Chilli mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) preferential distribution trend for chilli plants in Haryana

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Abstract- Investigation on the preferential distribution of chilli mite, *Polyphagotarsonemus latus* (Banks) under field conditions was studied at the Department of Zoology, CCSHAU, Hisar during 2014, 2015 and 2016. The preference for top leaves, followed by middle and bottom leaves was shown by *P. latus* on chilli crop. Top leaves harbored 37, 42 & 46 percent mites followed by 34, 32 & 33 percent on the middle leaves and 30, 25 & 22 percent on the bottom leaves of chilli crop during 2014, 2015 and 2016, respectively. This results predict that top canopy of chilli plant is the suitable place for the growth and development of *P. latus*.

INTRODUCTION

Chilli (*Capsicum annuum* L.) is a tropical and subtropical crop grown all over India as well as abroad. It is one of the most important commercial spice crops, earning valuable foreign exchange for the country. India produces about 10.70 lakh tonnes of chilli from an area of 9.08 lakh hectares (Singhal, 2003). Among the constraints in chilli cultivation, the attack of a multitude of insect pests and mite at different crop stages is of the upmost concern. Surveys conducted the major pests that attack on chilli are aphids (*Myzus persicae* Sulzer, *Aphis gossypi* Glover), mite (*Polyphagotarsonemus latus* Banks) and thrips (*Scirtothrips dorsalis* Hood) (Berke and Sheih, 2000), which have been identified as main sucking pests of Byadagi chilli.

Polyphagotarsonemus latus (Banks) commonly known as broad mite, yellow mite, chilli mite belonging to the family Tarsonemidae, is an important polyphagous pest with a very wide host range including many cultivated crops like chilli, potato, french beans, sweet pepper, bell pepper, cucumber, egg plants, chrysanthemum, cotton, dahlia etc. (Luypaert *et al*., 2015).

On leaves, damage is characterized by malformation of growing tissues, including leaves, shoots and flowers. It seen in the newly emerged leaves and cause severe damage on under surface of chilli leaves leads to bronzing hence called tambera disease (Chakravarthy *et al*., 1998). When populations are high, infested leaves bend and turn to coppery and purple color. The mite injects toxic saliva causing twisted, hardened and distorted growth in the terminal buds, leaf curling, elongation of leaf petiole, buds drops immaturely, plants become stunted in growth which causes significant reduction in yield in the range of 30-90% (Monika, 2014) that lead to huge economic losses. However, in extreme cases, the complete failure of the crop occurs. Fruit areas which are infested have a burnt appearance and rough texture. Furthermore, there may be a lifting of the epidermis superficial layer, which remains to the fruit surface a silver-gray thin film (Rogers *et al.*, 2010).

Seeing the importance and demand of chilli along with drop in yield due to infestation by *P. latus*, the present investigation was carried out to find out the preferential distribution of chilli mite population dynamics which gives an idea about peak of their activity and may be helpful in developing pest management strategies. There is also no more literature is available as distribution of *P. latus* mites on chilli plant, which is required for reliable sampling and precise estimation of crop loss.

MATERIALS AND METHODS

Collection of leaf samples

To study the distribution of the mite, ten chilli plants were selected randomly from each plot for counting the number of mites. Samples were taken weekly from transplanting (first week of September) to harvesting (first week of December). Under stratified sampling,

each plant was divided into three vertical strata/canopy i.e. top, middle and bottom strata/canopy. Two leaves from each strata/canopy per plant were collected in separate labelled polybags, one bag for each plant on each sampling day. Altogether, six leaves per plant were taken randomly from ten plants.

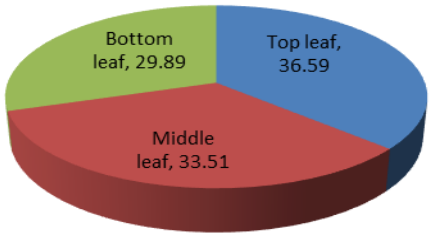
All the collected leaves were brought to the Acarology laboratory in the Department of Zoology, CCSHAU, Hisar for counting the number of eggs and mobile/active stages (nymphs and adults) under a stereo zoom binocular microscope. The data on number of eggs, mobile/active stage per leaf was used to compare the abundance of the mite on leaves at different canopy levels as well as on different leaves in a shoot.

RESULTS

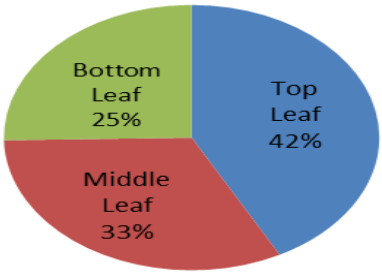
The mite population comprising of eggs as wells as mobile/active stages were more abundant on leaves in the top strata/canopy (37, 42 & 46 %) of the chilli plant compared to the leaves in the middle strata/canopy (34, 32 & 33 %). It is apparent that the mites preferred top position of the plant and cause serve damage. During the experiment it was observed that the terminal leaves in a shoot of top canopy harbored maximum number of eggs as well as active stages compared to the corresponding leaves in the shoot in middle and bottom canopy. This shows distinct relationship between the number of the mites on the leaves and the total number on the corresponding leaves. As the total number of mites on terminal leaves increased, the number of mites on corresponding leaves, especially on the terminal leaves also increased. It is suggested that the terminal leaves from the shoots at the top canopy shall be sampled for more precise and reliable estimation of mite population on chilli plant. Mann *et al.* (1920) observed prominent damage by yellow mite on top leaves of potato plants which resulted withering of foliage commencing from the tip of the plant. Montasser *et al.* (2011) reported that chilli plant has more suitable diet *i.e.* essential for developmental stages of *P. latus* and greater number of eggs delivered which are essential for mite survival and population build up.

P. latus attack young, growing plant parts and oviposit on the undersides of leaf surfaces. Young pepper plants have a particular low tolerance for broad mite damage (Jovicich *et al*., 2009); only five adult mites on a young pepper plant can result in lower fruit weight (Weintraub, 2007).

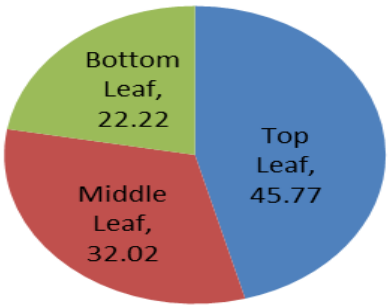
Yellow mites in chilli mostly preferred the apical leaves for their feeding, shelter and oviposition. The number of eggs varied between 2 to 100 per top leaf or second leaf (Anonymous, 1994). The nymphal and adult stages were found to be distributed mainly on top two leaves and were negligible on third and fourth leaves (Anonymous, 1994; 1998). In another study, Rani (2001) reported that chilli mite preferred top three leaves (2.19 to 2.46 eggs/ leaf) as against bottom leaves (1.65 to 1.98 active stage/leaf).On potato, compound leaves at the top canopy level harbored more number of yellow mite (72.61 eggs and 73.28 active stages/compound leaf) compared to leaves at the middle canopy level (57.15 eggs and 60.36 active stages/compound leaf) (Rani, 2001). Pérez-Otero *et al*. (2007) reported that the broad mite develops on the underside of tender leaves of camellia, where it finds adequate conditions of moisture, shade and food. It was also found on the shaded side of the fruit, so it is not visibly apparent.



(a) 2014



(b) 2015



(c) 2016

Fig. 1: Occurrence of *Polyphagotarsonemus latus* on top, middle and bottom leaves of chilli under field conditions during (a) 2014 (b) 2015 and (c) 2016

As observed under field conditions, preference for top leaves, followed by middle and bottom leaves was shown by *P. latus*. Top leaves harbored 42 percent mites followed by 33 percent on the middle leaves and 25 percent on the bottom leaves of chilli crop during 2015 (Fig. 1b). Similar results were obtained for occurrence of *P. latus* on chilli crop for crop season 2016 (Fig. 1c) which showed 45.77 percent mites on top leaves. This was higher than mite density on both the middle (32.02 %) and the bottom (22.22 %) leaves. In general, maximum population buildup of *P. latus* was noticed on the top leaves (36.59 %) followed by middle (33.51 %) and bottom (29.89 %) leaves of chilli during 2014 (Fig. a).

REFERENCES

[1] Anonymous. 1994. *Progress Report. AICRP on Agricultural Acarology*, University of Agricultural Sciences, GKVK, Bangalore. pp.78.

[2] Anonymous. 1998. *Progress Report, AICRP on Agricultural Acarology*, University of Agricultural Sciences, Bangalore. pp. 193.

[3] Berke, T. and Shieh, S.C. 2000. Chilli peppers in Asia. Capsicum and Eggplant. News Letter, 19: 38-41.

[4] Chakravarthy, A.K., Venkatesh, R.S.N., Somashekar C., Vijaylakshmi M., Patil S.V. and Nagaraju S., 1998. Monitoring insect and mites on potato in Hassan, Karnataka, *Insect Environment*, **3**(4): 91.

[5] Jovicich, E., Cantliffe, D.J., Osborne, L.S., Stoffella, P.J., Simonne, E.H., Mason, P.G. and David, R. 2009. Release of *Neoseiulus californicus* on pepper transplants to protect greenhouse grown crops from early broad mite (*Polyphagotarsonemus latus*) infestations. In: Proceedings of third international symposium on biological control of arthropods, Christchurch, New Zealand, pp 347–353.

[6] Luypaert G, Witters J, Berkvens N, Huylenbroeck JV, Riek JD, Clercq PD. 2015. Cold hardiness of the broad mite Polyphagotarsonemus latus (Acari: Tarsonemidae). Experimental and Applied Acarology. DOI 10.1007/s10493- 015-9894-3.

[7] Mann, H.H., Nagesha, S.D. and Kulakarni, S., 1920.The tambera disease of potato. *Agri. J India*, 15:282-284.

[8] Monika, 2014. Evaluation of chilli hybrids for resistance against mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae). M.Sc Thesis, CCS HAU, Hisar.

[9] Montasser, A. A.; Marzouk, A. S.; Hanafy, A. R. I. and Hassan, G. M. 2011. Seasonal fluctuation of the broad mite Polyphagotarsonemus latus (Acari: Tarsonemidae) and its predatory mites on some pepper cultivars in Egypt. International Journal of Environmental Science and Engineering, 2: 9-20.

[10] Pérez-Otero R., Mansilla-Vazquez, JP. and Saliero-Corral, MC 2007. First report of the Broad Mite Polyphagotarsonemus latus Banks on Camellia japonica in Spain. American Camellia yearbook: 52-56.

[11] Rani, HR. 2001. Bio-ecology and control of yellow mite, Polyphagotarsonemus latus (Banks) infesting potato and chilli. M.Sc. (Agri.) thesis, UAS, Bangalore.

[12] Rogers, M.E., Stansly, P.A., Childers, C.C., Mccoy, C.W. & Nigg, H.N. 2010. Florida citrus pest management guide: Rust mites, spider mites, and other phytophagous mites. University of Florida. IFAS (Eds.). New York, USA. 603p. http://edis.ifas. ufl.edu/cg002.

[13] Singhal, V. 2003. Chillies in Indian Agriculture, Indian Economic Data Research Centre, In: Mayapuri, New Delhi, India, pp. 565-570.

[14] Weintraub, P.G. 2007. Integrated control of pests in tropical and subtropical sweet pepper production. Pest Manag Sci 63:753–760.