**SHODH SAMAGAM**

**ISSN : 2581-6918 (Online), 2582-1792 (PRINT)**

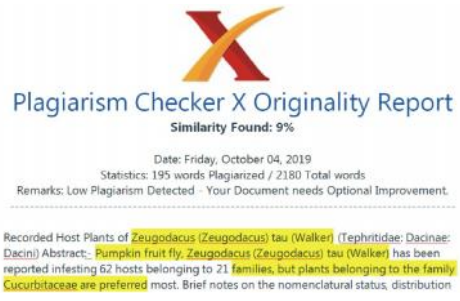
# Recorded Host Plants of Zeugodacus (Zeugodacus) tau (Walker) (Tephritidae: Dacinae: Dacini)

**Md. Abbas Ahmad,** Assistant Professor, Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa (Samastipur), India
**A. Vasudha**, Research Scholar, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India

**ORIGINAL ARTICLE**


Corresponding Author's :
**Md. Abbas Ahmad,** Assistant Professor, Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa (Samastipur), India
**A. Vasudha**, Research Scholar, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India
shodhsamagam1@gmail.com

Received on : 04/10/2019
Revised on : -----
Accepted on : 11/10/2019
Plagiarism : 09% on 04/10/2019


Plagiarism Checker X Originality Report
Similarity Found: 9%

Date: Friday, October 04, 2019
Statistics: 195 words Plagiarized / 2180 Total words
Remarks: Low Plagiarism Detected - Your Document needs Optional Improvement.

Recorded Host Plants of Zeugodacus (Zeugodacus) tau (Walker) (Tephritidae: Dacinae: Dacini) Abstract:- Pumpkin fruit fly, Zeugodacus (Zeugodacus) tau (Walker) has been reported infesting 62 hosts belonging to 21 families, but plants belonging to the family Cucurbitaceae are preferred most. Brief notes on the nomenclatural status, distribution

## Abstract :-

Pumpkin fruit fly, Zeugodacus (Zeugodacus) tau (Walker) has been reported infesting 62 hosts belonging to 21 families, but plants belonging to the family Cucurbitaceae are preferred most. Brief notes on the nomenclatural status, distribution and nature of infestation and damage have also been added.

## Key Words :-

Zeugodacus (Zeugodacus) tau, host plants, Dacinae, Dacini, Distribution, infestation

## Introduction :-

Pumpkin fruit fly, Zeugodacus (Zeugodacus) tau (Walker) (=Bactrocera (Zeugodacus) tau) damages 62 host plants species belonging to 21 families, but plants belonging to the family Cucurbitaceae are preferred most (Vasudha et al., 2019). It mainly attacks cucurbits and infestation intensifies when the population of its homologue species melon fly, Zeugodacus (Zeugodacus) cucurbitae is low. Competition between the two species is frequently seen in cucurbit hosts (Kapoor, 2004). Larvae of both species compete for resource exploitation and Z. cucurbitae took advantage over Z. tau at the high-density level and at low and high temperature conditions. Competitions mainly affected the puparial mass and the survival rate of the two species but had no marked effect

on the puparial duration or development duration (Shen et al., 2014).

Zeugodacus tau females prefer to lay the eggs in soft tender host tissues by piercing them with the ovipositor. A watery fluid oozes from the puncture, which transforms into a brown resinous deposit. Maggots feed inside the host and oviposition punctures and larval tunnels provide entry points for bacteria and fungi that cause the fruit to rot. Infested fruits become distorted and usually drop. The fallen fruits are unfit for human consumption and have no market value (Vasudha, 2019). The extent of losses varies between 30 to 100 per cent, depending on the cucurbit species and the season. The losses caused in fruit crops by insect pests particularly by Z. tau have been estimated to be as high as 40 per cent of the production in Indonesia (Hasyim et al., 2004). Borah and Dutta (1997) reported that in Assam during Kharif and summer 1995-96, Z. tau and Callantra [=Dacus] sp. were found infesting cucurbit vegetables and snake gourd had the highest fruit infestation (62.62 per cent). In Himachal Pradesh the 80 per cent losses of vegetable crops have been reported by Z. tau and complex species (Prabhakar et al., 2009; Sood et al., 2010). Jaleel et al. (2018) reported that Z. tau is causing approximately 30-40 per cent losses of agricultural products every year in Asia. The Z. tau contains a complex of sibling species that called the Z. tau complex. Z. tau and complex species feed on varieties of agricultural crops (Allwood et al., 1999; Shi et al., 2017).

## Nomenclature status :-

**Fig. 1. Zeugodacus tau, male**

Zeugodacus tau (Fig. 1) was described by Walker in 1849 from Fujian: Foochow (China) in the genus Dasyneura. Zia (1937) placed Z. tau in the genus Chaetodacus. Hardy (1959) treated it as a species belonging to the genus Dacus (Zeugodacus). White and Elson-Harris (1992) considered it a species under the genus Bactrocera and subgenus Zeugodacus. It has been known as Dacus pictus Froggatt, Chaetodacus tau (Walker), Dacus caudatus var. nubilus Hendel, D. hageni Meijere, D. nubilus Hendel, D. tau (Walker), Dasyneura tau Walker, Z. nubilus ssp. femoralis Hendel, Dacus (Zeugodacus) elegantis Tseng, Chen & Chu and Dacus (Zeugodacus) flavus Tseng, Chen & Chu. Z. tau is a very common species throughout south-east Asia. It is an economic pest species, mainly infesting cucurbit crops, but can be misidentified as it belongs to a complex (Z. tau-complex) of closely related species. Virgilio et al. (2015) investigated phylogenetic relationships within and among subtribes of the fruit fly tribe Dacini by sequencing four mitochondrial and one nuclear gene fragment and proved the monophyly of the Dacini. They raised the subgenus Bactrocera (Zeugodacus) to generic rank, Zeugodacus Hendel, stat. nov. and placed all species of subgenus (Zeugodacus) in the genus Zeugodacus. Doorenweerd et al. (2018) published a global checklist of all 932 species of the tribe Dacini; of these 24 species were included in Z. tau complex. David and Ramani (2019) attempted to analyse phylogenetic relationships between three genera of the tribe Dacini, viz. Bactrocera, Dacus and Zeugodacus from India based on morphological characters. Cladistic analysis revealed the monophyly of Dacini, Bactrocera and Dacus with supporting non-homplasious synapomorphies. Zeugodacus was retrieved as a monophyletic sister-group to Dacus.

## Distribution :-

The distributional records of Z. tau are based on Agarwal and Sueyoshi (2005), Drew and Romig (2013), EPPO (2015) and CABI (2018).

India (Andaman & Nicobar Is., Andhra Pradesh, Arunachal Pradesh, Bihar, Haryana, Himachal Pradesh, Chattisgarh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Meghalaya, Punjab, Sikkim, Mizoram, Tripura, Tamil Nadu, Uttrakhand, Uttar Pradesh, W. Bengal), Bhutan, Pakistan, Myanmar, Singapore, China (n. to Xizang, Chongqing, Shaanxi, Sichuan, Hubei, Guangdong, Hainan, Hong Kong, Guangxi, Yunnan, Zhejiang, Guizhou, Fujian Provinces), Bhutan, Bangladesh, Sri Lanka, Nepal, Taiwan, Laos, Philippines, Thailand, Cambodia, Vietnam, East Malaysia (Sabah, Sarawak), Peninsular Malaysia, Singapore, Brunei Darussalam, Indonesia (Sumatra, Bali, Java, Sulawesi), trapped Japan (Ishigaki Island).

## Infestation and damage :-

Female flies prefer to lay eggs in tender host tissues by piercing them with ovipositor. In many hosts a watery fluid oozes from the puncture, which subsequently transforms into a brown resinous deposit. The damage to crops results from: (i) oviposition, (ii) larval feeding, and (iii) decomposition of host tissue due to invasion of secondary microorganisms (bacteria and fungi). Infested hosts (Fig. 2) become distorted, callused and usually drop (Vasudha and Agarwal, 2019). Extent of damage done by these flies depends upon their population density; hosts' availability, size and condition; and weather factors. Larvae bore their way into interior of the host, macerate the tissues and ingest the broken-down tissues and associated bacteria. Larval feeding converts the host tissues into a semi-liquid bad smelling mass.

**Fig. 2. Infested bitter gourd by Zeugodacus tau larvae**

Crop loss is often >60 per cent (Kapoor, 1993). The extent of losses done by fruit flies varies between 30 to 100 per cent, depending on the cucurbit species and the season (Dhillon et al., 2005). The fruit loss in passion caused by Z. tau was estimated as high as 40 per cent of the production (Hasyim et al. 2004). Hasyim et al. (2008) reported that percentage of damaged passion fruits by Z. tau was approximately 20 per cent in plot where sanitation was commenced while in other two plots it was 30-40 per cent.

## Hosts :-

In India, hosts of fruit flies have been listed by Narayanan (1953), Narayanan and Batra (1960), Kapoor (1970), Kapoor and Agarwal (1983), Kapoor (1993). Batra (1968) listed hosts of Z. tau [(named as Dacus (Zeugodacus) hageni de Meijere (= D.caudatus Fabricius)] from India. Agarwal (1984) listed hosts of Z. tau from Bihar. White and Elson-Harris (1992) gave a

list of hosts of economically important fruit fly species occurring in different areas of the world. Allwood et al. (1999) listed hosts of fruit flies from south-east Asia. Hosts of Z. tau belong to the families: Anacardiaceae, Cucurbitaceae, Elaeocarpaceae, Moraceae, Myrtaceae, Oxalidaceae, Rutaceae, Sapotaceae, Solanaceae (Carroll et al., 2004 onwards). Kapoor (2005/ 6) and Singh et al. (2010) mentioned that it especially infests cucurbitaceous plants and other fleshy fruits. Drew and Romig (2013) mentioned that this fly has been reported infesting fruits of nine plant families but primarily species of Cucurbitaceae and listed some new hosts. Plant Health Australia (2016) also mentioned that fruits of families Arecaceae, Curcurbitaceae, Fabaceae, Loganiaceae, Moraceae, Myrtaceae, Oleaceae, Sapotaceae and Vitaceae are infested by this fly. USDA (2016) published a probable host list of Z. tau to prevent the dissemination and establishment of this pest in United States. Liquido et al. (2016) mentioned that Z. tau infests 77 suitable hosts while 30 are undetermined hosts. Hosts of Z. tau have also been listed on the websites of CABI (2018) and by Jaleel et al. (2018). Z. tau co-exists with Z. cucurbitae and they infest nearly same hosts. A list of hosts of Z. tau is given in table- 1.

**Table 1. List of host plants of Zeugodacus tau***

| Family | Common name | Scientific name | Reference(s) |
|---|---|---|---|
| ACHARIACEAE | - | Hydnocarpus anthelminticus | Jamnongluk et al. (2003); Sumrandee et al. (2011) |
| ANACARDIACEAE | Machang/ horse mango/malmut/ bachang | Mangifera foetida | White and Elson-Harris (1992) |
| ANACARDIACEAE | Mango | Mangifera indica | Narayanan and Batra(1960); Batra (1968); Kapoor (1970); Koizumi and Yamamoto (1972); Wee and Shelly (2013); CABI (2018 ) |
| ARECACEAE | Asian palmyra palm/ toddy palm/ sugar palm | Borassus flabellifer | Borah and Dutta (1996); Allwood et al. (1999); CABI (2018 ) |
| CARICACEAE | Papaya | Carica papaya | Borah and Dutta (1996) |
| CELASTRACEAE | Hyunja | Siphonodon celastrineus | Thanaphum and Thaenkham (2003) |
| CUCURBITACEAE | White gourd or wax gourd | Benincasa hispida | Batra (1968); Kapoor (1993); Huque (2006); CABI (2018) |
| CUCURBITACEAE | Colocynth, bitter apple, bitter cucumber, vine of Sodom | Citrullus colocynthis | White and Elson-Harris (1992) |
| CUCURBITACEAE | Watermelon | Citrullus lanatus | Narayanan and Batra (1960); Kapoor (1993); CABI (2018) |
| CUCURBITACEAE | Ivy gourd; voigt scarlet gourd | Coccinia grandis | Allwood et al. (1999); Baimai et al. (2000); Kitthawee and Dujardin (2010) |
| CUCURBITACEAE | Melon | Cucumis melo | Narayanan and Batra (1960); Koizumi and Yamamoto (1972); Allwood et al. (1999); Drew and Romig (2013); CABI (2018) |

| | | | |
|---|---|---|---|
| CUCURBITACEAE | Cucumber | Cucumis sativus | Narayanan and Batra (1960); Batra (1968); Kapoor (1970); Allwood et al. (1999); Huque (2006); Thakur and Gupta (2012); CABI (2018) |
| CUCURBITACEAE | Giant pumpkin | Cucurbita maxima | Narayanan and Batra (1960); Batra (1968); Kapoor (1970); Huque (2006); Singh et al. (2010); CABI (2018) |
| CUCURBITACEAE | Pumpkin, winter squash | Cucurbita moschata | Narayanan and Batra (1960); Jamnongluk et al. (2003); Sumrandee et al. (2011); Guoping et al. (2015); CABI (2018) |
| CUCURBITACEAE | Marrow, field pumpkin | Cucurbita pepo | Allwood et al. (1999); Prabhakar et al. (2009); Shen et al. (2014); CABI (2018) |
| CUCURBITACEAE | Bryony/striped cucumber | Diplocyclos palmatus | Koizumi and Yamamoto (1972); Kapoor (1993) |
| CUCURBITACEAE | Mao zhui xing guo | Gomphogyne cissiformis | Allwood et al. (1999) |
| CUCURBITACEAE | Bottle gourd, calabash | Lagenaria siceraria | Batra (1968); Kapoor (1970); Koizumi and Yamamoto (1972); White and Elson Harris (1992); Kapoor (1993) Prabhakar et al. (2009) |
| CUCURBITACEAE | Ribbed gourd, angled luffa | Luffa acutangula | Narayanan and Batra (1960); Batra (1968); Kapoor (1970); Koizumi and Yamamoto (1972); Drew and Romig (2013); CABI (2018) |
| CUCURBITACEAE | Sponge gourd, smooth luffa, Egyptian luffa | Luffa aegyptica | Narayanan and Batra (1960); Kapoor (1970); Kapoor (1993); Borah and Dutta (1996); Allwood et al. (1999); CABI (2018) |
| CUCURBITACEAE | Vernonia Tree, serpent gourd, padwal | Gymnopetalum integrifolium | Allwood et al. (1999) |
| CUCURBITACEAE | Chinese lardfruit | Hodgsonia macrocarpa | Allwood et al. (1999) |
| CUCURBITACEAE | Chui Guo Ma Die Er | Zehneria wallichii | Allwood et al. (1999) |
| CUCURBITACEAE | Bitter gourd | Momordica charantia | Kapoor (1970); White and Elson-Harris (1992); Kapoor (1993); Allwood et al. (1999); Prabhakar et al. (2009); Shen et al. (2014); CABI (2018) |

| | | | |
|---|---|---|---|
| CUCURBITACEAE | Spiny bitter cucumber, Gac fruit, Kakrol, Kakur, Kantola | Momordica cochinchinensis | Allwood et al. (1999); Sumrandee et al. (2011) |
| CUCURBITACEAE | Monk fruit | Siraitia grosvenorii | Liu et al. (2005) |
| CUCURBITACEAE | Macassar ebony | Trichosanthes celebica | Allwood et al. (1999) |
| CUCURBITACEAE | Snake gourd, serpent gourd, chichinga | Trichosanthes cucumerina | Narayanan and Batra (1960); Batra (1968); Kapoor (1970); Kapoor (1993); Allwood et al. (1999); Baimai et al. (2000); Huque (2006); CABI (2018) |
| CUCURBITACEAE | Parval or pointed gourd | Trichosanthes dioica | Huque (2006) |
| CUCURBITACEAE | Japanese snake gourd | Trichosanthes ovigera | Christenson and Foote (1960); Allwood et al. (1999) |
| CUCURBITACEAE | - | Trichosanthes pubera subsp. rubriflos | Allwood et al. (1999) |
| CUCURBITACEAE | Mahakal, Indrayan | Trichosanthes tricuspidata | Narayanan and Batra (1960); Kapoor (1970); Allwood et al. (1999); Sumrandee et al. (2011) |
| CUCURBITACEAE | - | Trichosanthes wallichiana | Allwood et al. (1999) |
| CUCURBITACEAE | Lollipop climber | Bryonia lacinosa | Narayanan and Batra (1960); Kapoor (1970) |
| FABACEAE | Common bean, kidney bean | Phaseolus vulgaris | Borah and Dutta (1996);Allwood et al. (1999); CABI (2018) |
| GENTIANACEAE | Perfume flower tree, pua keni keni, trai tichlan | Fagraea ceilanica | Allwood et al. (1999) |
| LOGANIACEAE | Nux vomica | Strychnos nux-vomica | Allwood et al. (1999) |
| LOGANIACEAE | - | Strychnos rupicola | Allwood et al. (1999) |
| MELASTOMATACEAE | Malabar melastome, Indian -rhododendron, Shapti | Melastoma malabathrica | Drew and Romig (2013) |
| MORACEAE | Jackfruit | Artocarpus heterophyllus | White and Elson-Harris (1992); Kapoor (1993); Drew and Romig (2013) |
| MORACEAE | Cluster fig, Indian fig | Ficus racemosa | Borah and Dutta (1996); Allwood et al. (1999); CABI (2018) |
| MORACEAE | Dye fig, humped fig | Ficus tinctoria | Drew and Romig (2013) |
| MORACEAE | Mulberry | Morus sp. | White and Elson-Harris (1992) (unconfirmed record) |

| | | | |
|---|---|---|---|
| MUNTINGIACEAE | Calabur tree, Jamaica cherry, Panama berry | Muntingia calabura | White and Elson-Harris (1992) |
| MYRTACEAE | Wax apple, water apple, rose apple | Syzygium samarangense | Christenson and Foote (1960); Kapoor (1970); White and Elson-Harris (1992); Kapoor (1993) |
| MYRTACEAE | Malay rose apple, otaheite cashew, pommerac | Syzygium malaccense | White and Elson-Harris (1992) |
| MYRTACEAE | Guava | Psidium guajava | Allwood et al. (1999); Wee and Shelly (2013); CABI (2018) |
| MYRTACEAE | Malabar plum, mountain App | Syzygium jambos | Drew and Romig (2013) |
| OLEACEAE | Chathuravalli, Chathuramulla | Myxopyrum smilacifolium | Allwood et al. (1999) |
| OXALIDACEAE | Star fruit | Averrhoa carambola | Koizumi and Yamamoto (1972); Wee and Shelly (2013) |
| PASSIFLORACEAE | Passion fruit | Passiflora edulis | Octriana (2010); Drew and Romig (2013); Hasyim et al. (2008); CABI (2018) |
| RUBIACEAE | Great morinda, Indian mulberry, beach mulberry | Morinda citrifolia | Drew and Romig (2013) |
| RUTACEAE | Pomelo | Citrus maxima | Narayanan and Batra (1960); Kapoor (1970); Kapoor (1993) |
| RUTACEAE | Mandarin Tangerine | Citrus reticulata | Wu et al. (2011); Zhang et al. (2012) |
| RUTACEAE | Orange | C. sinensis | Zhang et al. (2012) |
| SAPINDACEAE | Longan | Dimocarpus longan | Borah and Dutta (1996), CABI (2018) |
| SAPOTACEAEA | Sapota, sapodilla | Manilkara zapota | Narayanan and Batra (1960); Kapoor (1970); Borah and Dutta (1996); Drew and Romig (2013); CABI (2018) |
| SOLANACEAE | Bell pepper, paprika | Capsicum annum | Borah and Dutta (1996); Pal and Choudhuri (2007); CABI (2018) |
| SOLANACEAE | Chilli pepper | Capsicum frutescens | Borah and Dutta (1996); Wang (1996) |
| SOLANACEAE | Tomato | Solanum lycopersicum | Narayanan and Batra (1960); Batra (1960); Kapoor (1970); Koizumi and Yamamoto (1972); Boopathi et al. (2017) |
| VITACEAE | Bherseri | Tetrastigma lanceolarium | Allwood et al. (1999) |
| VITACEAE | Grapes | Vitis vinifera | Margosian et al. (2007) |

*Hosts of Zeugodacus tau as cited in probable host list (USDA, 2016) to prevent the dissemination and establishment of Zeugodacus tau in the United States are not included.

## Conclusion :-

Pumpkin fruit fly, Zeugodacus (Zeugodacus) tau (Walker) has been reporting 62 hosts and mostly prefers cucurbits. The fly is well distributed throughout India and south-east Asia. It damages hosts due to larval feeding and decomposition of host tissue due to invasion of secondary microorganisms (bacteria and fungi). Its population can be kept under threshold levels through effective management strategies in crop fields by employing in a unified programme with community approaches for getting better results.

## References :-

1. *Agarwal, M.L. 1984. Fruit flies (Diptera: Tephritidae) and their host plants in Bihar. Biol. Bull. India, 6(2): 76-82.*
2. *Agarwal, M.L. and Sueyoshi, M. 2005. Catalogue of Indian fruit flies (Diptera: Tephritidae). Oriental Insects, 39: 371-433.*
3. *Allwood, A.J., Chinajariyawong, A., Kritsaneepaiboon, S., Drew, R.A.I., Hamacek, E.L. and Hancock, D.L. Hengsawad, C., Jipanin, J.C., Jirasurat, M., Kong Krong, C., Leong, C.T.S. and Vijaysegaran, S. 1999. Host plant records for fruit flies (Diptera: Tephritidae) in South East Asia. Raffles Bull. Zool., Suppl. 7: 1-92.*
4. *Baimai, V., Phinchongsakuldit, J., Sumrandee, C. and Tigvattananont, S. 2000. Cytological evidence for a complex of species within the taxon Bactrocera tau (Diptera: Tephritidae) in Thailand. Biol. J. Linn. Soc. 69: 399-409.*
5. *Batra, H.N. 1968. Biology and bionomics of Dacus hageni de Meijere. Indian J. Agric. Sci.38(6): 1015-1020.*
6. *Boopathi, T., Singh, S.B., Manju, T., Chowdhury Samik, Singh, A.R., Dutta, S.K., Dayal, V., Behere, G.T., Ngachan, S.V., Hazarika, S. and Rahman, S.M.A. 2017. First report of economic injury to tomato due to Zeugodacus tau (Diptera: Tephritidae): relative abundance and effects of cultivar and season on injury. Fla. Entomol. 100(1): 63-69.*
7. *Borah, S.R. and Dutta, S.K. 1997. Infestation of fruit fly in some cucurbitaceous vegetables. J. Agril. Sci. Soc. North-East India, 10(1): 128-131.*
8. *CABI, 2018. Bactrocera tau. Invasive species compendium. https://www.cabi.org/isc/datasheet/8741*
9. *Carroll, L.E., Norrbom, A.L., Dallwitz, M.J. and Thompson, F.C.2004 onwards. Pest fruit flies of the world - larvae. Bactrocera tau (Walker). Version: 8th December 2006. http://delta-intkey.com*
10. *Christenson, L.D. and Foote, R.H. 1960. Biology of fruit flies. Annu. Rev. Entomol. 5: 171-192.*
11. *David, K.J. and Ramani, S. 2019. New species, redescriptions and phylogenetic revision of tribe Dacini (Diptera: Tephritidae: Dacinae) from India based on morphological characters. Zootaxa, 4551(2): 101-146*

12. *Dhillon, M.K., Singh, R., Naresh, J.S. and Sharma, H.C. 2005. The melon fruit fly, Bactrocera cucurbitae: A review of its biology and management. 16pp. J. Insect Sci.5: 40.*

13 *Doorenweerd, C., Leblanc, L., Norrbom, A.L., San Jose, M. and Rubinoff, D. 2018.A global checklist of the 932 fruit fly species in the tribe Dacini (Diptera, Tephritidae). ZooKeys, 730: 17-54.*

14. *Drew, R.A.I. and Romig, M.C. 2013. Tropical Fruit Flies (Tephritidae: Dacinae) of South-East Asia. CAB International, Wallingford, 653 pp.*

15. *EPPO, 2015. EPPO Technical Document No. 1068, EPPO study on pest risks associated with the import of tomato fruit. EPPO, Paris. Bactrocera tau (Diptera: Tephritidae). https://gd.eppo.int/download/doc / 424_minids_BCTRTA.pdf*

16. *Guoping, Z., Lili, R., Ying, S., Qiaoling, W., Daojian, Y., Yuejin, W. and Tianxiu, L. 2015. Gamma irradiation as a phytosanitary treatment of Bactrocera tau (Diptera: Tephritidae) in pumpkin fruits. J. Econ. Entomol. 108: 88-94.*

17. *Hardy, D.E. 1959. The Walker types of fruit flies (Tephritidae- Diptera) in the British Museum collection. Bull. Br. Mus. (Nat. Hist.) Entomol. 8: 159-242.*

18. *Hasyim, A., Muryati, and de Kogel, W.J. 2008. Population fluctuation of adult males of the fruit fly, Bactrocera tau Walker (Diptera: Tephritidae) in passion fruit orchards in relation to abiotic factors and sanitation. Indonesian J. Agric. Sci. 9(1): 29-33.*

19. *Hasyim, A., Muryati, Khairul, M., Riska and Kogel, W.J. de, 2004. Fruit fly control in Indonesia. Annual Report, Research Institute of Fruit Solok. Unpublished Report (In Bahasa Indonesia).*

20. *Huque, R. 2006. Comparative studies on the susceptibility of various vegetables to Bactrocera tau (Diptera: Tephritidae). Pak. J. Biol. Sci. 9: 93-95.*

21. *Jaleel, W., Lu, L. and He, Y. 2018. Biology, taxonomy, and IPM strategies of Bactrocera tau Walker and complex species (Diptera: Tephritidae) in Asia: a comprehensive review. Environ. Sci. Pollut. Res. 25(10): 19346-19361.*

22. *Jamnongluk, W., Baimai, V. and Kittayapong, P. 2003. Molecular phylogeny of tephritid fruit flies in the Bactrocera tau complex using the mitochondrial COI sequences. Genome, 46: 112-118.*

23. *Kapoor, V.C. 1970. Indian Tephritidae with their recorded hosts. Oriental Ins.4(2): 207-251.*

24. *Kapoor, V.C. 1993. Indian Fruit Flies, Insecta: Diptera: Tephritidae. Oxford & IBH Publ. Co., N. Delhi, 228 pp.*

25. *Kapoor, V.C. 2004. Fruit fly pests and their present status in India.In: Proc. 6th Int. Fruit Fly Symp.,6-10 May 2002, Stellenbosch, South Africa, Barnes, B.N. (ed.), ARC, Irene: Isteg Scientific Publ., S. Africa, pp. 23-33.*

26. *Kapoor, V.C. 2005/06. Taxonomy and biology of economically important fruit flies of India. In: Biotaxonomy of Tephritoidea. Isr. J. Entomol. 35-36: 459-475*

27. *Kapoor, V.C. and Agarwal, M.L. 1983. Fruit flies and their increasing host plants in India. pp. 252-257. In: Fruit Flies of Economic Importance. Cavalloro, R. (ed.),CEC/IOBC Symp. Athens 1982. Balkema, Rotterdam.*

28. *Kitthawee, S. and Dujardin, J.-P. 2010. The geometric approach to explore the Bactrocera tau complex (Diptera: Tephritidae) in Thailand. Zoology, 113: 243-249.*

29. *Kitthawee, S. and Dujardin, J.-P. 2010. The geometric approach to explore the Bactrocera tau complex (Diptera: Tephritidae) in Thailand. Zoology, 113: 243-249.*

30. *Koizumi, K. and Yamamoto, M. 1972. Seguro-uri-mibae [Dacus (Zeugodacus) tau (Walker)]. Kôbe Shokubutsubôeki Jôhô, 622: 10-12 (in Japanese).*

31. *Liquido, N., McQuate, G. and Suiter, K. 2016. USDA Compendium of fruit fly host information (CoFFHI) In: Proc. 9th Int. Symp. Fruit Flies of Economic Importance(ISFFEI), 12-16 May 2014, Bangkok, Thailand. Sabater-Muñoz, B., Vera, T., Pereira, R. and Orankanok, W. (eds.), pp. 420-434.*

32. *Liu, L.H., Liu, Y.H., Zhou, B., and Zhang, Y.Q. 2005. Studies of the damage caused by Bactrocera tau Walker (Trypetidae: Bactrocera) and its quantity dynamics in different host fields. J.S.W. Agril. Univ. Chonggingi China, 27(2): 176-179.*

33. *Margosian, M.L., Bertone, C.A., Borchert, D.M. & Takeuchi, Y. 2007. Identification of areas susceptible to the establishment of fifty-three Bactrocera spp. (Diptera: Tephritidae: Dacinae) in the United States. USDA Report Publication, California, 42 pp.*

34. *Narayanan, E.S. 1953. Seasonal pests of crops. Indian Farming, 3(4): 8-11 & 29-31.*

35. *Narayanan, E.S. and Batra, H.N. 1960. Fruit Flies and Their Control. ICAR. Publ. N. Delhi, 60 pp.*

36. *Octriana, L. 2010. Identifikasi dan analisis tingkat parasitasi jenis parasitoid terhadap hama lalat buah Bactrocera tau pada tanaman markisa. J. Hort. 20(2): 179-185.*

37. *Plant Health Australia, 2016. The Australian Handbook for the Identification of Fruit Flies. Version 2.1. Plant Health Australia. Canberra, ACT. http://www.planthealthaustralia.com.au/wp-content/uploads/2016/05/Handbook-for-the-identification-of-fruit-fly.pdf*

38. *Prabhakar, C.S., Sood, P., Mehta, P.K. and Choudhary. A. 2009. Distribution and developmental biology of fruit flies infesting cucurbits in North-western Himalaya. J. Insect Sci.Ludhiana, 22(3): 300-308.*

39. *Shen, K., Hu, J., Wu, B., An, K., Zhang, J. Liu, J. and Zhang, R. 2014. Competitive Interactions between Immature stages of Bactrocera cucurbitae (Coquillett) and Bactrocera tau (Walker) (Diptera: Tephritidae) under laboratory conditions. Neotrop. Entomol. 43(4): 335-343.*

40. *Shi, W., Yang, T.-Y., Ye, H. and Cao, J. 2017. Impact of host plants on genetic variation in the Bactrocera tau (Diptera: Tephritidae) based on molecular markers. J. Entomol. Sci. 52(4): 411-426.*

41. *Singh, S.K., Kumar, D. and Ramamurthy, V.V. 2010. Biology of Bactrocera (Zeugodacus) tau (Walker) (Diptera: Tephritidae). Entomol. Res.40: 259-263.*

42. *Sood, P., Prabhakar, C. and Mehta, P. 2010. Eco-friendly management of fruit flies through their gut bacteria. J. Insect Sci. Ludhiana, 23(3): 275-283.*

43. *Sumrandee, C., Milne, J.R. and Baimai, V. 2011. Ovipositor morphology and host relations of the Bactrocera tau complex (Diptera: Tephritidae) in Thailand. Songklanakarin J. Sci. Technol. 33(3): 23-24.*

44. *Thakur, M. and Gupta, D. 2012. Effect of different plant extracts on reproduction of fruit fly Bactrocera tau (Walker). Biopestic. Int. 8: 32-37.*

45. *Thanaphum, S. and Thaenkham, U. 2003. Relationships of forms within the Bactrocera tau (Walker) (Diptera: Tephritidae) taxon based on heat shock protein 70 cognate sequences. Ann. Entomol. Soc. Am. 96: 44-53.*

46. *USDA, 2016. Fruit fly host lists and host assessments. Bactrocera tau Host List 2016. https://www.aphis.usda.gov/plant_health/plant_pest_info/fruit_flies/downloads/host-lists/bactrocera-tau-host-list.pdf*

47. *Vasudha, A. 2019. Biology, population dynamics and trapping of Zeugodacus (Zeugodacus) tau (Walker) (Diptera: Tephritidae) M.Sc. (Ag.) Thesis, RPCAU, Pusa (Samastipur) (unpublished).*

48. *Vasudha, A. Ahmad, M.A. and Agarwal, M.L. 2019. Life history traits and immature stages of Zeugodacus (Zeugodacus) tau (Walker) (Diptera: Tephritidae).J. Entomol. Zool. Studies, 7(2): 1149-1153.*

49. *Vasudha, A. and Agarwal, M.L. 2019. Management of Dacine fruit flies (Tephritidae: Dacinae: Dacini) in horticultural ecosystems: A review. J. Entomol. Zool. Studies, 7(3): 33-42.*

50. *Virgilio, M., Jordaens, K., Verwimp, C., White, I.M. and De Meyer, M. 2015. Higher phylogeny of frugivorous flies (Diptera, Tephritidae, Dacini): Localised partition conflicts and a novel generic classification. Mol. Phylogenet. Evol. 85: 171-179.*

51. *Walker, F. 1849. List of the specimens of dipterous insects in the collection of the British Museum. Part IV. Brit. Mus. (Nat. Hist.), London, p. [3] + 689-1172.*

52. *Wang, X.J. 1996. The fruit flies (Diptera: Tephritidae) of the East Asian region. Acta Zootaxon. Sin. 21: 1-338.*

53. *Wee, S.L. and Shelly, T. 2013. Capture of Bactrocera fruit flies in traps baited with liquid versus solid formulations of male lures in Malaysia. J. Asia Pac. Entomol. 116(1): 37-42.*

54. *White, I.M. and Elson-Harris, M.M. 1992. Fruit Flies of Economic Significance: Their Identification and Bionomics, CAB. Int. Publ., Wallingford, 512 pp.*

55. *Wu, B., Shen, K., An, K., Huang, J. and Zhang, R. 2011. Effect of larval density and host species on preimaginal development of Bactrocera tau (Diptera: Tephritidae). J. Econ. Entomol. 104: 1840-1850.*

56. *Zhang, G.N., Hu, F., Dou, W. and Wang, J.J. 2012. Morphology and distribution of sensilla on tarsi and ovipositors of six fruit flies (Diptera: Tephritidae). Ann. Entomol. Soc. Am. 105: 319-327*

57. *Zia, Y. 1937. Study on the Trypetidae or fruit flies of China. Sinensia, 8(2): 103-226, pls. 6.*

********