil (63.19%) followed by Ocimum oil (60.00%) and Rosemarinus oil (56.67%). The Cymbopogan oil and Mentha oil (53.33%) shows on par results, whereas the Syzygium oil (46.67%) recorded a moderate efficacy against mite. The least was recorded in the Lavendula oil (43.33%) against two spotted spider mite after 48 hours of release. Overall mean results indicated that the maximum mite repellency was recorded in case of Eucalyptus oil (37.62%) followed by Ocimum oil (32.38%) and Rosemarinus oil (28.57%). The Cymbopogan oil (26.67%) and Mentha oil (26.19%) shows on par results, whereas the Syzygium oil (25.77%) recorded a moderate efficacy against mite. The least was recorded in the Lavendula oil (24.29%) against two spotted spider mite.

Previous findings demonstrated that the extract of neem and tulasi leaves have insecticidal properties due to the presence of triterpene, sesquiterpene, esters and strong antioxidant components such as flavonoids were reported by Esmaeily et al. (2017). This was in accordance with the findings of Premalatha et al. (2016).
### Table - 1: Bio efficacy of certain potent essential oils on the repellency of two spotted spider mite, *T.urticae* by using dry film bioassay technique

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Treatment</th>
<th>Conc. %</th>
<th>No.of mite/Replication</th>
<th>Per cent mite repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1hr</td>
</tr>
<tr>
<td>T1</td>
<td>Rosemarinus oil</td>
<td>3</td>
<td>10</td>
<td>10.00(18.43)</td>
</tr>
<tr>
<td>T2</td>
<td>Mentha oil</td>
<td>3</td>
<td>10</td>
<td>6.67(14.96)</td>
</tr>
<tr>
<td>T3</td>
<td>Syzygium oil</td>
<td>3</td>
<td>10</td>
<td>5.33(12.72)</td>
</tr>
<tr>
<td>T4</td>
<td>Eucalyptus oil</td>
<td>3</td>
<td>10</td>
<td>16.67(24.09)</td>
</tr>
<tr>
<td>T5</td>
<td>Cymbopogan oil</td>
<td>3</td>
<td>10</td>
<td>6.67(14.96)</td>
</tr>
<tr>
<td>T6</td>
<td>Ocimum oil</td>
<td>3</td>
<td>10</td>
<td>13.33(21.42)</td>
</tr>
<tr>
<td>T7</td>
<td>Lavendula oil</td>
<td>3</td>
<td>10</td>
<td>3.33(10.52)</td>
</tr>
<tr>
<td>T8</td>
<td>Control</td>
<td>-</td>
<td>10</td>
<td>0.00(0.00)</td>
</tr>
<tr>
<td></td>
<td>S.Ed</td>
<td></td>
<td></td>
<td>4.62</td>
</tr>
</tbody>
</table>

The crops sprayed with fractions of essential oils at regular intervals were very effective and recorded maximum repellency of two spotted spider mite under laboratory condition was reported by Heikal (2012). Similar results was obtained with foliar spray of neem oil 3%, NSKE 5% and *Ocimum sanctum* leaf extract 5% recorded the highest reduction of yellow mite was reported by Eswara Reddy and Dolma (2017). This was in line with the findings of Mar *et al.* (2018); Kheradmand *et al.* (2015) and Laborda *et al.* (2013).

Green gram being a vegetable crop application of essential oils is advisable rather than the usage of acaricides under field condition. This research is mainly dedicated to the peasant farmers who are not capable of utilizing the acaricides as a primary source of management practices against mite population. Hence focus to be given in future to these essential oils which are economically cheaper, environmentally safer cum eco friendly pest management tool.

### 4. References


