Morphological Taxonomy of Black Pepper (*Piper nigrum*) Leaf Gall Thrips in Sri Lanka

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ABSTRACT

In India and Sri Lanka, Leaf Gall Thrips(LGT) is considered among major pests of Black pepper (*Piper nigrum*). LGTs initially infest tender leaves causing tubular and hypophyllous galls along the leaf margin.*Gynaikothrips karnyi* was first recorded by Bagnall (1914) from Sri Lanka and subsequently by Ananthakrishnan(1952) in India. However, Tillakeratne et al(2012), identified only two species of Gynaikothrips in their extensive survey in 2005 - 2008, in which, *G. karnyi* is not included. In their checklist, *Liothrips karnyi* was mentioned to be infesting *Piper nigrum* L, forming leaf galls. Devasahayam(1994) mentions three species of thrips infesting the pepper leaf in India but *G. karnyi* has not been identified as a leaf gall forming species in pepper.This leads to a serious taxonomic confusion where the precise identification of the LGTs in pepper in Sri Lanka is debated. Therefore, the present study was intended to correctly identify the pepper LGTs in Sri Lanka through morphological examination.Live specimens of pepper thrips were collected from 5 districts and taxonomically investigated.Abdominal segment X is tubelike, forewing surface free of microtrichia,Maxillary stylets narrow,distance between midcoxae is broader than of hind coxae, abdominal segment IX shorter, forewings not banded,abdominal tergite with two pairs of wing retaining setae, cheeks without warts, forewing has parallel sides, maxillary bridge absent, stylets are retracted in to posterior margin of compound eyes, pronotum with five pairs of distinct setae, sculpture indistinct, both sexes lack fortarsal tooth. Mid and hind tibiae are yellowish in colour and antennal segments VII and VIII are uniformly pale as V and VI. These characteristic features lead the specimens to *Liothrips mirabilis* (Schumtz) belonging to Family Phlaeothripidae, Suborder Tubulifera, Subfamily Phlaeothripinae. This result updates the existing Thysanoptera checklist of Sri Lanka,confirming the confusing original description of *L. mirabilis* by Priesner(1968).

Key words : Black pepper, *Piper nigrum*, Leaf Gall Thrips, *Liothrips mirabilis, Gynaikothrips karnyi,*

Introduction

Black pepper (*Piper nigrum*) is a perennial flowering plant that belongs to the plant family *Piperaceae*. Being one of the most widely used spices in the world, it is known as the King of Spices. Infestation by insect pests is a main factor responsible for the low productivity of pepper in major pepper growing countries. In India and Sri Lanka, Leaf Gall Thrips (LGT) is considered among major pests of pepper (Ravindran, 2000). LGTs initially infest tender leaves resulting the margins curling inwards, causing tubular and hypophyllous galls along the leaf margin (Fig 1.0 A) The attacked leaves become undersized and pale, as the growth of the attacked veins gets arrested (Ravindran, 2000).

Fig 1.0 Pepper Leaf Gall Thrips **A -** Damage on Pepper Leaves **B -** Adult Thrips **C -** Nymph of Pepper Thrips

Devasahayam (1994) mentioned three species of thrips (Order Thysanoptera) infesting the pepper leaf in India : *Liothrips chavicae* Z., *L. karnyi* Bagn. and *L. pallipes* Karny. Sarma Y.R et al (1987) referred to this pest as marginal gall-forming thrips - *Liothrips karnyi* (Fig 1.0 B).
Visalakshi and Joseph (1966) stated that LGT, *Gynaikothrips karnyi* was first recorded by Bagnall (1914) from Sri Lanka and subsequently by Ananthakrishnan (1952) in India. However, according to Tillekaratne et al (2011), only two species of Gynaikothrips have been identified in their survey for thrips in Sri Lanka in 2005 - 2008, none of which is making galls on pepper leaves. In their checklist, *Liothrips karnyi* (Bagnall 1914) has been mentioned to be infesting *Piper nigrum* L, forming leaf galls.
This leads to a serious taxonomic confusion where the precise identification of the Gall forming thrips in black pepper in Sri Lanka is debated. Therefore, the present study was intended to correctly identify the Leaf Gall Thrips (LGT) in Sri Lanka through standard morphological taxonomic methods and record its identity, updating the country's existing thrips checklist.

Materials and Methods

Live specimens of pepper thrips were collected from hand-picked pepper leaves selected from 5 districts of Sri Lanka at the National Cinnamon Research and Training (NCRTC), Department of Export Agriculture, Thihagoda. The marginal leaf galls were carefully cut and opened to remove the adult pepper gall thrips and they were kept in the 5% NaOH liquid for the body contents to be cleared. Then the slides were prepared in Hoyer's media and mainly using standard and published morphological taxonomic keys provided by Mound, L.A. (2020) and Mound and Kibby (1998), they were subjected to taxonomic identification. Results were confirmed by Dr. Manfred R. Ulitzka, Research Entomologist, Offenburg, Germany.

Results and Discussion

Liothrips Uzel, 1895 is the largest genus in the subfamily Phlaeothripinae, comprising 283 named species. However, species identification in this genus is very difficult and only available identification key (Priesner 1953) is unreliable and misleading (Mound,2020).
The original description of *L. mirabilis* is confusing as it is stated to have been taken by Uzel on the leaves of *Pavetta hispida* and rolled leaf of a pepper plant in Peradeniya, Sri Lanka in 1902. Priesner in 1968 studied one specimen from the type series but could not say which plant it came from. He also did not study the original specimens of *karnyi* collected at Peradeniya in 1913, from pepper. He therefore placed *karnyi* twice in his key, providing opportunity for uncertainty. *Liothrips karnyi* and *Liothrips mirabilis* have the same unusual character state of

antennal segments VII and VIII as pale as V and VI thus it has been considered that they are a single species, known only from type specimens taken in Sri Lanka (Mound, 2020).
Abdominal segment X is tubelike (Fig 2.0 – A), forewing surface is free of microtrichia which is a characteristic feature of Family Phlaeothripidae, Suborder Tubulifera. Maxillary stylets are narrow as of Sub family Phlaeothripinae, distance between midcoxae is broader compared to that is of hind coxae, abdominal segment IX and tube are shorter, macropterous, forewings not banded, each abdominal tergite with two pairs of wing retaining setae, Male has no large tubercle on the inner margin of femur near base (Fig 2.0 – C) cheeks without warts, forewing has parallel sides (Fig 2.0 – B), maxillary bridge absent, and stylets are retracted in to the back margin of compound eyes, pronotum with five pairs of well-developed distinct setae, sculpture indistinct, both sexes lack foretarsal tooth. These characteristic features lead the specimens to the genus liothrips. Mid and hind tibiae are yellowish in colour (Fig 2.0 – B)and antennal segments VII and VIII are uniformly pale as V and VI (Fig 2.0 – C) as described for *Liothrips mirabilis*.

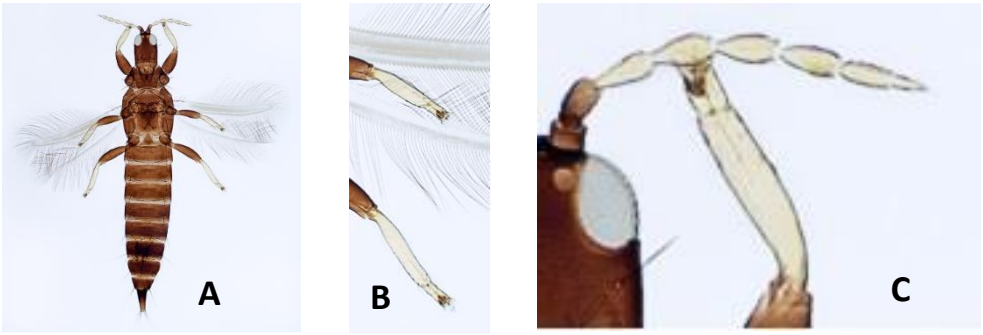

Figure 2.0 Pepper Leaf Gall Thrips (*L. mirabilis*) **A** - *L. mirabilis* **B** – Mid and hind tibia with fore wing, **C** – Antenna of *L. mirabilis*

Conclusion

This study taxonomically re-identifies the pepper leaf gall thrips as *Liothrips mirabilis* based on the latest taxonomic classification and updates the thrips checklist in Sri Lanka, resolving the historical taxonomic confusion on this species.

Reference

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