International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Rational Management of Yellow Mite, *Polyphagotarsonemus Latus* (Banks) on Mulberry

Arun Kumar K M[1], N. Srinivasa[2]

Department of Entomology, University of Agricultural Sciences, GKVK, Bangalore
Corresponding Author Email: *arunkumarkmagri[at]gmail.com*

Abstract: ***The experiment conducted for the rational management of yellow mite on mulberry, wherein synthetic acaricides and acaropathogens (as two applications at 15 days interval) were evaluated for their effectiveness against yellow mite at GKVK, Bengaluru during September, 2021. The pooled data recorded 3, 7, 10 and 14 days after each application indicated the superiority of spiromesifen[at]100 g ai/ha application, which resulted in 89 per cent reduction in mite population followed by dicofol[at]0.05% ai, abamectin[at]5g ai/ha, propargite[at]570 g ai/ha, diafenthiuron[at]400 g ai/ha, fenpyroximate[at]30g ai/ha and buprofezin[at]150 g ai/ha with 73 to 81 per cent control of mites. HMO[at]1 - 2% and hexythiazox[at]20g ai/ha treatments were modest (with 64 to 68% control) in their effectiveness. Least effective treatments were Fusarium semitectum[at]1x10^8 spores/ml and Lecanicillium lecanii[at]1x10^8 CFU's/ml with only 40 - 42 per cent control of mites.***

Keywords: Yellow mite, management, synthetics, entomopathogenic fungi

1. Introduction

Mulberry (*Morus* spp.) is a fast growing, woody tree species of Moraceae family with perennial nature and origin in Himalayan hills of India and China (Soo - ho *et al.*, 1990; Vijayan, 2010; Khan *et al*., 2013; Yuan and Zhao, 2017; Rohela *et al*., 2020). Moraceae, also known as the mulberry or fig family. It is a family of flowering plants of more than twenty - four species with one subspecies and at the minimum hundred identified varieties. It is an economical and widespread woody plant and has an enormous economic value other than sericulture leading to its several unique and special features. *Morus alba* (white mulberry), *Morus nigra* (black mulberry) and *Morus rubra* (red mulberry) are all commonly accepted worldwide species of genus Morus as they exhibit maximum medicinal properties. Among all the species, *M. alba* is a dominant species (Ercisli and Orhan, 2007). The yellow mite, *Polyphagotarsonemus latus (*Banks) usually attacks on the lower surface of small terminal tender leaves and on the medium sized younger leaves. Female lays the eggs on the lower surface of leaves. The tiny yellow mite colonizes and feeds on the lower surface of leaves and when their population increases they may enters the upper surface of leaves even and cause severe damage (Fig.1 and 2). The nymphs and adult mites are sap feeders and use their stylet like chelicerae for piercing and sucking the sap content from the young leaves causing leaf margins to curl and effect on the leaf moisture content of the leaves and becomes brittle, shrivelled, curled, dwarfed, thickened and puckered. Internodes may be short, giving plants a stunted appearance and the mite injects toxins during their feeding (Karmakar, 1995). Leaf curl caused by mites is serious and yield losses due to yellow mites are estimated to be 50 per cent. Under favourable weather situations, the yield loss due to yellow mite may go up to 96.39 per cent, sometimes leading to complete crop failure. The study was conducted to evaluate synthetics, entomopathogenic fungi and natural products, and the results are presented herein.

2. Materials and Methods

The experiment was laid out in Randomized Block Design with 14 treatments and three replications including untreated check in the experimental block of Department of Sericulture at GKVK, Bengaluru during September, 2021 (Fig.3). The mulberry variety V - 1 with recommended spacing of 90 x 90 cm and with 30 plants per plot was used for the study. Two sprays were given at 15 days interval to determine the effectiveness of 14 treatments against yellow mite *viz.*, abamectin 1.9EC, buprofezin 25SC, diafenthiuron 50WP, fenpyroximate 5EC, hexythiazox 5.45EC, propargite 57EC, spiromesifen 240SC and dicofol 18.5EC were purchased from the Bengaluru open market. Horticulture mineral oil (MAK All season HMO) was supplied by Bharath Petroleum Limited, Mumbai. Fungus formulation *Lecanicillium lecanii* was obtained from Multiplex Bio - tech Pvt. Ltd., Bengaluru. The fungal culture of *Fusarium semitectum* was obtained from Indian Type Culture Collection (ITCC), Division of Plant Pathology, IARI, New Delhi. The compost from MRS, Hebbal, Bengaluru was used in the preparation of the compost tea by mixing the compost with water at 1: 10 ratio, kept for four days in the plastic container and frequently stirring the solution. Spray applications were made by using high volume Knapsack sprayer and care was taken to avoid the drift to adjacent plots by cloth barricade net around each plot at the time of spraying.

The observations were recorded on number of mites one day prior to spray application and 3, 7, 10 and 14 days after each application. Five leaves from upper portion of five different plants were sampled from each plot. The leaves were carried in separate polythene bags to the laboratory and observations were recorded under a stereo binocular microscope and to count the number of mites, including eggs and active stages from the entire leaf. The mite population data were expressed as number/cm^2 leaf area. The data from the field experiments were subjected to $\sqrt{x+0.5}$ transformation, analyzed statistically following the Analysis of Variance Technique (ANOVA) for Randomized Complete Block Design (RBD) for comparing the treatments and the results were interpreted

at 5% level of significance. The efficacy of various treatments against mites was determined by using the formula suggested by Henderson and Tilton (1955) as below:

Per cent reduction in mite population = [1 – (T_a×C_b) / (T_b×C_a)] × 100

Where, T_a = Population in the treated plot after spray
T_b = Population in the treated plot before spray
C_a = Population in the control plot after spray
C_b = Population in the control plot before spray

3. Results and Discussion

Yellow mite population data pooled over two spray applications are presented in Table 1. Extent of reduction in mite population (%), which was more evident 7 and 14 days after application, is depicted in Fig.4. Among the different treatments, spiromesifen application resulted in 89 per cent reduction in mite infestation followed by dicofol, abamectin, propargite, diafenthiuron, fenpyroximate and buprofezin with 73 to 81 per cent control of mites. HMO [at]1 - 2% and hexythiazox (64 to 68% control) treatments were modest in their effectiveness. Least effective treatments were *Fusarium semitectum*[at]1x108 spores/ml, *Lecanicillium lecanii*[at]1x108 CFU's/ml with 42 and 40 per cent control of mites, respectively.

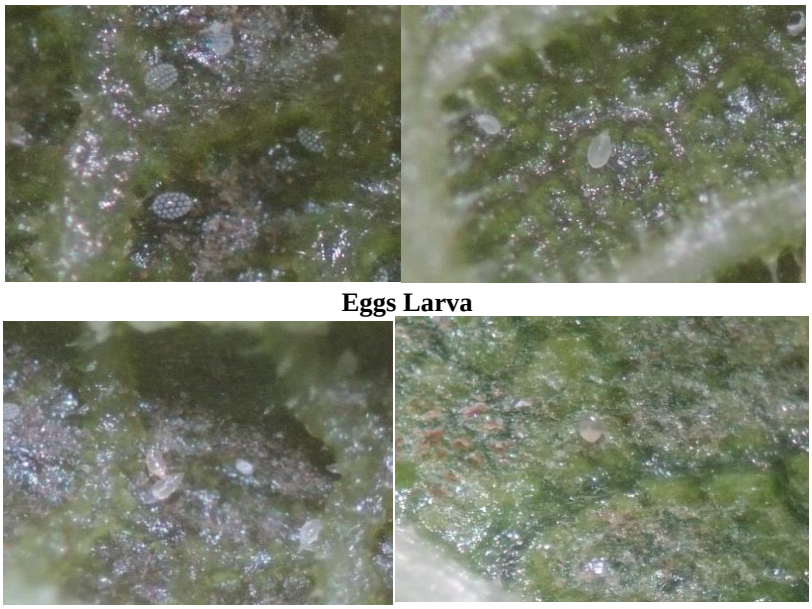

Figure 1: Developmental stages of yellow mite, *Polyphagotarsonemus latus* (Banks)

Figure 2: Yellow mite infested mulberry plants (variety V - 1)

Figure 3: Mulberry plants used to study the rational management of yellow mite, *Polyphagotarsonemus latus* (Banks) at GKVK campus, Bengaluru

Table 1: Per cent reduction in yellow mite, *Polyphagotarsonemus latus* population on mulberry (pooled from two sprays)

Treatments	3 DAS		7 DAS		10 DAS		14 DAS		Pooled data
	I spray	II spray	I spray	II spray	I spray	II spray	I spray	II spray	
Abamectin 1.9 EC[at]5 g *a. i.* / ha	67.35	92.36	83.84	84.53	76.29	84.72	71.11	89.23	81.18
Buprofezin 25 SC[at]150 g *a. i.* / ha	41.09	86.25	59.12	87.02	79.14	82.41	73.77	76.79	73.20
Diafenthiuron 50 WP[at]400 g *a. i.* / ha	68.37	90.39	74.75	90.19	76.96	90.97	61.11	86.01	79.84
Fenpyroximate 5 EC[at]30 g *a. i.* / ha	65.31	91.28	70.71	84.37	73.20	86.79	78.89	82.04	79.07
Hexythiazox 5.45 EC[at]20 g *a. i.* / ha	45.92	84.51	81.82	82.51	63.92	61.75	58.89	72.10	68.93
Propargite 57 EC[at]570 g *a. i.* / ha	66.33	79.69	85.86	93.10	75.26	88.92	68.90	83.01	80.13
Spiromesifen 240 SC[at]100 g *a. i.* / ha	87.76	88.25	94.95	91.11	88.66	89.23	84.44	86.08	88.81
Dicofol 18.5 EC[at]2.5 ml/lit.	73.47	94.18	87.88	92.16	74.23	86.85	57.78	82.99	81.19
Horticultural Mineral Oil[at]1.5 %	36.73	69.56	64.65	75.65	61.86	70.08	62.22	73.34	64.26
Horticultural Mineral Oil[at]2 %	50.18	80.88	59.60	81.71	70.10	82.68	71.11	69.90	70.77
Lecanicillium lecanii $1x10^8$ CFU's/ml[at]2.5 g/lit.	24.49	47.53	37.37	46.70	38.14	40.44	38.89	50.05	40.45
Fusarium semitectum $1x10^8$ spores/ml[at]2 ml/lit.	23.47	43.31	32.32	52.39	38.14	52.48	40.00	58.00	42.51
Compost tea	1.02	4.30	10.10	16.16	3.09	11.85	2.22	15.72	8.06

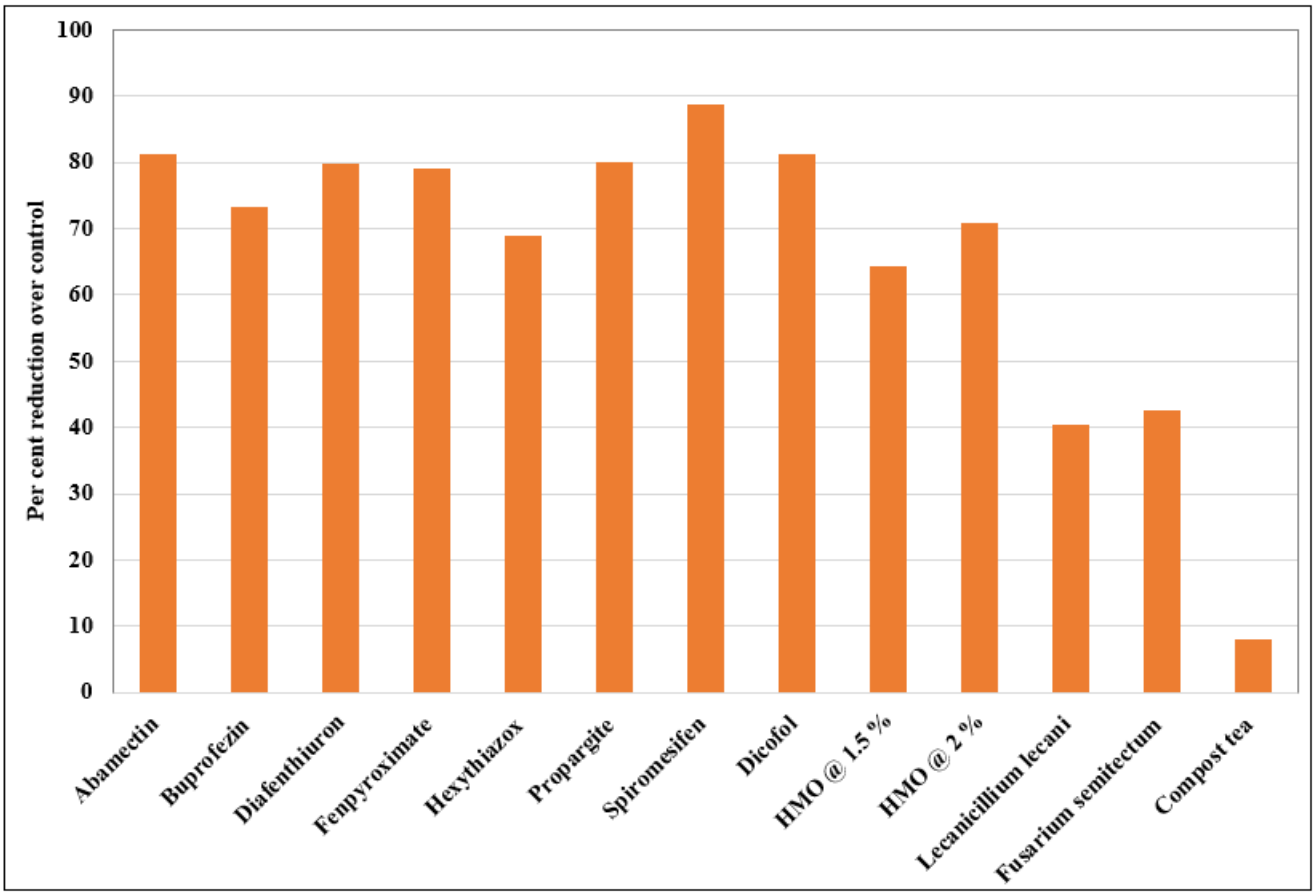

Figure 4: Per cent reduction in yellow mite, *Polyphagotarsonemus latus* (Banks) population on mulberry (pooled from two sprays)

Absolutely, no published information is available either on control or management of yellow mite on mulberry. However, for comparison information available on the control of yellow mite on other crops like chilli, potato, jute, which are severely damaged by yellow mite has been made used for discussion on the present results. Superiority of spiromesifen causing 89 per cent control of yellow mite is comparable with the findings of Varghese and Mathew (2013), Tatagar (2004), Nagaraj *et al*. (2007), Nandini (2010) and Gupta *et al.* (2021), who found spiromesifen, propargite, abamectin as more effective treatments for the control of sucking pests including yellow mite on chilli. Promising control of yellow mite, *i. e*., 79 – 80% control in the present study with the use of dicofol, abamectin, diafenthiuron, and fenpyroximate is in line with the findings of Singh and Singh (2013) and Singh *et al*. (2017) on chilli crop. Two spray applications of buprofezin at two weeks interval accounting for overall reduction of 79 per cent in yellow mite infestation on mulberry in the present study corroborate the reports of Kumar *et al*. (2019), again on chilli crop. Sarkar *et al*. (2018) suggested the use of *Lecanicillium lecanii* in combination with spiromesifen, while Smitha & Giraddi (2006) and Mikunthan & Manjunatha (2006) suggested the use of *Fusarium semitectum* against yellow mite or thrips in view of their ecofriendly features like safety to natural enemies of thrips and/ mites. However, in the present study, stand - alone application of *Fusarium semitectum[at]*$1x10^8$ spores/ml or *Lecanicillium lecanii[at]*$1x10^8$ CFU's/ml accounted for only 40 to 42 per cent control of yellow mite on the mulberry crop. As hexythiazox[at]20 g ai per hectare and Horticulture mineral oil[at]1 – 2 per cent, which accounted for yellow mite control to an extent of 64 to 68 per cent, the scope and suitability of their use in combination with other synthetics or acaropathogens may not be over looked, as suggested by Babu *et al*. (2018) against yellow mite on jute crop.

4. Conclusion

The present findings' analysis showed that Two applications of spiromesifen, dicofol and abamectin at two - weeks interval resulted in maximum reduction (81 to 89%) in mite population, while *Fusarium semitectum* ([at]$1x10^8$ spores/ml) and *Lecanicillium lecanii* ([at]$1x10^8$ CFUs/ml) were found least effective (with 41 - 43% reduction).

Acknowledgment
The authors acknowledge the Head, Department of Agricultural Entomology, College of Agriculture, Bengaluru, University of Agricultural Sciences, GKVK, Bangalore, Karnataka state India, for proving the laboratory facilities for the experiment, my guides and co - guides for their support and guidelines in conducting the experiment.

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