

Acaricidal activity of aqueous extracts from leaves and bark of cinnamomum and jatropha against two spotted spider mite, *Tetranychus urticae* Koch

Two-spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) is a polyphagous pest which infests wide range of crops such as vegetables, fruit and flower crops (Meyer and Rodriguez, 1996). Conventional synthetic pesticides such as chlorinated hydrocarbons, organophosphates, carbamates and pyrethroids showed a temporary success in controlling this mite pest, but later posed serious problems like pesticide resistance, secondary pest outbreak, pest resurgence and toxic residues in the environment. So, in recent years awareness and realization of ill effects of these chemicals to man and the environment has kindled interest in exploring alternative and biorational pest control methods and one such would be the use of plant based products. In the present study we explored the acaricidal properties of aqueous extracts from leaf and bark of tree species of *Cinnamomum* (Lauraceae) and *Jatropha* (Euphorbiaceae) against two-spotted spider mite, *T. urticae* and also assessed their toxicity to the phytoseiid mite, *Neoseiulus longispinosus* Evans, a common potential predator often found associated with *T. urticae*.

Investigations on the effect of extracts from tree species of *Cinnamomum* and *Jatropha* against two-spotted spider mite,

infesting tomato and the effect of promising extracts on the common phytoseiid predator, *N. longispinosus* was carried out at the Department of Entomology, University of Agricultural Sciences, GKVK, Bangalore during the period 2005-07.

T. urticae culture was maintained on tomato plants in the green house and *N. longispinosus* was reared on the same prey mite (*T. urticae*) culture consisting of different life stages maintained on mulberry leaves in the laboratory. Plant extracts selected for investigating their acaricidal activity against *T. urticae* were aqueous extracts of leaves and bark of six plant species from two botanical families, namely Lauraceae and Euphorbiaceae. Plant species selected were *Cinnamomum camphora*, *C. zeylanicum* and *C. tamala* (Lauraceae) and *Jatropha curcus*, *J. gossypifolia* and *J. multifida* (Euphorbiaceae).

Matured fresh leaves and bark were used for the preparation aqueous extracts. These extracts were assayed for repellence (walk-off), mortality and oviposition deterrence on *T. urticae* following leaf dip bioassay. The extracts were evaluated at 5 and 10 per cent concentration against *T. urticae* and the

Table 1. Acaricidal activity of aqueous extracts from leaf and bark of *Cinnamomum* and *Jatropha* against *Tetranychus urticae*

Plant species and concentration of aqueous extracts	Corrected walk-off (%) at 24 h		Corrected mortality (%) at 72 h	
	Leaf extracts	Bark extracts	Leaf extracts	Bark extracts
<i>Cinnamomum camphora</i> @ 5%	26.67 (30.97)	54.45 (47.55)	24.44 (29.58)	25.56 (30.35)
<i>Cinnamomum camphora</i> @ 10%	46.67 (43.08)	63.34 (52.76)	43.33 (41.16)	45.34 (42.32)
<i>Cinnamomum zeylanicum</i> @ 5%	22.22 (28.07)	25.56 (30.17)	16.67 (24.02)	27.78 (31.75)
<i>Cinnamomum zeylanicum</i> @ 10%	30.00 (33.14)	43.34 (41.15)	25.56 (30.35)	35.55 (36.57)
<i>Cinnamomum tamala</i> @ 5%	25.56 (30.32)	40.00 (39.22)	27.79 (31.80)	25.56 (30.32)
<i>Cinnamomum tamala</i> @ 10%	35.56 (36.55)	56.67 (48.86)	36.67 (37.25)	34.36 (35.88)
<i>Jatropha curcus</i> @ 5%	11.11 (19.16)	16.67 (24.02)	15.56 (23.20)	15.56 (23.13)
<i>Jatropha curcus</i> @ 10%	24.45 (29.55)	22.23 (28.11)	22.22 (28.07)	23.33 (28.84)
<i>Jatropha gossypifolia</i> @ 5%	31.11 (33.85)	51.12 (45.64)	23.33 (28.76)	23.33 (28.78)
<i>Jatropha gossypifolia</i> @ 10%	37.78 (37.91)	62.12 (52.02)	28.89 (32.41)	32.11 (34.47)
<i>Jatropha multifida</i> @ 5%	30.00 (33.19)	46.67 (43.07)	37.78 (37.87)	23.34 (28.88)
<i>Jatropha multifida</i> @ 10%	40.11 (38.87)	53.34 (46.93)	44.45 (41.81)	40.00 (39.20)
S. Em.±	(1.90)	(2.25)	(1.48)	(1.15)
C.D. (0.05)	(5.47)	(6.4)	(5.27)	(4.34)

Figures in parentheses are $\sqrt{x+0.5}$ transformed values

promising extracts from leaf and bark, i.e., each at 10 per cent concentration were assessed for their effect on the phytoseiid mite predator.

Twenty four hours after treatment among the aqueous leaf extracts, *C. camphora* extract @ 10 per cent caused the highest repellence of *T. urticae* adults (47%), however, it was statistically on par with *J. multifida* and *J. gossypifolia* with 40 and 38 per cent walk-off, respectively. Extract of *J. curcus* recorded least walk-off of 11 per cent. Mortality recorded 72 hours after treatment showed that *J. multifida* aqueous leaf extract @ 10 per cent recorded the highest mortality of 45 per cent on par with that of *C. camphora* @ 10 per cent (43%). The effect was least with *J. curcus* @ 5 per cent and *C. zeylanicum* @ 5 per cent causing only 15 to 17 per cent mortality of adults.

Among the bark extracts, *C. camphora* extract @ 10 per cent accounted for maximum walk-off of adult females to the extent of 63 per cent and was statistically on par with that of the same extract at 5 per cent concentration, those of *C. tamala*, *J. gossypifolia* and *J. multifida* at 10 per cent concentration. Killing

effect of aqueous bark extract of *C. camphora* @ 10 per cent was superior over all other extracts, resulting in 45 per cent mortality followed by that of *J. multifida* and *C. tamala* (both at 10%) which caused 40 and 35 per cent mortality, respectively. The lowest mortality was recorded by *J. curcus* extract @ 5 per cent concentration (16%) (Table 1).

No report is available on the toxicity of the *C. camphora* extracts against phytophagous mites. However, proven toxicity or anti-mite activity of camphora oil against house dust mite, stored product mites and parasitic mites has been documented by Furuno *et al.* (1974) and Ottoboni *et al.* (1992). In this direction, the present results provide a strong impetus to explore the possibility of using camphora extracts on phytophagous mite species like *T. urticae*.

Irrespective of the plant species, bark portion of the plants was observed to contain more oviposition inhibitory principles compared to that of the leaves. This was more evident as less number of eggs was laid by *T. urticae* females on bark extracts treated leaf discs. *C. camphora*, *C. zeylanicum* and *J.*

Table 2. Effect of aqueous extracts from leaf and bark of Cinnamomum and Jatropha on longevity and oviposition of *Tetranychus urticae* females and phytoseiid predator, *Neoseiulus longispinosus*

Plant species and concentration of aqueous extracts <i>Tetranychus urticae</i>	<i>Tetranychus urticae</i> females				Phytoseiid predator, <i>Neoseiulus longispinosus</i>		
	No. of eggs per female	ODI	Oviposition period (days)	Female longevity (days)	Corrected walk-off (%) after 24 h	Corrected mortality (%) at 72 h*	Total no. of eggs/female in 3 days
<i>Cinnamomum camphora</i> leaf @ 10%	63.68 (8.00)	30.98	21-25	22-26	13.33 (21.14)	10.00 (5.00)	8.66 (3.02)
<i>Cinnamomum camphora</i> bark @ 10%	45.90 (6.80)	44.95	21-22	23-24	10.00 (15.00)	6.66 (2.28)	6.99 (2.67)
<i>Cinnamomum zeylanicum</i> leaf @ 10%	55.58 (7.48)	36.99	19-20	20-22	3.33 (6.14)	6.66 (12.28)	8.00 (2.91)
<i>Cinnamomum zeylanicum</i> bark @ 10%	48.33 (6.97)	42.86	17-18	17-20	6.66 (12.28)	3.33 (6.14)	8.66 (3.07)
<i>Cinnamomum tamala</i> leaf @ 10%	76.88 (8.76)	22.24	22-27	25-28	0.00 (0.00)	3.33 (6.14)	10.33 (3.28)
<i>Cinnamomum tamala</i> bark @ 10%	56.88 (7.57)	35.99	20-23	20-24	3.33 (6.14)	3.33 (6.14)	9.98 (3.23)
<i>Jatropha curcus</i> leaf @ 10%	67.68 (8.25)	28.20	20-22	21-22	13.33 (21.14)	12.00 (18.43)	7.66 (2.85)
<i>Jatropha curcus</i> bark @ 10%	55.33 (7.47)	37.10	18-19	20-21	6.66 (12.28)	10.00 (15.00)	6.32 (2.52)
<i>Jatropha gossypifolia</i> leaf @ 10%	60.09 (7.83)	32.98	20-24	23-25	3.33 (6.14)	13.33 (21.14)	7.66 (2.85)
<i>Jatropha gossypifolia</i> bark @ 10%	47.20 (6.90)	43.82	19-20	19-20	10.00 (15.00)	3.33 (6.14)	9.00 (3.07)
<i>Jatropha multifida</i> leaf @ 10%	73.76 (8.61)	24.20	24-26	26-28	0.00 (0.00)	3.33 (6.14)	9.33 (3.12)
<i>Jatropha multifida</i> bark @ 10%	60.93 (7.83)	32.95	22-25	25-26	3.33 (6.14)	1.33 (1.91)	10.00 (3.24)
Control (water)	120.86 (11.01)	-	29-32	32-34			11.26 (3.38)
S. Em.±	(0.126)	-	-		(5.19)	(4.6)	(0.10)
C.D. (0.05)	(0.36)				(17.56)	(16.9)	(0.29)

ODI-Oviposition Deterrent Index

*Figures in parentheses are angular transformed values, @ Figures in parentheses are $\sqrt{x+0.5}$ transformed values

gossypifolia extract treated leaf discs recorded 46 to 48 eggs per female laid over 17-24 days (with Oviposition Deterrent Index ranging between 43 and 45) against 121 eggs/female noticed in untreated (water treated) control leaf discs (Table 2).

The repellent effect of extracts inducing walk-off in predator *N. longispinosus* was not evident as observed with *T. urticae*. The maximum walk-off of predators observed was only 10-13 per cent with *C. camphora* (leaf/bark), *J. gossypifolia* (bark) and *J. curcus* (leaf) extracts. Only *J. gossypifolia* leaf extract showed the maximum mortality of 13 per cent, while all other extracts showed less than 10 per cent mortality as observed by Gopal (2000). These predators laid relatively less number of

eggs on leaves treated with different plant extracts compared to water treated control leaves. However, the differences in the number of eggs were not significant. Thus the safety of aqueous extracts from *Cinnamomum* and *Jatropha* to mite predator was evident (Table 2).

The overall results of present investigations indicated significant repellent and toxic effect of aqueous bark extracts of *C. camphora* and *C. tamala* and *J. gossypifolia* and *J. multifida* compared to their leaf extracts against *T. urticae*. These extracts also showed significant oviposition deterrence against adult females and were found relatively safe to the phytoseiid predator, *N. longispinosus*.

All India Network Project on Agril. Acarology,
Dept. of Agril. Entomology, University of Agricultural Sciences,
GKVK, Bangalore - 560 065, Karnataka, India.
Email: reddygvm@gmail.com

G.V. MANJUNATHA REDDY
R. GIRISH
M. S. UMA
N. SRINIVAS

References

- Meyer, M.K.P. and Rodriguez, M., 1996, Acari associated with cotton in South Africa. *Revista da. De inves dolultramar*, 13: 1-33.
- Gopal, T.S., 2000, Evaluation of certain botanicals against spider mites, *Tetranychus urticae* Koch and *Oligonychus indicus* (Hirst.) (Acari: Tetranychidae) and their effect on mite predator, *Amblyseius longispinosus* (Evans) (Acari: Phytoseiidae). *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore (India).
- Furuno, T., Terada, Y., Yano, S., Uehara, T. and Jodai, S., 1994, Activities of leaf oils and their components from Lauraceae trees against house dust mites. *J. Japan Wood Res. Soc.*, 40: 78-87.
- Ottoboni, F., Rigamonti, I.E. and Lozzia, G.C., 1992, House dust mites prevention in Italy. *Bollettino-di-Zoologia-Agraria-e-di-Bachicoltura.*, 24 : 113-120.