



## WHITEFLIES (ALEYRODIDAE: HOMOPTERA) OF PUNJAB, PAKISTAN

Muhammad Tayyib, Anjum Suhail, Muhammad Jalal Arif and Muhammad Aslam Khan

Department of Entomology, University of Agriculture, Faisalabad  
Department of Plant Pathology, University of Agriculture, Faisalabad

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### \*Corresponding Author:

Muhammad Tayyib

Email: [muhammadyayib81@yahoo.com](mailto:muhammadyayib81@yahoo.com)

### ABSTRACT

The whiteflies collected from various localities of the Punjab Province have resulted in the identification of one subfamily, 19 genera and 70 species. Of these, four genera, namely *Aleuroclava*, *Dialeurolobus*, *Singhius* and *Tetraleurodes* and 27 species are new records for Pakistan, while 10 species, viz., *Aleuroclava agranosa*, *A. suturalis*, *Aleurolobus dentatus*, *A. porus*, *Aleurotrachelus setosus*, *Bemisia elongata*, *B. maculata*, *Dialeurodes dorsalis*, *Pealius pakistanensis* and *Tetraleurodes aporus* are new to science.

**Keywords:** Diversity, Pakistan, whiteflies

### INTRODUCTION

Whiteflies being polyphagous feed on a large number of host plants like field crops, fruit trees, vegetables, ornamentals and weeds. However, the magnitude of infestation and the nature and extent of injury vary with plant species, seasons and localities. Of various species of whiteflies, the cotton whitefly, *Bemisia tabaci*, is highly polyphagous and has been recorded feeding on 540 host plants belonging to 77 families (Basu, 1995). This may be attributed to the presence of biotypes (A and B) in this species, especially the 'B' biotype which is a very voracious feeder.

Whiteflies are phytophagous insects which generally feed on the lower side of plant leaves. They damage the cultivated crops in a number of ways. They suck the sap from the leaves and weaken the plants resulting in low fruiting with reduced yield. They excrete large amounts of honeydew and throw it on different parts of plants. The sooty mould grows on it and interferes with the process of photosynthesis. It also soils the plants and the plant products. They inject toxic saliva into the plants, which results in plant disorders. They also act as vectors of many plant viruses, which adversely affect the growth and yield of crops.

Economically, the whiteflies are serious pests of crops and cause heavy losses in them in Pakistan. For example, the American varieties of cotton failed completely during 1919

and 1926 and partially in 1921, 1923 and 1927 due to the heavy attacks of cotton whitefly (Husain and Trehan, 1933). A serious outbreak of cotton whitefly, *Bemisia tabaci*, occurred in August, 1974 and completely destroyed the crop in parts of Lahore, Sahiwal, Faisalabad, Jhang, Sargodha and Rahim yar Khan districts where majority of the farmers had to plough up their cotton fields (Yunus *et al.*, 1980). In 1991-92, the whitefly transmitted Gemini virus caused a loss of 68.5% in susceptible cotton varieties in the Punjab Province. Some fields were completely damaged and ploughed up (Ali *et al.*, 1995). In 1995, the cotton whitefly caused a decline of 2.25 million bales of cotton by transmitting the Gemini virus in Pakistan (Anonymous, 1996). During September, 1996, the cotton whitefly appeared in an epidemic form and resulted in complete or partial failure of the crop at different places in Bahawalpur region (Aheer *et al.*, 1999). Three species of whiteflies, viz., *Aleurolobus barodensis*, *Neomaskellia bergii* and *N. Andropogonis*, have been recorded on sugarcane in Pakistan, of which the former two were very serious. These whiteflies resulted a loss of 30-40 per cent in sucrose and 20-25 per cent in total solids every year. In severe cases, the juice quality also adversely affected (Singh *et al.*, 1956). Similarly, seven whitefly species have been reported damaging the citrus plants, of which *Dialeurodes citri*, *D. elongata*, *Aleurolobus citrifolii*, *Aleurocanthus husaini* and *A. woglumi* are major pests in different parts of the Punjab. These pests

greatly reduce the vigour and yield by de-sapping the plants (Husain and Khan, 1945).

Despite their great economic importance, very little taxonomic work has been done on these insects in Pakistan. Martin and Mound (2007) listed 1556 species from different countries of the world and various workers have identified nearly 180 species from India, but in Pakistan only 43 valid species have been reported. Besides, the excessive use of agrochemicals and the changes in climatic factors have resulted in changes in the biodiversity in the agricultural landscapes. The present research was, therefore, undertaken to further investigate and understand the whitefly diversity in the Punjab Province of Pakistan.

## MATERIALS AND METHODS

The Pupal cases on the leaves of different types of vegetation were collected during the years 2008-2010 from 20 different localities of the Punjab Province, viz., Bahawalpur, Bhukkar, Chakwal, Dera Ghazi Khan, Faisalabad, Gujrat, Islamabad, Jhelum, Kallar Kahar, Lahore, Lodhran, Multan, Muree, Okara, Rahim Yar Khan, Rawalpindi, Sahiwal, Sargodha, Sialkot and Vehari. The leaves having Pupal cases on them were detached and brought to the laboratory in paper envelopes after writing the name of locality, host plant and date of collection on them. The pupal cases were removed from the leaves with a fine needle and preserved in 75 per cent alcohol in vials.

For identification of these specimens, the permanent slides were prepared according to Martin (1987) with little modifications, as given below.

1. The pupal cases were punctured from the ventral surface with a minuten pin and gently heated to the boiling point in 5-10 per cent KOH in a watch glass for 5-10 minutes to remove their inner body contents.
2. Then they were treated with glacial acetic acid to neutralize the alkali.
3. The pupal cases were thereafter treated with chloral phenol and heated for a few minutes to remove the wax coating present on them.
4. The black pupae were rinsed in alcohol and then treated with hydrogen peroxide to bleach their colour. They were then left as such. The white and pale cases were rinsed in glacial acetic acid and then stained with acid fuchsin for a few minutes.
5. After this, the specimens were treated with 95 and 100 per cent alcohol each for 5-10 minutes to remove the excessive stain.
6. Finally, the pupal cases were mounted in Hoyer's medium on microscopic slides, which were dried at room temperature for 24 hours.

The specimens were identified with the help of a phase-contrast microscope with magnifications of 40X, 100X and 400X up to the species level.

## RESULTS

The present research regarding the taxonomic study of whiteflies collected from 20 localities of the Punjab Province during the years 2008-2010 has yielded the following 70

species in 19 genera and one subfamily, of which 10 species are new to science and 4 genera and 27 species are new records for Pakistan.

Family: Aleyrodidae

Subfamily: Aleyrodinae

Genus *Acaudaleyrodes* Takahashi

1. *A. rachipora* (Singh)

Genus *Aleurocanthus* Quaintance & Baker

2. *A. clitoriae* Jesudasan & David (New record in Pakistan)
3. *A. davidi* David & Subramaniam (New record in Pakistan)
4. *A. lobulatus* Jesudasan & David (New record in Pakistan)
5. *A. russellae* Jesudasan & David
6. *A. spiniferus* (Quaintance) (New record in Pakistan)
7. *A. woglumi* Ashby

Genus *Aleuroclava* Singh (New record in Pakistan)

8. *A. agranosa* sp. nov.
9. *A. citri* Jesudasan & David (New record in Pakistan)
10. *A. citrifolii* (Corbett)
11. *A. cordii* (Qureshi)
12. *A. davidi* (Qureshi)
13. *A. evanantiae* Jesudasan & David (New record in Pakistan)
14. *A. kavalurensis* Jesudasan & David (New record in Pakistan)
15. *A. maximus* (Qureshi)
16. *A. murrayae* (Singh)
17. *A. pongamiae* Jesudasan & David (New record in Pakistan)
18. *A. psidii* (Singh)
19. *A. submarginatus* (Qureshi)
20. *A. suturalis* sp. nov.

Genus *Aleurolobus* Quaintance & Baker

21. *A. azimae* Jesudasan & David (New record in Pakistan)
22. *A. barleriae* Jesudasan & David (New record in Pakistan)
23. *A. barodensis* (Maskell)
24. *A. cassiae* Jesudasan & David (New record in Pakistan)
25. *A. dentatus* sp. nov.
26. *A. hederiae* Takahashi (New record in Pakistan)
27. *A. karunkuliensis* Jesudasan & David (New record in Pakistan)
28. *A. marlatti* (Quaintance)
29. *A. musae* Corbett (New record in Pakistan)
30. *A. porus* sp. nov.
31. *A. spinosus* Jesudasan & David (New record in Pakistan)
32. *A. walayarensis* Jesudasan & David (New record in Pakistan)

Genus *Aleuroplatus* Quaintance & Baker

33. *A. pectiniferus* Quaintance & Baker

Genus *Aleurotrachelus* Quaintance & Baker

34. *A. caerulescens* Singh
35. *A. setosus* sp. nov.

Genus *Bemisia* Quaintance & Baker

36. *B. afer* (Priesner & Hosny)
37. *B. elongata* sp. nov.

38. *B. giffardi* (Kotinsky)  
 39. *B. grossa* Singh (New record in Pakistan)  
 40. *B. leakii* (Peal) (New record in Pakistan)  
 41. *B. maculata* sp.nov.  
 42. *B. tabaci* (Gennadius)  
 Genus *Dialeurodes* Cockerell  
 43. *D. abbotabadensis* Qureshi  
 44. *D. anjumi* Qureshi  
 45. *D. cardamomi* David & Subramaniam (New record in Pakistan)  
 46. *D. citri* (Ashmead)  
 47. *D. dorsalis* sp.nov.  
 48. *D. kirkaldyi* (Kotinsky)  
 49. *D. rotunda* Singh (New record in Pakistan)  
 50. *D. vulgaris* Singh (New record in Pakistan)  
 Genus *Dialeurolobus* Danzig (New record in Pakistan)  
 51. *D. pulcher* Danzig (New record in Pakistan)  
 Genus *Dialeurolonga* Dozier  
 52. *D. elongata* Dozier  
 53. *D. lagerstroemiae* Jesudasan & David (New record in Pakistan)  
 Genus *Dialeuropora* Quaintance & Baker  
 54. *D. decempuncta* Quaintance & Baker  
 Genus *Neomaskellia* Quaintance & Baker  
 55. *N. andropogonis* Corbett  
 56. *N. bergii* (Signoret) (New record in Pakistan)  
 Genus *Pealius* Quaintance & Baker  
 57. *P. ayubiensis* Qureshi  
 58. *P. misrae* Singh (New record in Pakistan)  
 59. *P. moazzami* Qureshi  
 60. *P. mori* (Takahashi)  
 61. *P. pakistanensis* sp.nov.  
 62. *P. porus* Qureshi  
 Genus *Rhachisphora* Quaintance & Baker  
 63. *R. trilobitoides* (Quaintance & Baker)  
 Genus *Singhiella* Sampson  
 64. *S. bicolor* (Singh)  
 65. *S. crenulata* Qureshi & Qayyum  
 Genus *Singhius* Takahashi (New record in Pakistan)  
 66. *S. hibisci* (Kotinsky) (New record in Pakistan)  
 Genus *Tetraleurodes* Cockerell (New record in Pakistan)  
 67. *T. aporus* sp.nov.  
 Genus *Trialeurodes* Cockerell  
 68. *T. tricini* (Misra)  
 69. *T. vaporariorum* (Westwood)  
 Genus *Viennotaleyrodes* Cohic  
 70. *V. megapapillae* (Singh) (New record in Pakistan)

## DISCUSSION

In the present investigation, 70 species in 19 genera have been identified from the Punjab Province. Previously 50 species in 17 genera from Pakistan (Qureshi and Qayyum, 1969, 1970; Qureshi, 1978- 82, 1988, 1990, 1994; Qureshi and Halimie, 1980) and 31 species in 15 genera from Punjab (Mukhtar, 1997; Yousuf *et al.*, 1998) were recorded. It may be attributed to the poor and not intensive collection of the above mentioned workers.

Three genera, viz., *Aleuroclava*, *Singhius*, and *Tetraleurodes* which were previously found in the neighbouring country of India have been recorded for the first time in Pakistan. It is

very interesting to mention that the genus *Dialeurolobus* found in Russia and Korea has been collected here and presents a new record for the entire Indo-Pakistan subcontinent. In addition, description of 10 new species along with new records of 27 species appears to have made remarkable and valuable additions to the existing whitefly fauna of Pakistan.

There are already many aleurodid species, which are serious pests of economical crops in Pakistan. Now there is an addition of 27 newly recorded species on different host plants. In future, a number of these species may attain the status of economic pests of some valuable crops. So, the present research gives an alarming signal to the applied entomologists and crop growers to be watchful about such a situation.

The newly recorded species, *Dialeurolobus pulcher*, which has been collected in fairly large numbers from Beri (*Zizyphus jujube*) may become a serious pest of this fruit plant in future.

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