https://doi.org/10.33307/entomon.v46i1.588
ENTOMON 46(1): 69-72 (2021)
Short Communication No. ent. 46108

Pongamia oil soap for the management of chilli mite, *Polyphagotarsonemus latus* Banks and its impact on spider population

K. V. Veena Krishnan* and K. M. Sreekumar

Department of Agricultural Entomology, College of Agriculture, KAU, Padannakad 671314, Kerala, India. Email: veenakrishnan2000@gmail.com; sreekumar.km@kau.in

ABSTRACT: Field experiment was conducted to check the efficacy of the pongamia oil soap along with Spiromesifen and Neem oil soap at different concentrations in controlling chilli mite, *Polyphagotarsonemus latus* and its impact on spider population. Spiromesifen was found effective against chilli mite and showed persistent action in the field, whereas pongamia oil soap reported an immediate control over the pest but its effectiveness declined with time and concentration. Among the botanicals, 3% pongamia oil soap was found effective and was followed by the 2% pongamia oil soap. Pongamia oil soap proved effective against mite up to seven days after the treatment and the effect declined by 14 days after the spray. The botanicals as well as the chemical spiromesifen were found safe to spiders in the field.

KEY WORDS: Botanical pesticides, chilli mite management, spider safety

Polyphagotarsonemus latus Banks is a serious pest of chilli (*Capsicum annuum* L.) which infest the young plant parts leading to the symptoms like rat tailing, severe malformation and downward curling of leaves, stunted growth and complete crop failure at times. Chemical pesticides against pest have drawbacks like increased cost, pesticide-induced pest resurgence, residues in product, mortality of natural enemies etc. Botanical pesticides are safe and effective against various pests of crop. Pongamia seed oil has been evaluated against many pests and found effective as larvicide, antifeedant, oviposition deterrent, ovicide, juvenile hormone active agent and roachicide (Kumar and Singh, 2002). Flavanoids, chalcones, steroids and terpenoids are the secondary metabolites in pongamia oil which serve as natural pest repellents (Pavela, 2007).

Pongamia oil soap was prepared by following the method used for the preparation of ready to use neem oil garlic soap. Field evaluation was carried out at Instructional farm II of College of Agriculture, Padannakkad at Karuvacheri during November, 2019 – May, 2020. Vellayani athulya variety of chilli was grown in the field. The statistical design followed was RBD with eight treatments (Table 1) and three replications. The treatments were applied 2, 3 and 5 months after transplanting using sprayer. Spraying was carried out during early morning and precautions were taken to avoid drift. Six plants were selected randomly from a plot and tagged for taking pest and spider count. To count mite population, six leaves were collected at random from the top canopy of each selected plant and were brought to the lab in Zip lock bags. They were observed under stereo binocular microscope for

* Author for correspondence

counting mites. Population density was counted one day prior to treatment and 1st, 3rd, 5th, 7th and 14th day after the treatment application. Population of mite was not uniform during first spray and hence it was not recorded.

Square root transformations was followed for the data on population density The data were analysed using analysis of variance (ANOVA). For comparing the significance of each treatment WASP (Web Agri Stat Package) was used.

The pre-spray count population of mite came in the range of 17.78 – 19.00 mites/ 6 top leaves before the second spray. One day after the second spray, pongamia oil soap at 3% was found superior with a least mite count of 2.56 mites/ 6 top leaves and this was followed by pongamia oil soap 2% (3.61), 1% (4.39), standard check (5.33), pongamia oil soap 0.6% (6.00) and neem oil soap 0.6% (9.17). There was no much increase in the mite population in the 3% pongamia oil soap on the 3rd day and it recorded 2.94 mites / 6 top leaves, while count reduced in the standard check to 3.22 mites / 6 top leaves. Pongamia oil soap at 2% reported 4.50 mites / 6 top leaves followed by 1% (5.56), 0.6 % pongamia oil soap (7.06) and neem oil soap 0.6% (10.33). A sudden decrease in the population of mite was observed in the standard check with 0.89 mites / 6 top leaves on the 5th DAS. Among the botanicals pongamia oil soap at 3% remained superior over the others with 3.67 mites / 6 top leaves. Pongamia oil soap 2% and 1% were found on par with each other and recorded 5.72 and 6.39 mites / 6 top leaves respectively and this was followed by the 0.6% pongamia oil soap and neem oil soap (8.83 and 12.39 mites / 6 top leaves respectively). During all these days the soap solution and the control showed the highest mite population. The 7th day count revealed that the standard check was highly effective with a least population of 0.44 mites / 6 top leaves while a population of 5.44 mites/ 6 top leaves was counted from pongamia oil soap 3% and was on par with 2 % pongamia oil soap (6.94). Pongamia oil soap 1% recorded 8.78 mites/ 6 top leaves and was on par with 0.6% pongamia oil soap (10.72 mites/ 6 top leaves). This was followed by 0.6% neem oil soap (13.56) and soap solution (18.06) while the highest count was associated with control plot (25.00). A gradual increase in mite population was observed in all the treatment plots on the 14th day after the second spray, however the standard check reported as highly effective treatment with a population of 1.89 mites/ 6 top leaves. All the botanicals, soap solution and control recorded a high population (Table 1).

Mite population taken prior to the treatment application was at a range of 10.11 to 15.33 mites/ 6top leaves. Pongamia oil soap 3% was found superior with 2.22 mites/ 6 top leaves over soap solution (10.72) and control (16.28) on the first day after spray. Pongamia oil 2 and 1% were on par with each other with 3.28 and 3.72 mites/ 6 top leaves respectively and was followed by standard check (3.78 mites/ 6 top leaves) and pongamia oil soap 0.6% (5.00 mites/ 6 top leaves) which were also on par with each other. The neem oil soap at 0.6% has got a pest count of 7.61 mites/ 6 top leaves in the second spray. On the third day after the treatment, the standard check was found superior with 1.06 mites/ 6 top leaves and among the botanicals, pongamia oil soap at 3% was highly effective with 2.61 mites/ 6 top leaves while the control plot and soap solution recorded a pest count of 16.94 and 13.06 mites/ 6 top leaves respectively. 3.28 mites/ 6 top leaves were counted from the plot treated with 2% pongamia oil soap and was followed by 1% pongamia oil soap (4.06 mites/ 6 top leaves), 0.6% pongamia oil soap (4.94 mites/ 6 top leaves) and 0.6% neem oil soap (7.72 mites/ 6 top leaves). The population count taken on the fifth day after third spray showed that the standard check – spiromesifen as a highly effective miticide (0.11 mites/ 6 top leaves) over the control (17.22) and soap solution (13.28). The pongamia oil soap 3% reported 3.17 mites/ 6 top leaves followed by 2% pongamia oil soap (4.11 mites/ 6 top leaves) which was on par with the 1% pongamia oil soap (4.89 mites/ 6 top leaves). 0.6% pongamia oil soap got 5.89 mites/ 6 top leaves which were followed by neem oil soap 0.6% (10.06 mites/ 6 top leaves). A least count of 0.07 mites/ 6 top leaves was reported in the standard check followed by 3% pongamia oil soap with 3.11 mites/ 6 top leaves on the 7th day. Pongamia oil soap at 2% recorded 5.22

Table 1. Population density of chilli mite during field evaluation of pongamia oil soap on chilli

Treatment	Average population of mite (mites/ 6 top leaves/ plant)*											
	Second spray						Third spray					
	Pre spray	1 DAS	3 DAS	5 DAS	7 DAS	14 DAS	Pre spray	1 DAS	3 DAS	5 DAS	7 DAS	14 DAS
T_1 - Spiromesifen 22.9 SC @ 96 g a.i./ha	19.00 (4.36)	5.33 $(2.31)^{d}$	3.22 $(1.79)^{g}$	0.89 $(0.94)^{g}$	0.44 $(0.64)^{g}$	1.89 $(1.35)^{c}$	12.22 (3.43)	3.78 $(1.94)^{d}$	1.06 $(1.02)^{h}$	0.11 $(0.78)^{g}$	0.07 $(0.75)^{c}$	0.83 $(0.88)^{c}$
T_2 - Pongamia oil soap 3%	18.67 (4.32)	2.56 $(1.60)^{g}$	2.94 $(1.72)^{g}$	3.67 $(1.91)^{f}$	5.44 $(2.33)^{f}$	17.94 $(4.23)^{b}$	12.50 (3.54)	2.22 $(1.49)^{e}$	2.61 $(1.62)^{g}$	3.17 $(1.92)^{f}$	3.11 $(1.87)^{bc}$	14.67 $(3.68)^{ab}$
T_3 - Pongamia oil soap 2%	18.94 (4.35)	3.61 $(1.90)^{f}$	4.50 $(2.12)^{f}$	5.72 $(2.39)^{e}$	6.94 $(2.63)^{ef}$	21.17 $(4.60)^{b}$	10.33 (3.20)	3.28 $(1.81)^{de}$	3.28 $(1.81)^{f}$	4.11 $(2.15)^{e}$	5.22 $(2.39)^{b}$	11.17 $(3.33)^{b}$
T_4 - Pongamia oil soap 1%	17.78 (4.22)	4.39 $(2.09)^{e}$	5.56 $(2.36)^{e}$	6.39 $(2.53)^{e}$	8.78 $(2.96)^{de}$	18.44 $(4.29)^{b}$	10.39 (3.19)	3.72 $(1.93)^{de}$	4.06 $(2.01)^{e}$	4.89 $(2.32)^{de}$	5.50 $(2.45)^{b}$	12.06 $(3.44)^{b}$
T_5 - Pongamia oil soap 0.6%	18.50 (4.30)	6.00 $(2.45)^{d}$	7.06 $(2.66)^{d}$	8.83 $(2.97)^{d}$	10.72 $(3.27)^{d}$	20.94 $(4.56)^{b}$	10.11 (3.00)	5.00 $(2.17)^{d}$	4.94 $(2.22)^{d}$	5.89 $(2.53)^{d}$	9.11 $(3.09)^{ab}$	12.72 $(3.50)^{b}$
T_6 - Neem oil soap 0.6%	18.00 (4.24)	9.17 $(3.03)^{c}$	10.33 $(3.21)^{c}$	12.39 $(3.52)^{c}$	13.56 $(3.67)^{c}$	16.94 $(4.08)^{b}$	17.17 (4.10)	7.61 $(2.76)^{c}$	7.72 $(2.78)^{c}$	10.06 $(3.24)^{c}$	14.83 $(3.88)^{a}$	21.50 $(4.58)^{ab}$
T_7 - Soap solution 0.5%	18.11 (4.26)	13.22 $(3.63)^{b}$	14.94 $(3.87)^{b}$	16.00 $(4.00)^{b}$	18.06 $(4.25)^{b}$	20.50 $(4.52)^{b}$	15.33 (3.82)	10.72 $(3.27)^{b}$	13.06 $(3.61)^{b}$	13.28 $(3.71)^{b}$	16.00 $(3.82)^{a}$	17.66 $(3.99)^{ab}$
T_8 - Control	18.78 (4.33)	19.06 $(4.36)^{a}$	20.50 $(4.52)^{a}$	21.39 $(4.62)^{a}$	25.00 $(5.00)^{a}$	28.17 $(5.30)^{a}$	12.89 (3.55)	16.28 $(4.03)^{a}$	16.94 $(4.12)^{a}$	17.22 $(4.21)^{a}$	17.72 $(4.23)^{a}$	26.06 $(5.09)^{a}$
CD (0.05)	NS	0.20	0.20	0.19	0.36	0.70	NS	0.44	0.19	0.23	1.29	1.58

*Mean observations from six plants. Figures in parentheses denote square root transformed values.Means superscripted by same letter are not significantly different at 5% level of DMRT. DAS- Days after spray; NS- Non significant

mites/ 6 top leaves and was on par with 1% and 0.6% pongamia oil soap (5.50 and 9.11 mites/ 6 top leaves) while the 0.6% neem oil soap, soap solution and control showed the highest population of 14.83, 16.00 and 17.72 mites/ 6 top leaves respectively. A gradual increase in the mite population was observed on the 14th day in all experimental plots except the standard check which has got a population of 0.83 mites/ 6 top leaves.

Comparing with the control and soap solution all the other treatments showed acaricidal activity during field study. Spiromesifen reported a significantly superior effect on yellow mite than other treatments. Due to the persistent action of spiromesifen, the population declined greatly one day after spray and gradually reached the lowest population. After 7th day (0.44 and 0.07 mites/ 6 top leaves) an increase in mite population was recorded on 14th day (1.89 and 0.83 and mites/ 6 top leaves) during the second and third spray. According to Varghese and Mathew (2013), spiromesifen 45 SC @ 100 g a. i. /ha had a superior effect in controlling chilli mite among the 8 chemicals tested and it also recorded a similar trend *ie*., a gradual decline in mite population up to 7 days after treatment and an increase thereafter on the 14th day.

Among the botanicals pongamia oil soap 3 % significantly reduced the mite population followed by pongamia oil soap 2%, 1%, 0.6% and neem oil soap 0.6%. In all botanically treated plots, pest population declined to a minimum immediately after the spray, gradually increased thereafter and the highest count was recorded on the 14th day. Prasad *et al*. (2017) proved the effectiveness of pongamia oil and neem oil against chilli mite. Neem oil (4ml/l) and pongamia oil (5ml/l) resulted a high percent mortality of 71.50 and 68.50 respectively after ten days of application in the field against the mite. The efficacy of pongamia oil soap in controlling the mite might be due to its repellent and insecticidal properties.

Spider population in the field was uniform before and after each spray application in the field (0.00 to 2.33) which confirm that the botanicals (pongamia oil soap and neem oil soap) and spiromesifen don't have any immediate and persistent impact on spiders. Hence all the treatments are safe to spiders in ecosystem. Sahana and Tayde (2017) recorded a mean spider population of 0.50 and 0.55 spiders/plant on 3% pongamia oil and neem oil sprayed plants which was at par with the untreated control (1.03 spiders/ plant). Baladhiya *et al*. (2018) confirmed that the spiromesifen 22.9 SC 96 g a.i. /ha didn't have any adverse impact on spider population.

ACKNOWLEDGMENT

The authors are thankful to Kerala Agricultural University for the financial support.

REFERENCES

Baladhiya H.C., Patel N.B., Joshi V. I. and Acharya R.R. (2018) Bio-efficacy of spiromesifen 22.9 SC against brinjal mite, *Tetranychus urticae* Koch. International Journal of Current Microbiology and Applied Sciences 7(7): 1650-1656.

Kumar M. and Singh R. (2002) Potential of *Pongamia glabra* vent as an insecticide of plant origin. Biological Agriculture and Horticulture 20(1): 29-50.

Pavela R. (2007) Possibilities of botanical insecticide exploitation in plant protection. Pest Technology 1(1): 47-52.

Prasad R., Hembrom L. and Prasad D. (2017) Evaluation of acaricidal efficacy of some botanicals and conventional acaricides for management of yellow mite (*Polyphagotarsonemus latus* Banks) of chilli. Journal of Eco-friendly Agriculture 12(2): 50-52.

Sahana U. and Tayde A.R. (2017) Effect of selected botanicals and spinosad on shoot and fruit borer (*Leucinodes orbonalis* Gueene) and natural enemies in brinjal ecosystem. International Journal of Current Microbiology and Applied Sciences 6(7): 189-193.

Varghese T.S. and Mathew T.B. (2013) Bioefficacy and safety evaluation of newer insecticides and acaricides against chilli thrips and mites. Journal of Tropical Agriculture 51(1): 111-115.

(Received October 14, 2020; revised ms accepted February 09, 2021; printed March 21, 2021)