RESEARCH NOTE

Technology Gaps Analysis and Prominence of Two Spotted Mite *Tetranychus urticae* Koch. of Jasmine (*Jasminum sambac* L.) in Tamil Nadu

I. Merlin Kamala[1], J.S., Kennedy[2] and I.I. Devanand[3]

1. Ph.D Scholar, 2. Prof., Department of Agril. Entomology, TNAU, Coimbatore, Tamil Nadu
3. Asstt. Prof., Department of Agril. Ext., Annamalai University, Chidambaram, Tamil Nadu
Corresponding author e-mail: merlinento@gmail.com

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ABSTRACT

Investigations were conducted during 2015-2016, in major jasmine growing districts of Tamil Nadu, for assessing the distribution, infestation level and the relative importance of two spotted mite of jasmine, Tetranychus urticae. The mite population was more observed in Madurai (10.25 mites/2 cm^2 leaf area) followed by Coimbatore (9.47 mites/2 cm^2 leaf area), Tirunelveli (9.36 mites/2 cm^2 leaf area) and Ramanathapuram (8.65 mites/2 cm^2 leaf area) districts. Seventy-four per cent respondents were aware of jasmine mite as a pest, but only nine PER CENT respondents ranked it as the most important pest. The technological gap indices (TGI) were high in adopting right frequency in spraying of chemicals (91%), usage of biological control agents (87%) and effective cultural practices viz., collection and destruction of infested leaves and buds (82%) and planting inter/border crops (87%). A majority of respondents (45.45%) had high level of technological gap, whereas, only 18.18 per cent were in low level of technology gap. Thus, efforts should be taken to create awareness among jasmine growers for the use of eco-friendly bio-control methods against two spotted mite of jasmine as well as other pests of jasmine.

***Key words**: Jasmine; Two spotted mite; Webbings; IPM; Technological gap index;*

Jasmine (*Jasminum sambac* L.) is an important traditional plant belonging to the olive family (*Oleaceae*), cultivated nearly throughout the tropical and subtropical parts of the world for its sweet scented fragrant flowers. In jasmine, flowering commences during March-April and comes to peak in May-July. During this period, the weather is too hot and is favourable for multiplication of this mite population and the populations increase quickly. These tiny eight-legged arthropods lay eggs on the underside of leaves. An adult female can lay more than 100 eggs in three weeks. Eggs hatch in four to five days and the entire life cycle from egg to adult is completed in one to three weeks, depending on the temperature. The life-cycle of *T. urticae* consists of five different stages such as egg, larva, protonymph, deutonymph and the adult. Mites are typically found on the underside of leaves but may colonies entire plants during outbreaks. The mites suck sap from cells on the underside of plant leaves, in the early stages and characteristic white speckles can be seen from the upper leaf surface. As mite number increases, these white speckles also increase and the leaf exhibits a bleached appearance (*Martinez-Ferrer et al. 2006*). In case of severe infestation, the whole plant becomes pale in colour and affects production and size of the flower buds. Damage to the leaves inhibits photosynthesis, and severe infestations can result in premature leaf fall, shoot dieback, and decreased plant vigor. Although the individual lesions are very small, attack by hundreds or thousands of spider mites can cause thousands of lesions and thus can significantly reduce the photosynthetic capability of plants (*Zhang, 2003*). Such buds fetch a low market price. Silk webbing on the undersides of leaves is characteristic signs of spider mites. Under high population densities, the mites move to the tip of the leaf or top of the plant and congregate using strands of silk to form a ball-like mass, which will be blown by winds to new leaves or plants, in a process known as

"ballooning". As the infestation by the two spotted mite, *T. urticae* and the jasmine leaf webber, *Nausinoe geometralis* Guenee. Coincides with the flushing stage, the silky foliage of jasmine is severely affected, and thereby photosynthetic efficiency of plant is affected and hence affects flower production. The rapid developmental rate, short generation time, and high net reproductive rate of *T. urticae* allows them to achieve damaging population levels very quickly when growth conditions are suitable, resulting in an equally rapid decline of host plant quality.

Hence, considering the economic losses caused by this pest, this study was undertaken to assess the incidence of two spotted mite in major jasmine growing districts of Tamil Nadu and to assess farmer's perception on the awareness about this pest and its prominence over other key pests of jasmine.

METHODOLOGY

For assessing the awareness about the pests and their relative importance, roving surveys were undertaken in jasmine growing tracts of ten Southern districts of Tamil Nadu *viz.*, Kanyakumari, Tirunelveli, Thoothukudi, Virudhunagar, Ramanathapuram, Madurai, Theni, Dindigul, Erode and Coimbatore and face-to face interviews with jasmine growers were conducted during 2014-2015. From each selected districts, 10 jasmine growing farmers were randomly selected and the data was collected by means of a structured questionnaire administered via personal interviews and technology gap index was calculated. Thus, a total of 100 farmers spread over major jasmine growing districts of Tamil Nadu formed the sample of the study. Technological Gap Index (TGI) was computed to analyze the extent of adoption of various recommended practices related to pest management using the following formula (*Sakthivel et al., 2012*).

$$\text{Technological Gap Index (TGI)} = \frac{R - A}{R} \times 100$$

Where,

R = No. of respondents who responded

A = No. of respondents who had adopted the recommended practice

On account of a wide range of technological gap, the jasmine growers were categorized as 'High' for those having TGI of 70 and above, 'Medium' having TGI between 40 and 70 and 'Low' below 40.

For assessing the mite incidence, five plants were randomly selected and three leaves per plant representing top, middle and bottom of the plants was selected for sampling. The leaves were brought to the laboratory and were observed under stero zoom microscope for population of mite and eggs/ 2 cm^2 of leaf area. The data on incidence was transformed to "x+0.5 and analyzed by randomized block design. The treatment mean values of the values of the experiment were compared using Latin Square Distribution (LSD).

RESULTS AND DISCUSSION

Incidence of two spotted mite of jasmine in different districts of Tamil Nadu: The incidence of two spotted mite of jasmine was observed in all the ten districts of Tamil Nadu in varying proportion (Table 1). However, the incidence was maximum in Madurai district recording 10.25 mites per /2 cm^2 leaf area and Tirunelveli districts (9.47 mites per 2 cm^2 leaf area) and Coimbatore district (9.36 mites per 2 cm^2 leaf area), followed by Ramanathapuram district (8.65 mites per 2 cm^2 leaf area) The lowest per cent incidence was recorded in Tuticorin district (2.68 mites per 2 cm^2 leaf area) and Kanyakumari district (2.65 mites per 2 cm^2 leaf area), Theni (3.64 mites per 2 cm^2 leaf area) and Dindugal (3.71 mites per 2 cm^2 leaf area). Erode and Virudhunagar districts witnessed medium mite population of 4.62 and 5.68 mites per cm^2 leaf area, respectively.

Similar trend was noticed in the number of eggs per 2 cm^2 leaf area with the maximum eggs noticed in Madurai and Coimbatore districts (20.41 and 18.56 eggs) followed by Tirunelveli and Ramanathapuram districts (17.85 and 17.63 eggs). The variations in two spotted mite incidence in the study locations may be due to the interplay of various biotic and abiotic factors that influence the pest population. Hence, it is concluded that incidence of mite was high in Southern districts of Tamil Nadu and the hot weather in the region might be the probable reason for the pest buildup (*Prasad and Logiswaran, 1997*).

Relative importance of two spotted mite of jasmine and perception among jasmine growers: Majority of respondents (74%) knew about two spotted mite of jasmine, but only 9 per cent ranked as the most serious pest. The respondents who ranked jasmine budworm as the most important pest were 53 per cent and 16 per cent perceived blossom midge and only 7 per cent

Table 1. Frequency distribution and incidence of two spotted mite, *Tetranychus urticae* by jasmine growers (N=100)

Districts	No of eggs/2 cm^2 leaf area	No of mites/2 cm^2 leaf area
Kanyakumari	4.30^f	2.65^g
Tirunelveli	17.63^b	9.47^b
Tuticorin	6.42^e	2.68^g
Virdhunagar	10.24^b	5.68^d
Madurai	20.41^a	10.25a
Ramanathapuram	17.85^b	8.65^c
Theni	7.84^e	3.64^f
Dindugal	7.45^e	3.71^f
Erode	8.63^d	4.62^e
Coimbatore	18.56^b	9.36^b
SEd [CD (0.05)]	0.1847	0.2741

Each value is the mean of three replications; Figures in parentheses are square root transformed values; In a column, means followed by common alphabet (s) is / are not significantly different by LSD at P=0.05.

recorded leaf webworm as a major problem. Nearly half of the respondents (68%) felt that the incidence of jasmine mite is severe in May to August, medium (27%) in Feb - April, while in September-November it was 14 per cent only. Similar results were reported by *Isabel (1996)* and *Vanitha (2001)* in Southern districts of Tamil Nadu.

Technology Gap indices (TGI) on management practices of two spotted mite of jasmine among jasmine growers: Two spotted mite of jasmine is an emerging major pest of jasmine. Cultural control measures like pruning of bushes (91%) and field sanitation (86%) were followed by majority of jasmine growers, thus recorded lower TGI (Table 2). This is due to the ease of the practice, which can be done while doing day to day field works. The TGI was found high in other cultural/mechanical practices *viz.*, collection and destruction of infested leaves and twigs, planting of border/ intercrops etc. as these operations are labour intensive, thus not commonly followed by the growers. Raising of intercrops/border crops and their role in attracting beneficial organisms to naturally check the pest by providing pollen and nectar to the natural enemies and in turn getting additional income were unaware to the jasmine growers with a widened technology gap of 87 per cent. Regarding the usage of bio-control agents, growers were less educative and only an average of 10 per cent respondents use *Hirsutella thompsonii* and

Table 2. Technological gap at farmer's level in adopting recommended management practices for two spotted mite, *Tetranychus urticae* in jasmine

Particulars of practices*	Resp. (%)	TGI	*Category
Cultural/mechanical Practices			
Field sanitation	86.00	14.00	Low
Collection and destruction of infested leaves and buds	18.00	82.00	High
Planting inter/border crops	13.00	87.00	High
Pruning the bushes in winter	91.00	9.00	Low
Biological Control			
Spray Hirsutella thompsonii @ 1x 108 cfu ml-1	10.00	90.00	High
Spray Hirsutella thompsonii @ 1x 108 cfu ml-1	13.00	87.00	High
7. Use of Chrysoperla eggs	10.00	90.00	High
Chemical control			
Spray of spiromesifen 240 SC@0.8 ml l-1	53.00	47.00	Medium
Application of wettable sulphur 80WG@1g l-1	41.00	59.00	Medium
Spray neem seed kernel extract or azhadirachtin 5% (5 ml l-1) at bimonthly intervals	48.00	52.00	Medium
Right frequency of application of chemical pesticides	9.00	91.00	High

**Category of growers based on TGI*

Beauveria basssiana, which are efficient microbials against mites (*Wu et al., 2016)*. Moreover, the green lacewing, *Chrysoperla zastrowi sillemi* grubs were efficient predators of mites (*Yuksel and Goemen, 1992; Singh and Manoj, 2000; Zaki and Gesraha, 2001*), but the jasmine growers are unaware of its potential and recorded a TGI of 86 per cent. Similar results of less knowledge on bio-pesticides were noticed by banana growers (*Nikitha et al., 2016*). The main reason was the lack of awareness about biological control, less and slow relief of bio-control agents and their unavailability (*Bale et al., 2008*). Knowledge about use of botanical pesticides *ie.*, neem seed kernel extract or Azhadirachtin 5 per cent (5 ml per litre) at bimonthly intervals and their usuage were adopted by 48 per cent of growers, lessening the technology gap. In case of chemical control, comparatively medium TGI was observed, which is due to the ease of application and availability of chemicals. Jasmine growers chiefly rely on synthetic chemicals due to the quick recovery of plants from pest attack without any awareness about

its harmful side effects to the human beings and the environment. Regarding the frequency of application of chemicals, there is a long technology gap (91%), as the lack of patience and swift reaction by the growers on finding even a pink bud by spraying indiscriminately without any proper interval.

Distribution of respondents: Majority of the respondents (48%) belonged to the high technological gap category, whereas, 27 per cent under medium technology gap category. Only 18 per cent of the respondents were found in low level of technology gap. The adoption gap clearly indicates that among the various practices recommended for the management of two spotted mite of jasmine like application of chemicals and few cultural/mechanical practices with less complexity were more feasible and adopted. Several constraints viz., unavailability of labours for carrying out cultural practices, lack of awareness about the use of bio-pesticides etc. leads to widening of technology gap among the usage of environmentally safe pest management strategies.

CONCLUSION

The results of the present study indicated the technology gap among jasmine growers in the management of two spotted mite, *T. urticae*. It is therefore suggested that extension agencies should intensify their efforts to organize extension educational programs like trainings, demonstrations, field days, etc., to motivate the farmers to accept and adopt the IPM practices. In the extension programs, a special emphasis should be given to promote eco-friendly bio-control methods against two spotted mite as well as other pests of jasmine by conducting skilled demonstrations and specialized participatory trainings. As the world is moving towards "Go green" slogan, encouraging and educating the farming community to improved insecticides is a need of the hour to mend Indian farming

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