

A New Record of Fruit Fly *Trupanea amoena* (Frauenfeld) within Genus *Trupanea* Schrank of Subfamily Tephritinae (Diptera: Tephritidae) from Pakistan.

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Research Article

Received: 19/07/2013

Revised: 22/08/2013

Accepted: 28/08/2013

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Keywords: Tephritidae,
Trupanea, New record,
Identification, Morphological
characteristics, Pest.

ABSTRACT

This paper deals with new record and better description of Fruit fly *Trupanea amoena* (Frauenfeld) in Subfamily Tephritinae (Diptera: Tephritidae) which has been previously recorded from other regions of world. But, now it has been reported as a new pest from Pakistan infesting on cultivated and wild species of safflower (*Athamus tinctorius*). A diagnosis of this species collected from this locality is provided, and newly recorded species is illustrated and re-described with improved description. The morphological identity of *T. amoena* has been confirmed by comparing its morphologic characteristics data with the related species from the various regions as consulted in literature. The list of plant host as based sampling from host plant analysis is furnished from where immature stages of fly were recovered, and reliable literatures are presented for collected species. This study represents the first report and record of *T. amoena* from Swat valley of Pakistan.

INTRODUCTION

Within the family Tephritidae, the large colorfully marked pests are normally termed as “fruit flies”, but their larvae have an extremely diverse biology. The larvae of many fruit flies species grow in other portions of a plant, together with flower buds, seeds and stems of cultivated hosts. Most fruit flies taxa are widespread throughout the world and considered one of the most important pests, imposing huge losses to a broad array of agriculture and horticulture productions. Basically for subsistence farming, an extensive diversity of fleshy fruits and vegetables, are found in this country which provide reservoirs for fruit fly’s populations making the production of some varieties unprofitable [1,2]. The Tephritinae is considered the most specialized subfamily of fruit flies, predominantly infesting flower heads of Asteraceae [3].

The genus *Trupanea* Guettard is a group of small fruit fly species that have gray pollinose bodies, yellowish heads and legs, and wings with a distinctive star-like pattern. Males and females alike visit the flowers of a large number of plants of the family Compositae, and according to the scant biological literature treating this genus; the larvae inhabit ovaries of these flowers, thereby affecting to an unknown extent the production of seed. The genus *Trupanea* was erected without any included species by Guettard [4]. Most authors, under the impression that Guettard first used it prior to 1758, have credited Schrank (1795/ 1796) with the name. The *Trupanea amoena* (Frauenfeld) is a species of fruit fly or tephritid fly in the genus *Trupanea* Schrank of the family Tephritidae of order Diptera [5]. At world over, a lot of taxonomic work on this genus has been done by different researchers. In this regards, Hendel 1927 [6]; Seguy 1934 [7]; White 1988 [8]; Merz 1994 [9]; Merz 1999 [10]; Norrbom et al., 1999 [11]; Merz 2000 [12]; Merz 2001 [13]; Korneyev 2003 [14]; and Pape and Thompson 2013 [15]; described and gave drawings of new species, provided geographical distributions and new records of species and conferred the new classification system of species of this genus worldwide.

The Pakistan is best known for its wide variety of flora and fauna and has some of the world's most biodiversity. The Tephritidae fruit flies fauna of the Pakistan is scantily identified. Subsequently, the Scientists have discovered new species of fruit flies fauna in Pakistan and among the most significant are in the family Tephritidae.

During the study of tephritid flies fauna, one species of genus *Trupanea* was found to occur in this region. Illustrations and information on this fruit fly, its distribution, identification and host are given.

The classification and terminology of the family Tephritidae have been partly followed as given by McAlpine (1981) ^[16], Norrbom and Kim (1988) ^[17], Hancock and Drew (1994) ^[18] and mainly by Freidberg and Kugler (1989) ^[19].

MATERIALS AND METHODS

Sample collection

The specimens of fruit fly were collected from safflower (*Athamus tinctorius*) plants at Mingora which is located in the valley of Swat situated in the north of Khyber province in Pakistan. Collection site is enclosed by the mountains (34° 46' 33" north, 72° 21' 44" east Latitude/ longitude, and Altitude 951 m) locating at about 145 km North-West of the country's capital city Islamabad. The immature stages of fruit fly were obtained from dissections of flower heads of wild and cultivated safflower. Field collected samples of the immature stages of the fly collected from their hosts were then placed in collecting pans individually and transferred to laboratory. All collected samples were reserved in 75% alcohol and stored in laboratory before their taxonomic analysis.

Morphological identification

The whole samples were observed using Stereo Optical Microscope in order to verify the specimen's diagnosis based solely on morphological identification. The photos of detained samples, especially for the wings were captured using Confocal Optical Imaging System. Microscopic observations of samples showing morphological characteristics were harmonized with the diagnosis of *T. amoena*. The dimensions of adults were obtained by direct measurements of the specimens. All specimen images and adults captured are kept in Department of Entomology, University of Agriculture, Faisalabad, Pakistan.

RESULTS AND DISCUSSION

Genus *Trupanea* Schrank

- 1795 *Trupanea* Schrank, Naturh. u. Okonom. Briefe uber. Donaumoor, Mannheim, p. 47.
1830 *Urellia* Robineau-Desvoidy, Mem. Pres. Acad. Roy. Sci. Inst., 2: 774.
1846 *Trypanea* Agassiz, Nomen Zool., 9-10: 40.
1878 *Trypeta* Osten-Sacken, Smithson. Inst. Misc. Coll., 16 (270): 194.

Type: *Trupanea radiata* Schrank

The collected material of a single species exactly tallies with the published description of this genus by Kapoor (1993) ^[20] and largely conforms to Freidberg and Kugler (1989) ^[19], except gena 1.55 times wider than 3rd antennal segment and the latter 2.11 times longer than wide.

Trupanea amoena (Frauenfeld) (Figs. 1 and 2)

- 1857 *Trypeta amoena* Frauenfeld, Sber. Akad. Wiss, Wien, 22: 542.
1913 *Trypanea amoena* Bezzi, Mem. Ind. Mus., 3 (3): 167.
1959 *Trupanea amoena* Freidberg and Kugler, Fauna Palaestina Insecta IV-Diptera: Tephritidae, Israel Acad. Sci. Hum. Jeru., 212 pp.

MALE

Body length, 2.94 mm. Body colouration ground black with yellowish legs.

Head

Length, 0.53 mm. Width 2.12 times greater than length; frons 1.79 times wider than eyes, pale yellow, with lower part narrower than upper; frontal stripe light brown, with pale yellow hair; 3 pairs of inferior and 2 pairs of superior frontal orbital bristles; inferior pairs, lower superior pair and inner vertical bristles acuminate and brownish-yellow, upper superior pair, postocellar, postvertical, outer vertical pair and postorbital bristles lanceolate and pale yellow; ocellar triangle black, with bristles well developed having brown to black colouration; face concave, yellow, without any spot or band, 1.19 times longer than antenna, latter yellow, 1st and 2nd segments with brown to black hair, 3rd with dorsal surface concave and with distinct dorso-apical point which is 2.11 times longer than wide;

arista with short pubescence, black, fulvous basally; epistome projecting forward, yellow; gena 1.55 times wider than 3rd antennal segment, yellow, with 1 pair of brown to black bristles; subocular spot fulvous; mouthparts capitate; occiput black in upper part, remaining brownish-yellow.

Thorax

Length, 1.18 mm. Slightly shorter than abdomen (1.24 mm), entirely black (ground colour), with sparse grey pollinosity having pale yellow thick hair; notopleural area normally yellow; scutellum small, almost triangular, convex, its ground colour almost black, sparsely pollinose, with pale yellow hair; subscutellum, postnotum, anatergite, katatergite and mediotergite black in ground colour; haltere yellow; scapular setae absent.

Setae

Hm. 2, *a.npl.* 2, *p.npl.* 2, *mpl.* 2, *pt.* 2, *st.* 2, *a.sa.* 2, *p.sa.* 2, *prstv.* 2 (situated away from suture), *psu.* 2 (close to suture), *ia.* 2, *prsc.* 2, *sc.* 2 (basal), all stout, acuminate, yellowish-brown except posterior notopleural seta whitish-yellow and lanceolate.

Legs

Light yellow, fore femur with lateral and ventral and fore tarsus on anterior side with long yellowish-brown hair, mid tibia with 1 black apical spur.

Wings

(Fig. 1). Length, 3.59 mm. Longer than body (2.94 mm), with brown star-shaped pattern (stellate); 1st ray faint, incomplete, extending from stigma to vein M; brown spot present on vein CuA1; 2nd ray starting from costal margin, extending up to the cross vein r-m, united with star in cell r 2+3; subapical spot with 3 rays up to the posterior margin in cell m; vein R 4+5 without setulae; posterior cubital cell with very short extension; supernumerary lobe not developed.

Abdomen

Length, 1.24 mm. Ground colour black, thin pollinosity, pale yellow hair, terga I-II dorso-ventrally with some yellowish colouration, V with yellow to brown bristles on posterior and lateral margins.

FEMALE

Body length, 4.05 mm. It tallies with the male except the following:-

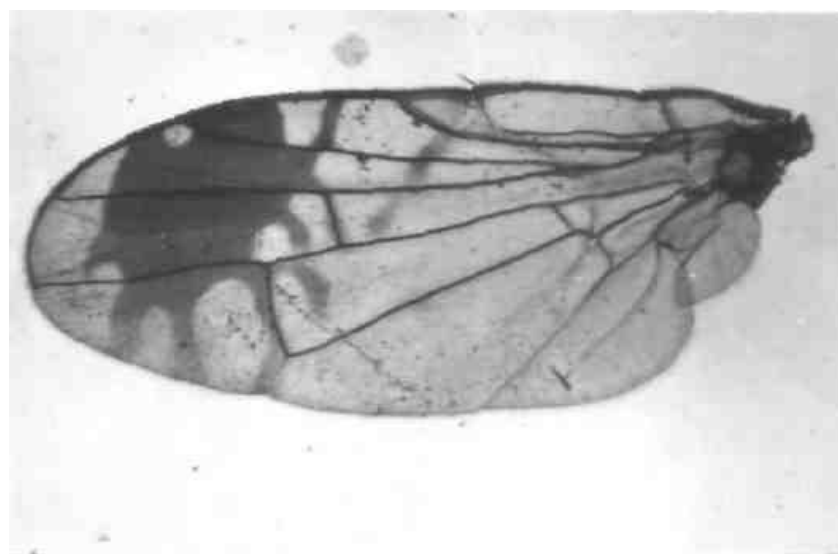


Figure 1: *Trupanea amoena* Wing

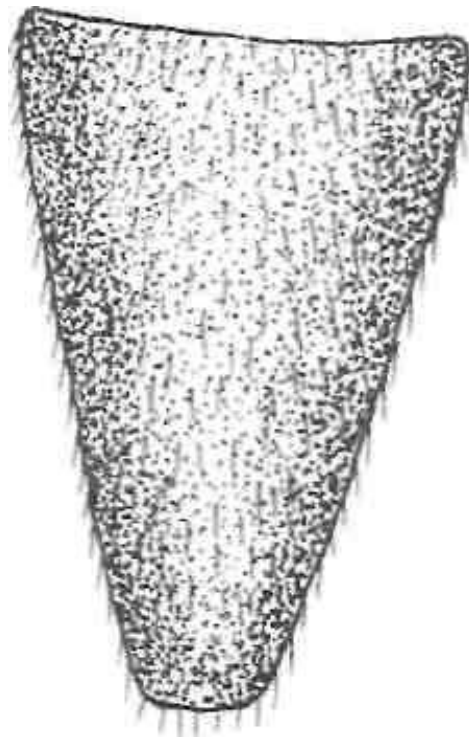


Figure 2. *Trupanea amoena* Oviscape

Setulae present on node of vein R 4+5; vein CuA1 without spot; thorax (1.47 mm) equal to preabdomen (1.47 mm); hair on fore tarsus absent; VI tergum with pale yellow hair; only oviscape (Fig. 2) visible, 0.83 mm long, shorter than preabdomen (1.47 mm), shiny brown, black apically, its basal half with pale yellow while apical half with brown hair.

Measurements (mm): 1 Male and 1 Female

Body parts	Male	Female
B.L.	2.94	4.05
H.L.	0.53	0.53
H.H.	0.65	0.76
H.W.	1.12	1.12
FR.W.	0.52	0.52
E.W.	0.29	0.29
A.L.	0.36	0.38
A.S3.L.	0.19	0.19
A.S3.W.	0.09	0.09
F.L.	0.43	0.48
G.W.	0.14	0.16
T.L.	1.18	1.47
T.W.	0.94	1.00
W.L.	3.59	3.65
PA.L.	1.24	1.47
OS.L.	—	0.83
H.W./ H.H.	1.73	1.47
H.W./ H.L.	2.12	2.12
H.H./ H.L.	1.25	1.44
FR.W./ E.W.	1.79	1.79
F.L./ A.L.	1.19	1.26
A.S3.L./ A.S3.W.	2.11	2.11
G.W./ A.S3.W.	1.55	1.77
T.L./ T.W.	1.25	1.47
Material examined: 1 Male and 1 Female (20-11-1996)		

In traditional classification, the differences between males and females are most obvious in nearly every specimen in the wing pattern. The male wings tend to have larger hyaline areas, with the dark markings correspondingly reduced, broken, or sometimes completely absent. However, further studies are needed with more specimens for the systemic analysis of species correlation and the confirmation of the molecular identification techniques.

Habitat

Adults were reared from maggots feeding in the flower heads of safflower (*Athamus tinctorius*) collected from Mingora (Swat) (Pakistan). All the type specimens have been deposited in the Insect Museum, Department of Agricultural Entomology, University of Agriculture, Faisalabad, Pakistan.

Based upon the findings of the present study, it can be fairly concluded that the Islamic Republic of Pakistan has a variable agricultural farming system. This was the first report of *T. amoena* in this locality. It is significant for plant protection practice to heavily diminish its population in all states of world using elimination, suppression and eradication techniques. The trapping male and female adults and male annihilation technique (MAT) with pheromone might be useful methods. Conversely, when the MAT technique is not effectual, the killing of pupae with ecologically pleasant insecticides can moreover be supportive. In addition to biological control means, the use of pupal parasitoid ought to be looked upon as well. More concentration must also be paid to the potential geographical distribution of *T. amoena*, suitable outbreak season and areas particularly in safflower cultivations.

Moreover, studies on population genetics of *T. amoena* are compulsory for Swat valley, by means of further sampling from additional locations. Such studies could elucidate the origin, pathway and invasion of this insect in this locality. It is not apparent that whether the spread of this species to some of the regions, has been by disaster by human activities or stretched from adjoining regions by natural ways. Potential hosts from areas where there are records of *T. amoena* and from suitable distribution areas of this pest ought to be quarantined and controlled rigorously, in order to prevent further invasion of this hazardous fruit fly in the other localities. Integrated management technique of control of fruit fly might have a significant effect over other methods of control to minimize infestation and reduction in the yield losses generally occurring due to this most important insect pest.

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