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Abstract: Population density and distribution pattern of the major groups of mites infesting an invasive plant, *Bidens sulphurea* Cav. were studied during the period of January, 2013 to September, 2013 covering three districts of Kerala viz. Malappuram, Palakkad and Thrissur. Random samples of leaves were collected from mite infested plants of *B. sulphurea* growing in various localities, based on visual symptoms. Individual leaf was thoroughly screened under a stereomicroscope to record the species diversity, nature of infestation, distribution pattern etc. of the associated mites. Results of the study revealed the association of both phytophagous and predatory mites on the plant. The phytophagous mites recovered during the study included members of 3 families viz. Tenuipalpidae, Bryobiidae and Tetranychidae while the predatory mites belonged to the family Phytoseiidae. A general abundance of tenuipalpid mites was recorded on the plant, irrespective of geographical variation. The family Tetranychidae was found represented by two genera viz. Tetranychus and Eutetranychus while the remaining families were found to comprise of a single genus each. Most of mite species preferred the lower surface of the leaves and in cases of severe infestation, the upper surface of the leaves was also found invaded by a few species. The paper also discusses on the population density and distribution pattern of individual mite species on *B. sulphurea*.

Keywords: Invasive plant, phytophagous, Population density, Distribution pattern, *B. sulphurea*

1. Introduction

*B. sulphurea* is an annual herb introduced widely as an ornamental plant for its beautiful flowers. It escaped from gardens and started growing wild along road sides, disturbed areas and wastelands. *B. sulphurea* was declared invasive by the United States Southeast Exotic Pest Plant Council in 1996 (US Department of Agriculture Plant Profile of *Cosmos sulphureus*). The introduction of invasive species generally causes extinction of local species and irreparable changes to the habitat and biodiversity of invaded ecosystems. These species lead to the killing or crowding of native species through predation, parasitism, diseases and competition (Chornesky and Randall 2003). They also alter ecological processes such as the water, nutrient, and energy cycles and thus completely change the ecosystem functions (Union of Concerned Scientists, 2007). Noxious invasive weeds like *Chromolaena odorata* and *Eichhornia crassipes* are known to harbour varied species of mites like the spider mites, eriobad mites eriophyid mites etc. (Ramani and Haq, 1984,1987; Haq and Ramani, 1987; Sheela and Haq, 1988, Sumangala and Haq, 2003, Ramani, 2007). The present paper presents the results of a study conducted on the population density and distribution pattern of some species of phytophagous mites infesting invasive plant viz. *B. sulphurea* in Kerala.

2. Materials and Methods

Middle aged leaves of *B. sulphurea* showing heavy infestation by mites were collected randomly in every two weeks, from various localities distributed over 3 districts Kerala viz. Malappuram, Palakkad and Thrissur of Kerala. Thorough screening of individual leaf was made under a Stemi DV4 stereo zoom microscope in the laboratory for recording the presence of mites. Population density of individual mite species was assessed following Per Leaf Counting method by keeping the leaves immersed in 70% alcohol for 5-7 minutes in a petriplate. The leaves were thoroughly washed in 70% alcohol to extract the entire mite population from the leaf surface. The mite specimens thus extracted from were then examined under the stereo zoom microscope. In order to study the population density of individual species of mite, the numbers of different life stages viz. the eggs, nymphal stages and adults, were counted separately for each species. The numbers of live individuals representing each species present on 25 leaves of the host plant were noted separately district-wise, for each sampling occasion. Data on the population density of each species during each sampling period were recorded and presented in
graphs. Live mite specimens were segregated with the help of a moistened camel hair brush and transferred to 70% alcohol for further processing. The specimens were dehydrated in alcohol series, cleared in clearing medium (mixture of absolute alcohol and lactic acid in 1:1 ratio), slide mounted in Hoyer’s medium and identified following keys and relevant literature.

3. Results and Discussion

Results of the study enabled to record the association of both phytophagus and predatory mites, representing 2 suborders viz. Prostigmata and Mesostigmata, on the invasive plant, *B. sulphurea*. The phytophagous mites recovered during the study included members of 3 families viz. Tenuipalpidae, Bryobiidae and Tetranychidae while the predatory mites belonged to the family Phytoseiidae. Tetranychidae was found represented by members of two genera viz. *Eutetranychus* and *Tetranychus* while the other families were represented by a single genus each. The tenuipalpid species recovered during the study was *Brevipalpus phoenicis* Geijskes. The family Bryobiidae was represented by *Bryobia* sp. *Eutetranychus orientalis* Klein and *Tetranychus* sp. were the species of tetranychid mites recovered during the study.

![Figure 2: Mean Population Density of Mites On B. sulphurea from the 3 Districts of Kerala](image)

All these species are known to be highly polyphagous with wide host range and are listed as major/minor pests of plants with varied economic categories ([Jeppson et al. 1975; Chiavegato and Kharfan 1993; Childers et al. 2003; Prabheena and Ramani, 2013]). Besides the above phytophagous species, a predatory species viz. *Amblyseius largoensis* Muma also could be recorded from *B. sulphurea*. This phytoseid mite has been recorded as an efficient predator of pest mites like the spider mites, false spider mites and eriophyid mites (Reis et al. 2000a).

![Figure 3: Amblyseius largoensis (Predatory mite) and Brevipalpus phoenicis recovered from B. sulphurea](image)

The population density and distribution pattern of the phytophagous mites showed variation with respect to seasonal and geographic variations. Numerical abundance of these mites could be recorded in April and the minimum population was observed in January. Seasonal changes in diversity and density of arthropods in tropical regions have been correlated with alterations in various local environmental factors like temperature, rainfall and relative humidity ([Klein et al., 2002; Philpott et al., 2006; Teodoro et al., 2008]). A positive correlation between mite density and physical factors like temperature and relative humidity was reported earlier in the case of gall forming eriophyid mites while rainfall exerted a negative correlation (Nasareen and Ramani, 2014). *B. phoenicis* recorded. The highest mean population density was recorded for *B. phoenicis* (646.9 individuals / 25 leaves), followed by *A. largoensis* (487.4 individuals / 25 leaves) and *Tetranychus* sp. (311 individuals / 25 leaves), *E. orientalis* (70.8 individuals / 25 leaves) and *Bryobia* sp. (28.4 individuals / 25 leaves).

The population density of the mites showed variation with respect to geographical variation also. During the present study, all the species except *B. phoenicis*, showed maximum variation...
population in Palakkad Dt. followed by Malappuram and Thrissur. The population of *B. phoenicis* was found high in Palakkad Dt. followed by Thrissur and Malappuram Dts.

![Figure 6: Comparative Analysis of Mite population from different sites](image)

**Figure 6:** Comparative Analysis of Mite population from different sites

### 4. Conclusion

Invasive alien plants, usually escape cultivation and become agricultural pests, infest lawns as weeds, displace native plant species, reduce wildlife habitat, and alter ecosystem processes. Mites, being a less explored group in India, especially in Kerala, studies were undertaken to explore and exploit their potential towards the regulation and effective suppression of the invasive plants, to ensure ecosystem functioning. Results of the present study revealed maximum population of mites during the dry season. *B. phoenicis* was species with highest population density followed by the predatory mite *A. largoensis*, *Tetranychus* sp., *E. orientalis* and *Bryobia* sp. The mite population density was found high in Palakkad Dt. followed by Malappuram and Thrissur, except in the case of *B. phoenicis*, which showed high population in Palakkad, followed by Thrissur and Malappuram. Feeding symptoms induced by mites included the presence of chlorotic spots, yellowing, followed by bronzing of leaves and development of necrotic areas and leprosis.

### References


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