C. Chattopadhyay and D. Prasad (eds),
Dynamics of Crop Protection and Climate Change

Host Plant Responses to *Tetranychus urticae* Koch Mediated Biotic Stress and Management Strategies

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The two-spotted spider mite, *Tetranychus urticae* Koch, is one of the most serious agricultural pests in the world (Razmjou *et al.* 2009). This mite is polyphagous and attacks broad range of crops, limiting the yield and thus, leading to huge economic losses. Understanding *T. urticae* populations, their cycles, and outbreaks require an in-depth knowledge of many factors, which include the biotic potential of the species, the influence of meteorological factors, the availability and relative susceptibility of hosts, competition between mite species, structural and chemical adaptations of each kind of mite. Documentation of the population abundance and spatial distribution of this pest in cucumber and selection of newer management practices would open up new scope for farmers to combat spider mites in cucumber cultivation. Keeping the above facts into consideration, the effort has been made to review the available literature.

Two-Spotted Spider Mite: Pest Status and Distribution

Two-spotted spider mite (TSSM), *T. urticae*, belongs to the group of acarines known as Acariformes, in the suborder Prostigmata and the family Tetranychidae. *T. urticae* was found to be major pest of vegetables in India (Meyer 1974; Prasad 1974; Natarajan 1989; Singh and Singh 1993; Nandagopal and Gedia 1995; Dhar *et al.* 2000; Dhooria 2003; Gupta 2003; Putatunda and Tagore 2003; Gulati 2004; Geroh 2007) and also worldwide (Choi *et al.* 2004; Hou Hui *et al.* 2004; Aslan *et al.* 2005; Adango *et al.* 2006; Gatarayiha *et al.* 2010).

T.urticae is the most notorious pest responsible for significant yield losses in many economic crops, vegetables and fruit trees (Salman 2007) and also ornamental and

agronomic crops worldwide (James and Price 2002). In India, *T. urticae* is reported as pest of vegetable crops from Haryana (Meyer 1974; Khanna 1991; Sunita 1996; Gulati 2004), Kerala (Lal 1982), Punjab (Gupta *et al.* 1971; Dhooria 2003; Kaur *et al*. 2010), Tamil Nadu (Nandagopal and Gedia 1995), Uttar Pradesh (Singh and Singh 1993) and West Bengal (Mukherjee and Somchoudhary 1981; Dhar *et al*. 2000).

Apart from vegetable crops, the spider mites are also reported to cause economic losses in fruit crops like apple, citrus, pear (Chhillar *et al.* 2007), raspberry (Charles *et al.* 1985; 1990; Raworth 1989; Gordan *et al.* 1990; Shanks *et al.* 1992; Mariethoz *et al.* 1994) and strawberry (Wyman *et al.* 1979; Congdon *et al.* 1993).

Population Fluctuations of *Tetranychus urticae* as Influenced by Season

For any efficient pest management system, the study of population abundance of pest is of vital importance. Most of the phytophagous mites remain in the field throughout the year on one or the other host but remain at low level during rainy and winter season. *T. urticae* (=*T. cinnabarinus*) attacked plants during hot and dry period, i.e., April to June, resulting in significant yield loss (Gupta *et al.* 1971). On okra crop its peak activity was recorded in the months of April (Natarajan 1989), January to April (Lal 1982), May-June (Pande and Yadav 1976; Sharma and Pande 1981; Singh and Singh 1993), June (Dhar *et al*. 2000; Putatunda and Tagore, 2003; Gulati 2004) and August (Sunita 1996). The peak population of mite was reported on tomato from September to November and on brinjal, cucurbits, cowpea from May to June (Dhooria 2003); on brinjal in June and July (Khanna 1991). Low to negligible mite population was encountered during December, January and February months (Pande and Yadav 1976; Natarajan 1989; Gulati 2004).

During severe infestation, *T. urticae* density was recorded as 75-90 mites per leaf on cucumber (Souliotis 1990). Afzal and Bashir (2007) recorded the maximum mite population from brinjal (2.77) followed by tomato (2.55), pumpkin (1.1) and cucumber (0.91), respectively. Dutta *et al.* (2012) also recorded higher number of mites per leaf on cucumber (16.08), second to brinjal (32.27). On okra crop, *T. urticae* density was recorded 11.9 mites/sq. cm leaf (Gulati 2004), 16.4 mites/sq. cm leaf (Sunita 1996), 17.3 mites/sq. cm leaf (Khanna 1991), 50.5 motile stages/sq. cm leaf (Dhar *et al.* 2000), 348 mites per leaf (Singh and Singh 1993).

Haque *et al.* (2011) studied seasonal abundance of spider mite *T. urticae* on vegetable and ornamental plants in Rajshahi and found that nine vegetable plants *viz*. joscpks coat, kathua, lady's finger, cucumber, brinjal, tomato, bottle gourd, bean and loofah contained the highest number of mites per leaf during the month of August. Spinach had the highest population in October, cowpea in November, pointed gourd and radish in December and bitter melon in January, respectively.

In cucumber, highest number of *T. urticae* eggs per female per day was recorded on the genotype Blackish Green; while lowest on Winter Long Green (Ullah *et al.* 2006).

Few Pages are not available

Salvia officialis (both Lamiaceae) and *Myrtus communis* (Myrtaceae) have the potential to be an alternative to synthetic pesticides, since they have been demonstrated to possess a wide range of bioactivities against insects and mites. Afify *et al.* (2012) evaluated the acaricidal activity of extracts of three essential oils chamomile, marjoram and *Eucalyptus* against *T. urticae* under different concentrations and reported chamoline as the most potent efficient acaricidal agent against *T. urticae* followed by marjoram and *Eucalyptus*.

Pest management strategies including biological control of *T. urticae* with predatory mites are discussed in reports (Ferguson 2008), but scanty reports are available on efficacy of botanicals against mites in cucumber (Lee *et al.* 2004). *T. urticae* Koch can reproduce rapidly on greenhouse cucumber, so it is important to apply control measures as soon as mite damage is detected.

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