



REPELLENCY PROPERTY OF CERTAIN BOTANICAL EXTRACTS AND ACARICIDES AGAINST TWO SPOTTED SPIDER MITE, *Tetranychus urticae* (KOCH) ON RED GRAM (*Cajanus cajan* L.)

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Abstract

Red gram, *Cajanus cajan* L. is an important pulse crop of high economic and nutritive value, is widely grown in India. Red gram is cultivated throughout the year both under irrigated and rainfed conditions. It is obvious that the quality and quantity of the red gram was drastically reduced by various insect and non-insect pests. Among these pests, red gram two spotted spider mite, *Tetranychus urticae* (Koch.) cause heavy damage to the red gram crop. Study was carried out to evaluate the repellency property of various plant extracts and two acaricides against two spotted spider mite on red gram. Treatments includes the *Andrographis* leaf extract, *Tagetes* leaf extract, *Vitex* leaf extract, *Eucalyptus* leaf extract, *Ocimum* leaf extract, dicofol and spiromesifen were tested for its efficacy. The maximum mite repellency property was recorded in case of spiromesifen (89.33%) and dicofol (83.33%) followed by *Andrographis* leaf extract (74.67%). The *Vitex* leaf extract (66.67%) and *Eucalyptus* leaf extract (63.33%) shows on par results, whereas the *Ocimum* leaf extract (53.33%) recorded a moderate repellency against mite. The least repellency was recorded in *Tagetes* leaf extract (40.00%) against two spotted spider mite after 48 hours of release. Botanical extracts are ecofriendly, hence leads to a safer Environment to the people.

Key words: Two spotted spider mite, Repellency, Plant extracts and Acaricides.

Introduction

Red gram, *Cajanus cajan* L. is an important annual commercial crop of India. Red gram is cultivated throughout the year both under irrigated and rainfed conditions. It is obvious that the quality and quantity of the red gram was drastically reduced by various insect and non-insect pests. Mite species belonging to the genus *Tetranychus* cause severe loss in the yield of red gram. Among the mite pests, two spotted spider mite, *Tetranychus urticae* Koch cause severe damage on red gram crop. Feeding of spider mites resulted in white specks on leaves which later coalesce and produce white patches resulting in the reduction of photosynthetic activity.

Indiscriminate use of insecticides 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. More over very meager work was reported on the effect of botanical leaf extracts of plant origin in Tamil Nadu.

Materials and Methods

Leaf dip Bioassay Technique

The effectiveness of the botanical leaf extracts and acaricides against *T. urticae* was done on the leaflets of

red gram. This method was based on the surface film technique by Elkertati *et al.* (2013). For this purpose leaflets were used from fresh red gram leaves. The leaf is checked under stereo binocular microscope for mite and other insect. The fresh leaf lets were dipped in the following treatments *viz.*, the *Andrographis* leaf extract, *Tagetes* leaf extract, *Vitex* leaf extract, *Eucalyptus* leaf extract, *Ocimum* leaf extract, dicofol and spiromesifen were tested for its efficacy and an untreated check was also maintained by dipping it 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 petridish (10 cm diameter and 1.5 cm in width). The petridish brim was smeared with petrogel or vaseline and firmly bind with rubber band to avoid the escape of test mite, *T. urticae*. 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 ($25 \pm 2^{\circ}\text{C}$) and $>80\%$ relative humidity. The laboratory reared adult female two spotted spider mite, *T. urticae* were transferred to each petridish with the help of a fine camel hair brush. The doses of phytochemical leaf extracts and acaricides were serially diluted with water. Each petridish was examined under a stereo binocular microscope for 1, 3, 6, 9, 12, 24 and 48 hours after treatment, the repellency property against two spotted spider mite was recorded.

This experiment was conducted as per the procedure followed by Sathyaseelan, (2018). The respective treatments were replicated thrice and the observations on the repellency property against two spotted spider mite were recorded under laboratory condition.

Preparation of Botanical Extracts

The botanical leaf extract was prepared by using soxhlet extraction principle. The freshly collected leaves were washed thoroughly with running tap water then washed with distilled water and the excess water was drained and by means of the muslin cloth the excess moisture was removed, then the leaves were allowed to air dry or shade dry. The leaves must be completely dried without any trace of moisture, which was made into fine powder by means of a mixer grinder. Each leaf sample was extracted separately at 50°C for 8 hours in 300ml of the above solvent. Later the crude extract was then evaporated to obtain concentrated slurry of about 10ml. The concentrated extract thus obtained was filtered through a sterilized Whatmann No.1 filter paper. The filtrate obtained was a pure native botanical extract from which we can prepare different required dose levels (Baskaran and Narayanasamy, 1995).

Results and Discussion

The bio efficacy of botanical extracts and acaricides against the repellency property of two spotted spider mite, *T. urticae* on red gram by using leaf dip method under laboratory condition. The results revealed that the botanical extracts showed a significant variation in the repellency property of mite was observed at 1, 3, 6, 9, 12, 24 and 48 hours after treatment (Table 1).

The maximum mite repellency was recorded in case of spiromesifen (13.33%) and dicofol (10.00%) and *Andrographis* leaf extract (10.00%). The *Vitex* leaf extract (6.67%) and *Eucalyptus* leaf extract (6.67%) shows on par results, whereas the *Ocimum* leaf extract (5.67%) recorded a moderate repellency against mite. The least repellency was recorded in *Tagetes* leaf extract (3.33%) against two spotted spider mite after 48 hours of release. against two spotted spider mite after one hour of release.

A similar trend was observed in the mite repellency property during 6, 9, 12 and 24 hours after treatment. The maximum mite repellency property was recorded in case of spiromesifen (89.33%) and dicofol (83.33%) followed by *Andrographis* leaf extract (74.67%). The *Vitex* leaf extract (66.67%) and

Eucalyptus leaf extract (63.33%) shows on par results, whereas the *Ocimum* leaf extract (53.33%) recorded a moderate repellency against mite. The least repellency was recorded in *Tagetes* leaf extract (40.00%) against two spotted spider mite after 48 hours of release.

Overall mean results indicated that the maximum repellency was recorded in case of spiromesifen (45.24%) and dicofol (44.29%) followed by *Andrographis* leaf extract (34.76%). The *Vitex* leaf extract (32.38%) and *Eucalyptus* leaf extract (30.00%) shows on par results, whereas the *Ocimum* leaf extract (27.14%) recorded a moderate repellency against mite. The least repellency was recorded in *Tagetes* leaf extract (20.00%) against two spotted spider mite on red gram crop

Eswara Reddy and Dolma (2017) reported that eleven essential oils (EOs) were screened for their fumigant and repellent activity against two spotted spider mite, *Mentha longifolia* showed more toxic to *T. urticae* (LC₅₀ 11.08mgL⁻¹ air). 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 Ambika and Chinniah (2007). This was in line with the findings of Premalatha *et al.* (2016)

The repellent activity of *Acorus calamus*, *Mentha piperita* and *C. flexuosus* showed 100% repellent activity against *T. urticae*. The oil extracted from *Eucalyptus citriodora* has high fumigation toxicity against mite (Souza, *et al.*, 2016) Similar results were obtained with Kheradmand, *et al.* (2015); Gorski, *et al.* (2016) and Ebadollahi, *et al.* (2017). Mar *et al.* (2018) estimated that the essential oil was extracted from leaves of *Lippia origanoides* have the acaricidal activity, the major compounds present in oil are carvacrol (48.31%), p-cymene (9.11%) and thymol (8.78%) respectively. This was in line with the findings of Moraes, *et al.*, (2015) and Esmaeily, *et al.* (2017).

Red gram being an important pulse crop, application of plant based botanical extracts 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 identify the active principles which are responsible for the maximum efficacy of these botanical pesticides.

Table 1 : Bio efficacy of certain botanical leaf extracts on the repellency property of two spotted spider mite, *T.urticae* on Red gram by using leaf dip method.

Sl. No	Treatment	Conc. %	No. of mite/ Replication	Per cent mite repellency							
				1hr	3hrs	6hrs	9 hrs	12 hrs	24 hrs	48 hrs	Mean
T1	<i>Ocimum</i> leaf extract	3	10	5.67 (13.96)	10.00 (18.43)	16.67 (24.09)	23.33 (28.88)	33.33 (35.26)	46.67 (43.09)	53.33 (46.91)	27.14 (31.40)
T2	<i>Tagetes</i> leaf extract	5	10	3.33 (10.52)	6.67 (14.96)	10.00 (18.43)	16.67 (24.09)	26.67 (31.09)	33.33 (35.26)	40.00 (39.23)	20.00 (26.57)
T3	<i>Andrographis</i> leaf extract	5	10	10.00 (18.43)	16.67 (24.09)	23.33 (28.88)	33.33 (35.26)	46.67 (43.09)	53.33 (46.91)	74.67 (61.12)	34.76 (37.41)
T4	<i>Vitex</i> leaf extract	5	10	6.67 (14.96)	13.33 (21.42)	20.00 (26.57)	26.67 (31.09)	40.00 (39.23)	53.33 (46.91)	66.67 (54.74)	32.38 (34.15)
T5	<i>Eucalyptus</i> leaf extract	5	10	6.67 (14.96)	10.00 (18.43)	16.67 (24.09)	23.33 (28.88)	33.33 (35.26)	53.33 (46.91)	63.33 (52.73)	30.00 (33.21)
T6	Spiromesifen 240 SC	2ml/l	10	13.33 (21.42)	23.33 (28.88)	33.33 (35.26)	46.67 (43.09)	66.67 (54.74)	76.67 (61.12)	89.33 (71.91)	45.24 (42.27)
T7	Dicofol 18.5 EC	2.5ml/l	10	10.00 (18.43)	23.33 (28.88)	30.00 (33.21)	40.00 (39.23)	53.33 (46.91)	66.67 (54.74)	83.33 (65.91)	44.29 (41.72)
T8	Control	-	10	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
S.Ed=				8.15	5.74	6.12	3.88	5.01	4.79	5.07	1.03
CD(p=0.05)				16.90	11.90	12.70	8.06	10.40	9.93	10.52	2.07

- Mean of three replications
- Figures in parentheses are arcsine transformed values

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