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Occurrence and Abundance of Thrips (Thysanoptera) Associated with Rice Crops from Meghalaya

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Abstract: *Studies were conducted during the month of June to November in the year 2009 to 2011 to determine the occurrence and abundance of thrips in rice field from Meghalaya. Specimens were collected from leaf blades from early nurseries to seedling and panicle stages. Sampling were done from four sites viz., Mawlai (25º 60' N 91º 90' E), Mylliem (25º 48' N 91º 82' E) (East Khasi Hills District), Nongjri (25º 74' N 91º 90' E) (Ri-Bhoi district) and Nongbah (25º 73' N 91º 88' E) (Jaintia Hills District). A total of five species of thrips belonging to 2 families (Thripidae and Phlaeothripidae) were recorded. Stencheatothrips biformis Bagnall was the dominant species accounting for 68% in abundance. This was followed by Anaphothrips sudanensis Tryborn comprising 17%. The other species include Haplothrips ceylonicus Schmutz, Haplothrips tenuipennis Bagnall and Bolacothrips indicus Ananthakrishnan which comprised of 10%, 3% and 2% respectively. The mean abundance of thrips was highest in the month of July and lowest in the month of November during each sampling period.*

Keywords: *Thrips, rice crop, occurrence, abundance, Meghalaya.*

1. INTRODUCTION

Rice, *Oryza sativa* L. is the staple food of about two-third of mankind. In India it forms one of the most important crops [1]. Rice cultivation in the NEH region of India is exposed to different biotic and abiotic stresses that include extreme temperatures at the time of flowering and grain filling stages thus resulting in a very dismal figure in rice productivity and production of the region which in turn reflects a lower per capita consumption as well. There are over 800 insect species damaging rice in one way or another, although the majority of them do very little damage. In tropical Asia only about 20 species are of major importance and of regular occurrence [2]. Several species that were earlier considered as minor pest have recently become major pests. Whereas the incidence of a few others has considerably declined [3].

Thrips are minute insects on average reaching no more than 1mm in length. Those with wings are weak fliers, but their wings are fringed with long setae [4]. Thysanoptera (thrips) includes insects with diverse life histories and habits. Most species feed on leaf, stem or flower tissues, though some feed on pollen and fungal hyphae or are predatory, and some are significant pollinators [5, 6, 7]. Thrips merit attention because they cause direct and indirect damage. They feed on plant tissue by rasping and sucking sap, resulting in tissue scarification and depletion of the plant's resources [8, 9]. Their preference to feed on young plants and ability to transmit diseases through saliva makes them detrimental early season pests to many different crops. Damage caused to crops includes stunted plant growth, leaf stippling, distortion, blemishes, slowed maturity, plant death, and reduction in yield and quality. Thrips damage is not readily apparent because the pest may not even be present by the time damage is noticeable. Oviposition and feeding injury causes direct damage to crops [10]. Study on rice thrips has been mostly done under field conditions with natural level of infestation [11, 12]. Abundance is an ecological concept referring to the relative representation of a species in a particular ecosystem. It is usually measured as the large number of individuals found per sample [13].

2. MATERIALS AND METHODS

2.1. Study Area Description

The study sites was carried out at Mawlai (25º 60' N 91º 90' E), Mylliem (25º 48' N 91º 82' E) (East Khasi Hills District), Nongjri (25º 74' N 91º 90' E) (Ri-Bhoi district) and Nongbah (25º 73' N 91º 88' E) (Jaintia Hills District) in Meghalaya, North East India and collection was focused mainly on rice fields as shown in (Figure 1 and 2). Thrip specimens were collected from rice fields right from their nurseries, seedling and panicle stage during the month of July to November in the year 2009 to 2011.

3. COLLECTING METHODS

Samples were collected from 1sq meter quadrate from the four corners of the fields using camel hair brush. Collected specimens were preserved in collection fluid containing 60% ethanol, glycerine and acetic acid @ 9:1:1 with Triton-X (0.1ml). Permanent mounting of the specimens were being done following the standard protocol [14]. Thrips specimen were being identified with the help of identification keys of J.M. Palmer, L.A. Mound & G.J. du Heaume, 1934 (Thysanoptera: CIE Guides to Insects of Importance to Man) [15] and J.S.Bhatti, 1982 (Revision of the Indian species of *Stenchaetothrips* Bangall. Oriental Insects, 16 (4):385-417 [16].

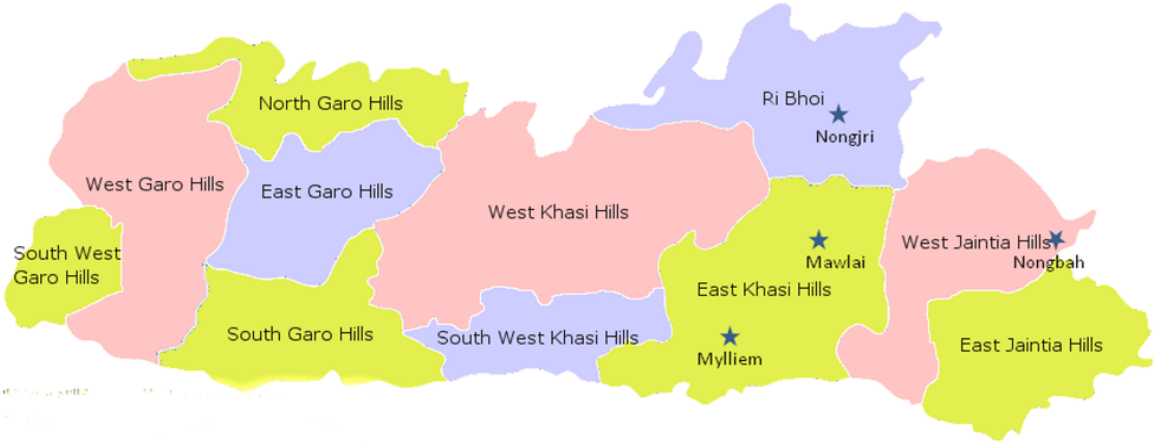

Figure 1. *Collection site of thrips in Meghalaya (*)*

Figure 2. *Study site at **a,** Mawlai. **b,** Mylliem. **c,** Nongjri. **d,** Nongbah.*

4. RESULTS AND DISCUSSION

Thrips collected from rice crops at Mawlai (Near NEHU Campus), Mylliem, Nongjri and Nongbah showed variations during the three years study. The abundance of thrips from the four sites show that *S.biformis* is found throughout the three years of study followed by *A.sudanensis*, *H.ceylonicus*, *H.tenuipennis* and *B.indicus* respectively. The maximum number of specimens was found in the month of July and minimum in mid-October to November (Figure 3). The sharp decrease in thrips population was probably due to slight altitudinal difference between the sites. The mean occurance of thrips throughout the study period shows that *S.biformis* (=63±4.15), is significantly higher as it could be observed in all the four sites during the study period right from the nursery to panicle stage, it was followed by *A.sudanensis* (=15.5±1.19), *H.ceylonicus* (=9.5±0.87), *H.tenuipennis* (=2.5±0.50) and *B.indicus* (=2±0) (Table 1**)**. There were significant differences in the abundance of thrips collected monthly as there were significant differences in the mean (± SE) number of individual species collected monthly (Table 2). Peak catches for *S.biformis* (= 18.25 ± 0.75), *A.sudanensis* (= 4.5 ± 0.29), and *H.ceylonicus* (=3±0.82) occurred in the month of July; while the peak capture of *H.tenuipennis* (=0.75±0.75) and *B.indicus* (=1±0.41) occurred in the month of September.

The damage shows severity during low rainfall as fields tends to dry out due to high temperature. The damage caused by the feeding of thrips becomes evident as yellow patches or streaks and result in curling of the leaves margin to the middle. In a heavy infestation the leaf tips wither off and the plant appear to be suffering from water strain. This leads to the stunt growth and severe loss of nutrients to rice crop due to the feeding infestation of thrips **(**Figure 4).

Table 1. *Mean (±SE) total rice thrips collected from the four sites in 2009-2011*

Species of thrips	Mean thrips (±SE)
S. biformis	63±4.15
A. sudanensis	15.5±1.19
H. ceylonicus	9.5±0.87
H. tenuipennis	2.5±0.50
B. indicus	2±0

Table 2. *Mean (±SE) monthly rice thrips species collected from the four sites in 2009-2011*

Month	S.biformis	A.sudanensis	H.ceylonicus	H.tenuipennis	B.indicus
July	18.25±0.75	4.5±0.29	3±0.82	0.5±0.29	0.75±0.25
August	15.25±1.18	3.75±0.63	2.5±0.50	0.75±0.25	0.25±0.25
September	13±0.91	2.5±0.29	2±0.41	0.75±0.75	1±0.41
October	9.5±1.04	2.75±0.25	0.5±0.29	0	0
November	7±1.08	2±0.58	1.5±0.29	0.5±0.29	0

The present study revealed five thrips species which occur on rice crop of which *S.biformis* was the abundant species. Its predominance is because of its consideration as the main rice thrips, further, it is distributed throughout south and south East Asia and is considered as a major pest in Bangladesh, China, India, Indonesia, Japan and Srilanka [17].

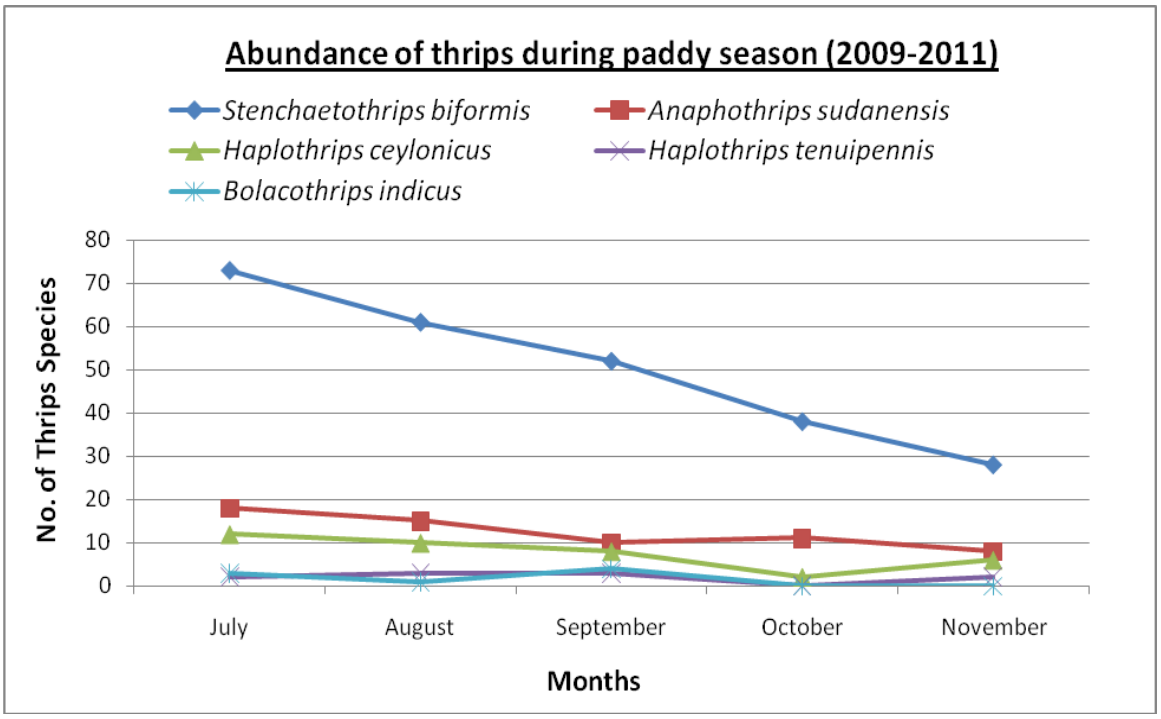

Figure 3. *Monthly abundance of each species in the year 2009-2011*

Figure 4. *Effects of Thrips infestation on paddy.*

Chatterjee also reported a severe outbreak of rice thrips from West Bengal in September 1986, wherein an estimated 60,000 ha was affected [18]. Studies by Dobson *et al.* and Akemo *et al.* indicated that the drier the weather, the quicker the onset of thrips damage and the more severe the symptoms [19, 20]. This was also true in our study, as a high thrips populations were observed in during low and infrequent rainfall. The occurance of *A.sudanensis*, *H.ceylonicus*, *H.tenuipennis* and *B.indicus* indicate that it may be due to the crop rotation practice in the region. As members of the *Anaphothrips* species are normally found on plants of the grass family, Poaceae [21], *Haplothrips* species breed almost exclusively in flowers, with many considered to be host specific [22]. They are particularly associated with the flower of Asteraceae, but considerable numbers are found in the flowers of Poaceae and Juncaceae or Cyperaceae [23, 24] and *Bolacothrips* species are considered to occur on grasses and on economic crops such as corn, rice, sugarcane and wheat [15]. There has been conspicuously little progress made in the chemical basis of thrips/host plant interactions since Kirk's review in 1995 [25]. A diversity of studies documented the variability in thrips performance and host selection based on plant genotype [26, 27, 28], plant parts and age [29, 30], or the influence of cultural conditions on thrips preference and performance [31, 32].

Advances studies have been made in identification of volatile attractants [33, 34, 35]. Very few studies, however, have advanced to the critical level of identifying ingested plant compounds that account for variable performance and host selection. Lack of data in the nutritional ecology of thrips has resulted in an even greater paucity in ecological theory concerning thrips nutrition. Exceptions exist, such as the effects/responses of thrips to plant inducible responses [36, 37]. A crude criterion such as measurements of thrips damage or total population sizes offer useful information in relation to host plant nutrients. As seen in one of the most comprehensive studies by Mollema and Cole (1996) who contrasted the nitrogen chemistry of a wide variety of accessions of four host species to damage by thrips in greenhouse tests [38].

5. CONCLUSION

On the basis of this study it can be concluded that thrips are serious pests due to their feeding by rasping the leaves and other tissues of plants to release the sap, reduces the plant's ability to produce food and interferes with transportation of foliar nutrients. The injury caused by their rasping on the leaves enables various plant pathogens also to gain entry, thus increasing disease problems. The study provides a basis for future improvement, particularly in relation to agriculture as it is for farmers to be aware of crop pest trends in their region and flexible in choosing both their management methods and in the crops they grow. Farmers closely monitoring the occurrence of pests in their fields and keeping records of the severity, frequency, and cost of managing pests over time will be in a better position to make decisions about whether it remains economical to continue growing a particular crop or use a certain pest management technique.

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