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EFFICACY OF CERTAIN ESSENTIAL OILS ON THE REPELLENCY PROPERTY AGAINST TWO SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* (KOCH) ON MULBERRY, *MORUS* SP L.

V. Sathyaseelan[1], M. Senthilkumar[1], M. Pazhanisamy[1] and V. Baskaran[2]

[1] Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalainagar-608002, Tamilnadu, India

[2] Department of Entomology, Institute of Agriculture, Kumulur, T.N.A.U., Tamilnadu, India

Mail ID: osathyamagri@gmail.com

Abstract

Mulberry, *Morus* sp. L. is a main food source for the silkworms and is important for the successful sericulture industry in India. Repellent property play a vital role to identify the pesticidal effectiveness of various essential oils and phytochemicals, it also accord a fundamental idea to characterize the effective biomolecules possessing the pesticidal properties. It is obvious that the quality and quantity of mulberry was drastically reduced by various insect and non-insect pests. Two spotted spider mite, *Tetranychus utricae* (Koch) is a polyphagous pest and attacks a wide range of crops. Mulberry is one of the preferred host plants for two spotted mite and also cause heavy damage. Study was carried out to evaluate the bioefficacy of various essential oils on the repellency property against two spotted spider mite on mulberry. Treatments includes the *Eucalyptus* oil, *Ocimum* oil, *Lavendula* oil, M*entha* 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 M*entha* 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 the best alternative pest management tool for the farmers and are ecofriendly and leads to safer environment.

***Keywords*:** Two spotted spider mite, Essential oils, Mulberry, Repellency property.

Introduction

Mulberry, Morus sp. L. is a main food source for the silkworms and is important for the successful sericulture industry in India. Repellent property play a vital role to identify the pesticidal effectiveness of various essential oils and phytochemicals, it also accord a fundamental idea to characterize the effective biomolecules possessing the pesticidal properties. It is obvious that the quality and quantity of mulberry was drastically reduced by various insect and non-insect pests. Two spotted spider mite, *Tetranychus utricae* (Koch) is a polyphagous pest and attacks a wide range of crops. Mulberry is one of the preferred host plants for two spotted mite and also cause heavy damage. Study was carried out to evaluate the bioefficacy of various essential oils on the repellency property against two spotted spider mite on mulberry.

Indiscriminate use of enormous insecticides load at short intervals is uneconomical besides environmentally unsafe. Hence, it is imperative to search for an alternative safer chemicals or phytochemical pesticides that are economical and eco-friendly in nature. Among the various means of mite management tactics the use of essential oils in mulberry gardens are appropriate because of the silkworm rearing. More over very meager work was reported on the bio efficacy of essential oils against mites in Tamil Nadu.

Materials and Methods

Preparation of essential oils

Eucalyptus oil, *Ocimum* oil, *Lavendula* oil, *Mentha* oil, *Rosemarinus* oil, *Cymbopogon* oil, *Syzygium* oil were obtained from oil extraction unit, Ooty. The required specific concentrations were prepared by the dilution technique and 0.05 per cent soap solution was added to the oil as an emulsifying agent for getting uniform mixture.

Leaf disc bioassay technique

The effectiveness of the essential oils against *T. urticae* was done on the mulberry leaves. The leaf was checked under stereo binocular microscope for mite and other insect. The fresh leaf were made into small discs (3cm diameter), dipped in the following treatments like, the *Eucalyptus* oil, *Ocimum* oil, *Lavendula* oil, *Mentha* oil, *Rosemarinus* oil, *Cymbopogon* oil, *Syzygium* oil and an untreated check with water for 15 min after which it was allowed to dry for 5 min at room temperature. Then the leaves were kept on a wet cotton pad in a Petri dish (10 cm diameter and 1.5 cm in width). The Petri dish brim was smeared with vaseline and firmly bind with rubber band to avoid the escape of test mite, *T. urticae.* The laboratory reared adult female two spotted spider mite, *T. urticae* were transferred to each Petri dish with the help of a fine camel hair brush. The doses of essential oils were serially diluted with water. Each Petri dish was examined under a stereo binocular microscope (Leica M205 German make) for 1, 3, 6, 9, 12, 24 and 48 hours after treatment, the repellency property of two spotted spider mite was recorded. This experiment was conducted as per the procedure followed by Ebadollahi *et al.* (2017). The Experimental Designs adopted for this research is completely randomized design. The respective treatments were replicated thrice; observation on the mite repellency recorded at different intervals was analyses statistically.

Results and Discussion

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

The maximum repellency was recorded in case of *Eucalyptus* oil (26.67%) followed by *Ocimum* oil (16.67%) and *Rosemarinus* oil (10.00%). The *Mentha* oil and *Cymbopogon* oil (6.67%) shows on par results, whereas the *Syzygium* oil (4.33%) recorded a moderate repellency against mite. The least repellency was recorded in *Lavendula* oil (3.33%) against two spotted spider mite after one hour of release.

A similar trend was observed in the mite repellency during 3, 6 and 12 hours after treatment. The maximum repellency was recorded in case of *Eucalyptus* oil (65.00%) followed by *Ocimum* oil (56.67%) and *Rosemarinus* oil (53.33%). The *Cymbopogon* oil (46.67%) and *Mentha* oil (43.33%) shows on par results, whereas the *Syzygium* oil (40.00%) recorded a moderate repellency against mite. The least repellency was recorded in *Lavendula* oil (36.67%) against two spotted spider mite after 24 hours of release.

The maximum repellency was recorded in case of *Eucalyptus* oil (84.05%) followed by *Ocimum* oil (76.67%) and *Rosemarinus* oil (70.00%).The *Cymbopogon* oil and *Mentha* oil (65.00%) shows on par results, whereas the *Syzygium* oil (53.33%) recorded a moderate repellency against mite. The least repellency was recorded in *Lavendula* oil (46.67%) against two spotted spider mite after 48 hours of release

Souza *et al.* (2016) who found that the oil extracted from *Eucalyptus citriodora* have higher fumigation toxicity against *T.urticae* even after 72 hours of exposure under laboratory condition. Reddy and Dolma (2017) reported that the alkaloid fraction present in lemongrass oil showed moderate repellency against the nymphs and adults of two spotted spider mite. This was similar to the results of Ebadollahi *et al.* (2017) who observed that the eucalyptus oil contains eucalyptol, citronellol, aromadendrene, linalool, citral, rutin, tannins and terpineol were responsible for the potent efficacy to manage the nymphs and adults of two spotted spider mite.

The peppermint oil contain thymol, menthol, triterpenes, diterpene esters, steroids and piperitenone were identified as the potent lethal constituents against two spotted spider mite was documented by Kheradmand *et al.* (2015). The lavender oil contain linalool, cineole and boreneol was identified as the lethal constituents against two spotted spider mite was documented by Salman *et al.* (2015).

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 line with the findings of Sathyaseelan (2018).

The present results are in agreement with data cited by Laborda *et al.* (2013) who reported that eucalyptus oil 3% followed by lemongrass oil 3% was found highly effective by recording lowest mite population. The chemical constituents present in lemongrass oil is D-limonene, sesquiterpenes, citronellol, citral and triterpene alkaloids was responsible for the higher efficacy against *T. urticae* was in line with our present findings.

Mulberry 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 Hence focus to be given in future to identify the active principles present in the botanicals which are responsible for the maximum efficacy of these essential oils as an effective tool against mite pest management.

Table 1 : Bioefficacy of various essential oils against two spotted spider mite, *Tetranychus urticae* on mulberry by leaf disc method.

S. No	Treatment	Conc. (%)	No. of mite /Repl.	Percent repellency of nymphs and adult mites						
				1hr	3hrs	6hrs	9hrs	12hrs	24hrs	48hrs
T_1	*Cymbopogon* oil	3%	25	6.67 (14.96)	13.33 (21.42)^{c}	23.33 (28.88)^{c}	23.33 (28.88)$^{b\,c}$	36.67 (37.27)^{d}	46.67 (43.09)^{c}	65.00 (53.73)$^{b\,c}$
T_2	*Rosemarinus* oil	3%	25	10.00 (18.43)	16.67 (24.09)$^{a\,b}$	23.33 (28.88)^{c}	33.33 (35.26)^{b}	40.00 (39.23)$^{b\,c}$	53.33 (46.91)$^{b\,c}$	70.00 (56.79)^{c}
T_3	*Eucalyptus* oil	3%	25	26.67 (31.09)	46.67 (43.09)^{a}	50.00 (45.00)^{a}	53.33 (46.91)^{a}	56.67 (48.83)^{a}	65.00 (53.73)^{a}	84.05 (65.91)^{a}
T_4	*Syzygium* oil	3%	25	4.33 (12.34)	10.33 (18.75)^{d}	20.00 (26.57)^{e}	30.00 (33.21)^{c}	33.33 (35.26)^{e}	40.00 (39.23)^{e}	53.33 (46.91)^{d}
T_5	*Ocimum* oil	3%	25	16.67 (24.09)	18.67 (24.09)^{b}	23.33 (28.88)^{b}	33.33 (35.26)^{b}	40.00 (39.23)$^{b\,c}$	56.67 (48.83)^{b}	76.67 (61.12)^{b}
T_6	*Mentha* oil,	3%	25	6.67 (14.96)	13.33 (21.42)^{c}	20.00 (26.57)^{de}	30.00 (33.21)^{c}	40.00 (39.23)^{bc}	43.33 (41.17)^{cd}	65.00 (53.73)$^{b\,c}$
T_7	*Lavendula* oil	3%	25	3.33 (10.52)	10.00 (18.43)^{de}	16.67 (24.09)$^{c\,d}$	26.67 (31.09)^{d}	26.67 (31.09)^{f}	36.67 (37.27)^{f}	46.67 (43.09)$^{d\,e}$
T_8	Control	-	25	0.00 (5.74)	0.00 (5.74)^{f}	0.00 (5.74)^{g}	0.00 (5.74)^{e}	0.00 (5.74)^{g}	0.00 (5.74)^{g}	0.00 (5.74)^{f}
	S. Ed.	-	-	6.78	5.69	3.15	3.47	3.24	3.96	3.49
	C.D. (p=0.05)	-	-	12.49	11.72	6.27	7.14	6.51	8.02	6.98

- Mean of three replications
- Figures in parentheses are arcsine transformed values
- In a column means followed by a common alphabet are not significantly different at 5% level by DMRT.

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