Short note [Nota corta]

INFESTATION OF CITRUS BLACK FLY, *Aleurocanthus woglumi* ASHBY, 1915 (HEMIPTERA: ALEYRODIDAE) IN AN AGROECOLOGICAL ORCHARD IN PARAÍBA STATE[1]

[INFESTACIÓN DE LA MOSCA NEGRA DE LOS CÍTRICOS, *Aleurocanthus woglumi* ASHBY, 1915 (HEMIPTERA: ALEYRODIDAE) EN UNA HUERTA AGROECOLÓGICA EN EL ESTADO DE PARAÍBA]

Geisa Mayana Miranda Souza*, Daniele Lavra Vieira, Roberio de Oliveira, Mileny dos Santos Souza, Joalisson Goncalves da Silva and Jacinto de Luna Batista

Departament Fitossanidade, Universidad Federal de Paraíba, Brazil.
Email: geisamayana@yahoo.com.br
**Corresponding author*

SUMMARY

Aleurocanthus woglumi is present in Paraíba state since 2009, causing a lot of damage to the citrus production in the State. There is a lack of knowledge about the bioecology of this Aleyrodidae member under the climatic conditions of Paraíba State. Thus, in order to know the population density of the pest and study the interference of climatic factors upon these insects, yellow sticky traps were installed evenly distributed in the orchard in the agroecological citrus property in Areia city, in Paraiba state. There were two distinct population peaks of the pest, one in September 2011 and another in April 2012. The lowest densities of the pest were recorded between October and December 2011, a period in which there was no new budding. The population monitoring of *A. woglumi* in Paraiba state has allowed knowing the time in which the insect occurs in the orchard and the variations in the number of individuals throughout time.

Key words: Integrated management; quarantine pest; traps.

RESUMEN

Aleurocanthus woglumi está presente en el estado de Paraíba desde 2009, causando mucho daño a la producción de cítricos en el Estado. Hay una falta de conocimiento sobre la bioecología de este miembro de los Aleyrodidae en las condiciones climáticas del estado de Paraíba. Por lo tanto, con el fin de conocer la densidad de población de la plaga y estudiar la interferencia de factores climáticos en estos insectos, se instalaron trampas pegajosas amarillas uniformemente distribuida en el huerto de cítricos agroecológico propiedad de la ciudad de Areia, en el estado de Paraiba. Hubo dos picos poblacionales distintos de la plaga, una en septiembre de 2011 y otra en abril de 2012. Las densidades más bajas de la plaga se registraron entre octubre y diciembre de 2011, un período en el que no había nuevos brotes. El seguimiento de las poblaciones de *A. woglumi* en el estado de Paraiba ha permitido conocer el tiempo en el que el insecto se produce en la huerta y las variaciones en el número de individuos a través del tiempo.

Palabras clave: Gestión integrada; plaga cuarentenaria; trampas.

[1] *Submitted May 26, 2014 – Accepted February 02, 2017.*

INTRODUCTION

The citrus black fly *Aleurocanthus woglumi* Ashby, 1915 is an exotic pest and at this time is widely spread in some Brazilian States, being considered as a present quarantine pest (A2) (Silva *et al.*, 2011). Despite the huge list of hosts cited by Oliveira *et al.* (1999), the citrus is especially chosen by this Aleyrodidae which directly affects Brazil's citrus fruit production, because it is more a polyphagous and phytophagous pest, causing serious damage to the culture.

In Brazil the national production of orange has reached values of 20 million tons, being the State of São Paulo the largest producer of fruit with 79.7% of the production. The State of Paraíba collaborates with 22.175 tons produced (IBGE, 2010), this production is still considered as incipient. As well as in other regions of the country the arrival of the pest in the State of Paraiba has concerned the citrus producers. The citrus black fly has been recorded in 14 cities of Paraíba infesting around 1.800 hectares (Lopes *et al.*, 2010). The model of citrus exploitation in Paraíba fits in the molds of ecological agriculture characterized by family agriculture.

The great damage that *A. woglumi* causes to producers is due to the feeding habit of the pest in sucking the sap of the plant, reducing this way, the assimilated compounds, furthermore, it releases an exudate which provides the presence of sooty mould (*Capnodium sp*.) in the leaves and fruit (Oliveira *et al.*, 1999; Nguyen and Hamon, 2003), thereby preventing its commercialization.

The initial outbreaks of the citrus black fly usually occur in small groups and in isolated trees in urban areas. The visual method (estimating the infestation during 10 minutes/man/tree) cited by Dowell *et al.* (1981), in Florida, United States, proved to be effective in determining the absence or presence of the insect. Hart (1979) showed that the yellow traps may indicate the presence where visual inspection is not enough.

There are three basic guidelines that facilitate the detection of *A. woglumi*: field inspections to verify the presence of adults should be made preferably in new budding; the eggs of *A. woglumi* tend to be grouped on the abaxial part of the leaf; in high infestations the citrus black fly is easily perceived for being always associated to the presence of sooty mould (*Capnodium sp*.) in the leaves and fruit.

According to Oliveira *et al.* (2001) the younger leaves may harbor eggs and nymphs of first instar and the older leaves may harbor nymphs of second to fourth instars. Inspections of pests in commercial plantations in Brazil have used two different sampling criteria. The first, defined by Gravena (2002) consists of taking 1% of sample plants in areas above 1.000 plants and in smaller orchards with at least 10 plants. Santos Filho *et al.* (2002) have defined 10 plants every five hectares and 20 plants in areas larger than five hectares.

The monitoring of *A. woglumi* constitutes an important tool for the management of exotic pests. The polyphagous behavior and the availability of hosts require the use of different methods and the knowledge of the agro-ecosystem (Andrade *et al.*, 2009), being the first step towards the establishment of strategies for the control of the citrus black fly in Paraíba state, as well as in other States.

Aiming the economic importance of the citrus black fly for the local citrus agro-ecosystem and the lack of detailed information about the population distribution of this species in the region, it was aimed to know the population variation of this pest and to study the interference of climatic factors upon these insects.

MATERIAL AND METHODS

The experimental area is located in Areia city, PB, microregion of Brejo and mesoregion of Agreste from Paraíba state, Northeastern , Brazil, showing a climate AS type (hot and humid), according to the Köppen classification (1948), corresponding to the humid environment, with an annual average rainfall close to 1.500 mm/year and air relative humidity around 75 to 87%. The annual average temperature oscillates between 22 to 26° C (Brazil, 1972), with the highest rates of rainfall in July (253 mm) and the lowest in November (23.4 mm).

The area selected for the deployment of the research is cultivated in the mold of agroecological production being composed by tangerine plants from the "Dancy" variety grafted in a ten years old "clove" lemon (*Citrus limonia*). However, there is a diversification of citrus species and varieties in the property which has 12 hectares. The area does not use chemical products for fertilization or phytosanitary treatment.

Level of infestation

The level of infestation of the citrus black fly was determined through sampling, using yellow sticky traps of 10 cm x 30 cm, evenly spread at the height of 1,5 m of the plant canopy. It was carried out 17 evaluations in 15 plants of the plot from August 2011 to April 2012.

The traps were exchanged every 15 days and those used before the exchange were covered by silk paper

all over the surface and transported to the Laboratory of Entomology in the Department of Plant and Environmental Sciences at the Federal University of Paraiba - UFPB, Campus II, Areia city, PB. In the lab, the captured insects were counted with the aid of a stereoscopic microscope, increasing 20 times.

Climatic data of the evaluation period

The meteorological data were obtained from the agroclimatic station of the Federal University of Paraíba, Campus II, Areia city. For the comparison between climatic variables and the curves of population fluctuation of adults, it was used the maximum and minimum temperatures, relative humidity and the sum of accumulated rainfall.

Data analysis

The average number of counted adults was multiplied by 80 (total area of capture) to estimate the total number of adults per trap. Correlation analysis was performed between the number of insects (males, females and total) and climatic variables, monthly average temperature (°C), relative humidity (%), and the sum of monthly rainfall (mm) (SAS, 2001).

RESULTS AND DISCUSSION

Level of infestation

Two distinct population peaks of the pest were observed during the evaluated period, being one in September 2011 and another in April 2012. It was possible to perceive a trend of population growth from February 2012 (Figure 1), after a period of intense rainfall (Figure 3) which was also found by Silva *et al.* (2011) in the agroforest cultivation in the mesoregion from Guamá (Pará), which attributed the population increase of the citrus black fly to the fact that plants after the rainy season release more new budding which are suitable for the pest oviposition. This demonstrates a relationship between the phonological phase in the plant and the insect pest oscillations in the field.

The variation patterns of populations of Aleyrodidae may differ among distinct geographic regions and among populations that are carried in the same region for several years and also among neighboring populations which are developed at the same time, as well as Cividanes and Santos (2003) have referenced to other species of Hemiptera. According to Maia (2008) the yellow sticky traps can be used as an attractive to the citrus adult black fly of citrus, indicating the size of the population.

Between October and December of 2011, the population of the citrus black fly was smaller; this period corresponds to the time of low rainfall in the region (Figure 1), recording values below 50 mm a month (Figure 3). The fewest citrus black fly amount verified in the period is due in part to the absence of new budding. In the correlation test among the data of population fluctuation (Figure 1) and climatic variables maximum and minimum temperatures (Figure 2), precipitation and relative humidity (Figure 3), statistical differences were not found.

Vieira (2008) evaluated the population fluctuation of the citrus black fly and the spatial dependence of *A. woglumi* in São Luís, MA, in a "Tahiti" lemon orchard; their findings indicated that the rainy season was what contributed the most to the elevation of the pest population level. Besides, it was concluded that the aggregate area of the citrus black fly was higher during the dry season, suggesting for this period the installation of only one trap per hectare. The weather conditions of Maranhão state in the Northeastern region from September 2008 to October 2009, Medeiros *et al.* (2009) reported that the lowest levels of *A. woglumi* have occurred under low rainfall conditions.

According to Avila-Rodrigues *et al.* (1997) as well as the dry season can be harmful to insects, heavy rain and low temperatures can increase the mortality of immature stages, especially in winter which may lower the temperature and the supply of food for this insect by triggering physical changes in plant tissues.

Medeiros *et al.* (2009) highlighted the difficulty of the control of pests like the citrus black fly that has got a high number of annual generations, especially in tropical regions. The knowledge about the time of infestation peaks of the insect-pests, as well as their distribution and the damage they may cause to the plant constitute an important tool for the management of agricultural production (Shreck *et al.*, 2007). According to Maia (2008) with the determination of the spatial distribution of the citrus black fly and the aspect regarding the insect, such as biology, behavior and economic factors, it is possible to construct sampling plans that provide a high level of precision and at the lowest possible cost, besides it may provide a greater efficiency in the control decision-making.

The citrus black fly is favored by the temperature range from 20-34° C and the relative humidity of 70-80% (EPPO, 2008). Matching this information with the climatic data of the region where the experiment was carried out, it seems that the humidity range in the sampled period was favorable to the development of *A. woglumi*, as well as the rainfall data as it can be observed in Figure 3.

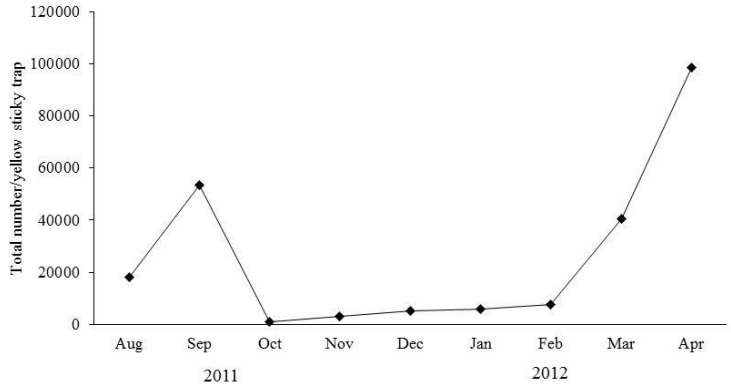

Figure 1. Population variation of the citrus black fly (*Aleurocanthus woglumi*) captured in yellow sticky traps in citrus cultivation agro-ecological systems from August/11 to April/12. Areia, PB, 2013.

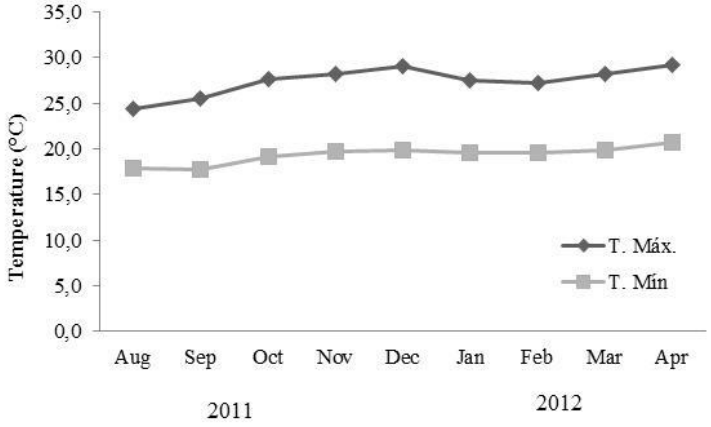

Figure 2. Average temperatures Maximum (Max. T.) and Minimum (Min. T.) observed during the evaluation period from August/11 to April/12. Areia, PB, 2013.

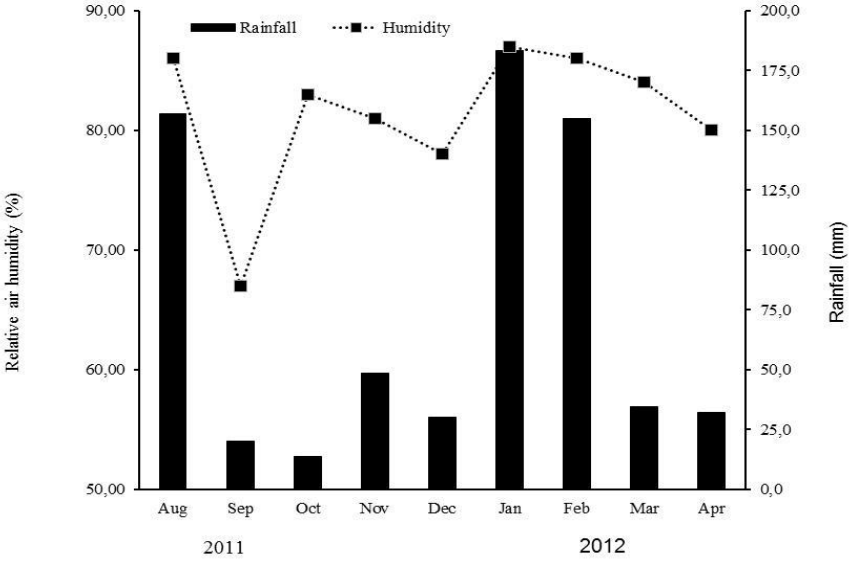

Figure 3. Indexes of accumulated rainfall (mm) and relative humidity (%) observed during the evaluation period from August/11 to April/12. Areia, PB, 2013.

CONCLUSION

In the evaluated experimental area the adults of the citrus black fly are found practically throughout the whole period of evaluations;

REFERENCES

Andrade, G. S., Pastori, P. L., Pereira, A. D. A., Dalvi, L. P., de Almeida, G. D. and Pereira, F. F. 2009. Briefing on the integrated control of *Aleurocanthus woglumi* Ashby (Hemiptera: Aleyrodidae) to Brazil. Boletín de Sanidad Vegetal 35: 259-263.

Ávila Rodrigues, F., Borges, A. C. F., dos Santos, M. R., Fernandes, J. J., Freitas Júnior, A. 1997. Flutuação populacional da mosca-branca e a incidência de osaico dourado em feijoeiro. Pesquisa Agropecuária Brasileira 32: 23-27.

Brasil, Ministério da Agricultura e Abastecimento. 1972. Levantamento exploratório, reconhecimento de solos do Estado da Paraíba. Rio de Janeiro. MA/Conta/Usaid/Sudene, Boletim Técnico, 15. 670p.

Cividanes, F. J. and Santos, D. M. M. dos. 2003. Flutuação populacional e distribuição vertical de *Brevicoryne brassicae* (L.) (Hemiptera: Aphididae) em couve. Bragantia 62: 61-67.

Dowell, R. V., Cherry, R. H., Fitzpathick, G. E., Reinert, J. A. and Knapp, J. L. Biology plant-insect relations and control of the Citrus blackfly. 1981. Agricultural Experiment Station, University of Florida. Gainesville. Bulletin 818 (Technical), p. 1-48.

EPPO-European Plant Protection Organization. Quarantine Pest. *Aleurocanthus woglumi*, 2008. Available at: <www.eppo.org/quarantine/insects/aleurocanthus_woglumi/alecwo ds-pdf> Accessed: 11 march, 2012.

GRAVENA, S. Manual Prático de Inspeção de Pragas de Citros**.** São Paulo: Ceres, 2002. 54 p.

Hart, W. G. 1979 Development of a trap for the Citrus blackfly, *Aleurocanthus woglumi* Ashby. Southwest Entomology 3: 219-225.

IBGE, Instituto Brasileiro De Geografia E Estatística. Produção agrícola municipal 2010. Available at: <http://sidra.ibge.gov.br> Accessed 20 november, 2012.

Köeppen, W. Climatologia. Buenos. Aires: Panamericana, 1948. 478 p.

Lopes, E. B., Brito, C. H., Batista, J. L. and Silva, A. B. 2010. Ocorrência da mosca negra dos citros (*Aleurocanthus woglumi*) na Paraíba. Tecnologia e Ciência Agropecuária 4:19-22.

Maia, P. S. P. Caracterização da distribuição espacial da mosca negra dos citros (*Aleurocanthus woglumi* Ashby, 1915) em pomar georreferenciado para determinar um plano de amostragem seqüencial. 2008. 77 f. Dissertação (Mestrado em Agronomia) – Curso de Pós-Graduação da Universidade Federal Rural do Amazonas, Manaus.

Medeiros, F. R., Lemos, R. N. S. D., Ottati, A. L. T., Araújo, J. R. G., Machado, K. K. G. and Rodrigues, A. A. C. 2009. Dinâmica populacional da mosca negra dos citros *Aleurocanthus woglumi* ashby (Hemiptera: aleyrodidae) em *Citrus* spp. no município de São Luís – MA. Revista Brasileira de Fruticultura 31:1016-1021.

Nguyen, R. and Hamon, A. B. 2003**.** *Citrus* blackfly, *Aleurocanthus woglumi* Ashby (Homoptera: Aleyrodidae). University of Florida, CIR 360.

Oliveira, M.R.V., Silva, C.C.A. and Navia, D. 1999. Praga Quarentenária A1: a mosca negra dos citros, *Aleurocanthus woglumi* Ashby (Hemiptera: Aleyrodidae). EMBRAPA, Brasília, 7 p (Comunicado Técnico, 40).

Oliveira, M. R. V., Silva, C. C. A. and Návia, D. 2001. Mosca negra dos citros *Aleurocanthus woglumi*: alerta quarentenário. Brasília: Ministério da Agricultura, Pecuária e Abastecimento, Brasília, Brazil, 12 p.

Santos Filho, H. P., Sanches, N. F., Oliveira, A. A. R., Noronha, A. C. S., Andrade, P. R. O., Lopes, F. F. and Oliveira, A. M. G. 2002. Monitoramento de Pragas Regulamentadas e Inimigas Naturais. Cruz das Almas: ADAB/EMBRAPA, 54 p.

SAS System. Version 8.2. Cary: SAS Institute, 2001. 6 CD-ROM. Windows 98.

Silva, A. G., Junior, A. L. B., Farias, P. R. S., and Barbosa, J. C.2011. Infestação da mosca negra dos citros (*Aleurocanthus woglumi*

Ashby) em pomares de citros, em sistemas de plantio convencional e agroflorestal. Revista Brasileira de Fruticultura 33: 53-60.

Shreck, A., Getz, C. and Feenstra, G. 2007. Social sustainability, farm labor, and organic agriculture: findings from an exploratory analysis. Agriculture and Human Values 23:439-449.

Silva, A.G., Junior, A. L. B., Farias, P. R. S. and Barbosa, J. C. 2011. Mosca negra dos citros: Características Gerais, Bioecologia e Métodos de Controle dessa Importante Praga Quarentenária da Citricultura Brasileira. Entomobrasilis 4: 85-91.

Vieira, D. L. Flutuação populacional e dependência de *Aleurocanthus woglumi* Ashby, 915 (Hemiptera: Aleyrodidae) em *Citrus latifólia*. 2008. 41p. Dissertação (Mestrado em Agroecologia) – Curso de Pós-Graduação em Agroecologia da Universidade Estadual do Maranhão, São Luiz.