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Research Article

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Appraisal of Thrips Population Dynamics in Mango using Weather Based Indices

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Abstract

The aim of this investigation was to assess the dynamics of mango thrips population across 20 mango orchards based on thermal indices under subtropical Lucknow condition during 2013 and 2014. Wide variations in thrips populations were observed across different critical crop phenological stages and seasons. The thrips population was observed between 13th SMW to 24th SMW during 2013 cropping season, whereas it was found from 15th SMW to 28th SMW in the subsequent year. The mean thrips population across standard weeks was highest (6.18 ± 0.14) during 15th SMW followed by 3.13 ± 0.15 in 16th and 1.87 ± 0.06 in 17th SMW during 2013, whereas in the next year (2014), the highest values were 4.67 ± 0.09 followed by 4.19 ± 0.10 and 4.07 ± 0.15 in 16th, 17th and 18th SMW respectively. Step wise regression analysis revealed that maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity, sunshine hours and evaporation could explained 55 per cent variations in thrips population. Different thermal indices *viz*., growing degree days (GDD), heliothermal units (HTU), photothermal units (PTU), were cumulated up to peak population density and a positive and significant correlation was revealed. The best fit polynomial regression analysis indicated that thrips population could be predicted up to 95 per cent using these thermal indices. Thus, it was concluded that use of all these robust indices may be useful in assessing the pest-weather dynamics of mango growing region and serve as a basis for real time pest management advisory.

Keywords

Thermal indices; GDD; Mango; Thrips; Prediction model

Introduction

Mango (*Mangifera indica* L.), one of the major fruit crops of India, is known as the king of fruits for its sweetness, excellent flavour, delicious taste and high nutritive value [1]. It is attacked by several pests during its vegetative and reproductive phases [2]. During the reproductive phase of the crop, pests like hoppers and thrips pose a threat to mango production. Under the era of changing climatic situation, thrips are becoming serious pest on mango. Several species of thrips are observed in mango orchards in Florida, the Caribbean, Central and South America, and Asia [3-5]. Among the thrips species, *Scirtothrips dorsalis* and *Thrips hawaiiensis* were recorded as severe pests of various vegetables, fruits and ornamental crops in eastern Asia [6,7]. In India, *Thrips palmi* was recorded on mango inflorescence [8], from Andhra Pradesh three species of thrips *viz*., *Megalurothrips distalis* (Karny), *Thrips hawaiiensis* and *Haplothrips tenuipennis* are reported on mango [9-11]. Two species of thrips *Scirtothrips mangiferae* Hood and *S. dorsalis* Hood were reported by Kumar and Bhatt [12] respectively, from Gujarat on mango. Kumar et al. [13] reported from Cuttack that *Scirtothrips mangiferae*, *S. dorsalis*, *Rhipiphorothrips cruentatus* Hood are occurring on mango. From Haryana *R. cruentatus* was reported by Dahiya and Lakra [14]. Patel et al. [15] reported three species of thrips on mango rootstock viz., *Pantachaetothrips* sp., *Selenothrips rubrocinctus* Giard, *Caliothrips impurus* Priesner, besides *Scirtothrips dorsalis*. From Kerala Ananthakrishnan and Muraleedharan [16] reported *Selenothrips rubrocinctus* on mango. Recently *Frankliniell schultzei* and *Thrips subnudula* reported on inflorescence of mango from Tamil Nadu [17]. Thrips pose an increasing threat to mango production, which can cause considerable economic loss in mango orchards. Indiscriminate use of synthetic insecticides for routine thrips control is detrimental to non-target organisms and causes pesticide residues on food and in the environment. Other destructive consequences include the development of resistant pest populations, pest resurgence and the outbreak of secondary pest infestations [18,19]. To minimize harmful effects of synthetic pesticides, development of non-polluting plant protection strategies is necessary. For rational use of synthetic pesticides forewarning/prediction models for the destructive pest like thrips are need of the hour.

Thermal characteristics may vary among species, populations, developmental stages, and with other ecological factors such as food source [20-23]. This effect of temperature can be described by specific rate functions of temperature for development (thermal models), which are used in predicting insect pests interaction with biotic and abiotic factors [24]. The pest forecasting models facilitate better preparedness to combat outbreaks of serious insect pests by developing effective pest management strategies well in advance. The temperature-response phenology models simulate the variability in insect development times within a population based on the detailed laboratory assessments of the insect's life history and thus, can provide better results on future pest activity [25]. In this context this study aimed to develop weather based prediction models for mango thrips.

Materials and Methods

A field experiment was conducted for two consecutive seasons (2013 and 2014) on a *Typic ustochrepts* soil in Lucknow, Uttar Pradesh, India at 22 locations. The climate of the experimental site is semi-arid subtropical with hot dry summers and cold winters. Orchards of Mango cv. *Dashehari* of 20-35 years age were selected with planting 7.5×7.5 to 10×10 mt. Each orchard had at least 25 trees. Data on thrips population was recorded on weekly basis from 5 randomly selected trees in four direction of the tree. Thrips count was taken after gently tapping shoot or panicle by holding white paper in the palm. For analysis, mean count per shoot or panicle was taken and expressed as number of thrips per shoot or panicle. Daily weather data of temperature (maximum and minimum), relative humidity (morning and evening), rainfall, wind speed, bright sunshine hours

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