JBiopest 7(1): 11-14 (2014)

Potentiality of *Cinnamomum* extracts to two spotted spider mite, *Tetranychus urticae* Koch and its predator *Neoseiulus longispinosus* (Evans)

G.V. Manjunatha Reddy[1]*, N. Srinivasa[2] and M. S. Muralidhara [3]

ABSTRACT

In this study the potential acaricidal activity of three species of *Cinnamomum viz., C. camphora, C. zeylanicum* and *C. tamala* was ascertained by using the methanol extracts from the leaves and bark against *Tetranychus urticae* Koch infesting tomato. The leaf extracts were evaluated at 4% and 8% concentration and bark extracts at 3% and 6%. The leaf extracts of all the three species of *Cinnamomum* @ 8% resulted in significant walk-off (repellence) of spider mites from the treated leaves up to 24 hours, the highest repellency was with *C. camphora* (59%) which also caused high mortality of mites (48%). On tomato leaves treated with *Cinnamomum* extracts, spider mite females laid less number of eggs (31 to 50/female) compared to that on the untreated leaves (121 eggs/female) and the Oviposition Deterrent Index (ODI) ranged from 41 to 59. Also compared to unexposed spider mite females, the ones exposed to *Cinnamomum* extracts lived short (16 to 23 days) with an apparently short egg laying period (14 to 21 days).

MS History: 2.4.2014 (Received)-7.5.2014 (Revised)-14.6.2014 (Accepted)

Key words: *Tetranychus urticae, Cinnamomum,* methanol extracts of leaf and bark, botanicals.

INTRODUCTION

Synthetic pesticides have been found economical in pest control. But, indiscriminate use of these synthetic pesticides adversely affects non-target organisms and leads to resistance build up in pest populations and causes environmental disturbance (Schmutterer, 1990). Awareness of these environmental risks has kindled interest in finding alternative pest control methods and alternative products that are as effective as synthetics. In this context plant products and biopesticides are being explored extensively as a feasible alternative to synthetics in protecting cultivated crops from pests (Onnkum,2012; Gupta *et al*., 1998; 1999; Praveen *et al.,* 2012; Syahputra,2013).

Tetranychus urticae Koch (Acari: Tetranychidae) commonly known as two-spotted spider mite is a polyphagous pest, infests wide range of crops (Meyer and Rodriguez, 1996). It has been reported to cause appreciable damage to tomato crops around Kolar and Bangalore region in the state of Karnataka and also pest multiplies rapidly (Anonymous, 2004 and Aji, 2005). *Neoseiulus longispinosus* (Evans) is a common potential predator often found associated with *T. urticae* colony (Lo and Ho, 1979).

Tomato (*Lycopersicon esculentum* Mill.) belonging to the family Solanaceae is an important, widely grown vegetable and is a good source of vitamins such as vitamin 'A', vitamin 'B' (thiamine), vitamin 'B_2' (riboflavin) and vitamin 'C' (ascorbic acid) and other minerals, which makes it a nutritively valuable vegetable in the whole world.

Use of botanicals is gaining importance because of their desirable properties like manipulation of growth, behavior and reproduction of the pest species, besides being ecofriendly. Hence, there is a great scope for undertaking investigations and to explore plant species that are biologically active against *T. urticae.*

MATERIALS AND METHODS

This study was carried out at the Department of Agril. Entomology, University of Agricultural Sciences, Bangalore. Leaves of tomato plants infested by mites in open field condition were initially cultured in petri plates on wet cottonwad. Methanol extracts of leaves and bark of *Cinnamomum* prepared from dried leaf and bark powder for which matured leaves and fairly dark colored bark were shade dried, powdered and subjected to hot extraction in Soxhlett Apparatus

Table 1. Activity of methanol extracts from the leaves and barks of *Cinnamomum* against *T. urticae*

Methanol leaf and bark extracts	Leaf		Bark	
	Corrected walk-off (%) 24 hrs after treatment	Corrected mortality (%)72 hrs after treatment	Corrected walk-off (%) 24 hrs after treatment	Corrected mortality (%) 72 hrs after treatment
C. camphora leaf@ 4% & bark @ 3%	42.22	28.89	58.89	35.56
C. camphora leaf @ 8% & bark @ 6%	58.90	47.78	84.45	60.00
C. zeylanicum leaf @4%& bark @ 3%	26.67	23.33	46.67	34.45
C. zeylanicum leaf @8% & bark @ 6%	30.89	33.33	65.57	50.00
C. tamala leaf @4% & bark @ 3%	27.78	14.45	33.33	24.44
C. tamala leaf @8% & bark @ 6%	50.00	36.44	41.11	33.33
F-Test	*	*	*	*
SEM±	(1.55)	(1.77)	(1.24)	(1.55)
C.D. at P= 0.05	(4.44)	(5.08)	(3.56)	(4.44)

* Significant

using methanol. Thick semisolid extract was obtained after complete evaporation of solvent in a drying tray. The extract was assayed for repellence (walk-off), mortality, oviposition deterrence etc on *T. urticae* including their toxicity to phytoseiid mite predator, *Neoseiulus longispinosus* (Evans). The leaf dip bioassay method was followed and *T. urticae* reared on potted tomato plants in a glass house was used. The leaf extracts were evaluated at 4% and 8% concentration and the bark extracts at 3% and 6%. Data with respect to per cent walk-off were recorded using the procedure given by Penman *et al*.(1986). The mortality was observed at 24, 48 and 72 hrs after treatment and the Oviposition Deterrent Index (ODI) was computed as suggested by Lundgren (1975) on zero (equal distribution of eggs in control and treatments) to 100 (all eggs in control only) scale for each treatment. The data were then analyzed statistically following ANOVA for Completely Randomized Design and the results were interpreted at 5% level of significance.

RESULTS AND DISCUSSION

The leaf extracts of all the species of *Cinnamomum* @ 8% resulted in higher walk-off (repellence) of spider mites from the treated leaves up to 24 hours. The highest repellency was with *C. camphora* which also recorded higher mortality of mites (48%)(Table 1). Increase in the repellent activity was evident with the increase in the concentration of bark extracts and significantly maximum walk-off and mortality were found with the extracts from C. *camphora* (Table 1).

Spider mite females laid less number of eggs on tomato leaves treated with *Cinnamomum* extracts compared to that on untreated leaves. The oviposition deterrent index (ODI) ranged from 41 to 59. Compared to unexposed spider mite females, the ones exposed to *Cinnamomum* extracts lived short with a reasonably shorter egg laying period (Table 2).

Though C. *camphora* extracts either from leaf or bark caused considerable walk-off by phytoseiid predators (13 to 19%), the maximum mortality observed with these predators was only 10% (Table 3). On *Cinnamomum* extract treated leaves female predators laid less number of eggs, but it was not significant, since on untreated leaves each female laid about 11 eggs in three days period (Table 3).

Table 2. Effect of methanol extracts of *Cinnamomum* on oviposition and longevity of *T. urticae*

Methanol extracts	Number of eggs / female	Oviposition Deterrent Index (ODI)	Duration of Oviposition (days)	Female longevity (days)
C. camphora leaf @ 8%	40.90	49.43	16-18	17-18
C. camphora bark @6%	31.33	58.82	14-15	16-17
C. zeylanicum leaf @ 8%	45.99	45.47	19-20	19-22
C. zeylanicum bark @6%	33.90	56.19	17-19	20-21
C. tamala leaf @8%	50.37	41.16	17-20	20-22
C. tamala bark @6%	45.545	44.74	17-21	21-23
Control (Water + methanol)	120.86	-	31-33	32-35
F-test	*	-	-	-
SEM±	(0.127)			
C.D. at P=0.05	(0.37)			

* Significant

It is evident that species of *Cinnamomum* particularly *C. camphora* contains acaricidal principle(s) which may be extracted conveniently using methanol and the report of acaricidal activity of *Cinnamomum* against plant feeding mites has been either meagre or scanty. However, information on the anti-mite activity of camphora oil against house dust mites (Furuno *et al.,* 1974) and honey bee parasitic mites (Calderone and Spivak, 1995) are available.

REFERENCES

Aji, C.S. 2005. Evaluation of selected newer molecules against *Tetranychus urticae* Koch *(Acari: Tetranychidae)* infesting tomato. M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Bangalore.

Anonymous, 2004. Production Year Book, Food and Agriculture Organization, Rome, Italy, **56**: 142-143.

Calderone, N.W. and Spivak, M. 1995. Plant extracts for control of the parasitic mite *Varroa jacobsoni* (Acaridae: Varroidae) in colonies of the western honey bee (Hymenoptera : Apidae). *Journal of Economic Entomology,* **88:** 1211-1215.

Furuno, T., Terada, Y., Yano, S., Uehara, T. and Jodai, S. 1974. Activities of leaf oils and their components from Lauraceae trees against house dust mites. *Journal of the Japan Wood Research Society*, **40** : 78-87.

Lo, K.C. and Ho, C.C. 1979. Influence of temperature on life history, predation and population parameters of *Amblyseius longispinosus* (Acarina: Phytoseiidae). *Journal of Agricultural Research. China*, **58**: 237-250.

Lundgren, L. 1975, National plant chemicals acting as oviposition deterrent on cabbage butterflies [*Pieris brassicae* (L.), *Pieris rapae* (L.) and *Pieris napi* (L.)]. *Zoological Science*, **4**: 253-258.

Meyer, M.K.P. and Rodriguez, M. 1996. Acari associated with cotton in South Africa. *Revista daj. De inves dolultramar,* **13:** 1-33.

Table 3. Effect of methanol extracts of *Cinnamomum* on phytoseiid predator *N. longispinosus.*

Methanol extracts	Corrected walk-off (%)24 hrs after treatment	Corrected mortality (%)72 hrs after treatment	Total number of eggs/female in three days period
C. camphora leaf @ 8%	13.33	3.33	8.22
C. camphora bark @ 6%	18.66	10.00	6.51
C. zeylanicum leaf 8%	10.00	3.33	10.65
C. zeylanicum bark @ 6%	0.00	6.66	8.99
C. tamala leaf @ 8%	3.33	3.33	9.33
C. tamala bark @ 6%	0.00	0.00	7.22
Control (Water + methanol)	-	-	11.11
F-test	*	*	NS
SEM±	5.52	5.31	0.11
C.D. at P=0.05	18.05	17.56	-

* Significant

Onnkum, O. 2012. Evaluation of aqueous extracts of five plants in control of fles beetleson okra (*Abelmoschus esculentus* (L.) Moench). *Jouranal of Biopesticide*, **5** (suppl.):62-67.

Penman, D.R., Chapman, R. B. and Bowie, M.K. 1986. Direct toxicity and repellent activity of pyrethroids against *Tetranychus urticae* (Acari : Tetranychiidae). *Journal of Economic Entomology*, **79**: 1183-1186.

Praveena, R., Devanand Venkatesubbu and Jagadeesan, M. 2012. Antifeedent activity of selected medicinal plants on *Earias vittella*. *Jouranal of Biopesticide.*, **5**(2):96-97.

Schmutterer, H. 1990. Properties and potential of natural pesticides from the neem tree *Azdirachta indica. Annual Review of Entomology*, **35**: 271-297.

Syahputra, E. and Endarto, O. 2013. Acaricidal activity of tropical plant extracts against citrus mites and their effect on predator and citrus plants *International Research Journal of Agricultural Science and Soil Science*, **3**(4): 99-106.

G.V. Manjunatha Reddy[1]*, N. Srinivasa[2] and M. S. Muralidhara [3]

[1,2]All India Network Project on Agricultural Acarology, University of Agricultural Sciences, GKVK, Bangalore 560 065

[3]C/o Dr.Narasegowda, Department of Horticulture, University of Agricultural Sciences, GKVK, Bangalore 560 065

***Contact : 09972854670

Email: reddygvm@gmail.com