

## ARTIGO / ARTÍCULO / ARTICLE

# Occasional damages caused by *Platystolus surcularius* (Bolívar, 1877) (Orthoptera: Tettigoniidae: Bradyporinae) on pistachio and sunflower crops in Central Spain

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**Abstract:** This work aims to assess the possible damage caused by *Platystolus surcularius* (Bolívar, 1877) (Orthoptera: Tettigoniidae: Bradyporinae) on pistachio (*Pistacia vera* L.) and sunflower (*Helianthus annuus* L.) crops in the municipality of Valparaíso de Abajo (Campos del Paraíso, Cuenca, Spain). Specimens of *P. surcularius* found were counted in transects and some of them were collected, identified and deposited in entomological collections. From the observations undertaken, it can be said that *P. surcularius* could cause damage, particularly if it bites the shoots of *P. vera*, while the damage detected in the leaves of *H. annuus* during sampling is considered negligible. Taking into account the results, it is concluded that this species should not be considered a pest.

**Key words:** Orthoptera, Tettigoniidae, Bradyporinae, Ephippigerini, *Platystolus surcularius*, *Helianthus annuus*, *Pistacia vera*, plant protection, Central Spain, Iberian Peninsula.

**Resumen:** Daños puntuales causados por *Platystolus surcularius* (Bolívar, 1877) (Orthoptera: Tettigoniidae: Bradyporinae) sobre cultivos de pistachero y girasol del centro de España. En este trabajo se pretenden evaluar los posibles daños producidos por *Platystolus surcularius* (Bolívar, 1877) (Orthoptera: Tettigoniidae: Bradyporinae) en cultivos de pistachero (*Pistacia vera* L.) y girasol (*Helianthus annuus* L.) en el municipio de Valparaíso de Abajo (Campos del Paraíso, Cuenca, España). Los individuos de *P. surcularius* encontrados fueron contabilizados en los transectos realizados y algunos fueron capturados, identificados y depositados en colecciones entomológicas. De las observaciones obtenidas, se puede decir que *P. surcularius* podría causar daños, particularmente si muerde los brotes de *P. vera*, mientras que el daño detectado en las hojas de *H. annuus* durante el muestreo se considera despreciable. Teniendo en cuenta los resultados, se concluye que esta especie no debería ser considerada una plaga.

**Palabras clave:** Orthoptera, Tettigoniidae, Bradyporinae, Ephippigerini, *Platystolus surcularius*, *Helianthus annuus*, *Pistacia vera*, sanidad vegetal, España Central, Península Ibérica.

Recibido: 9 de diciembre de 2021

Aceptado: 12 de enero de 2022

Publicado on-line: 19 de enero de 2022

## Introduction

Pistachio (*Pistacia vera* L.) belongs to the family Anacardiaceae Lindl., and is native to the northern part of Afghanistan, northeast Iran and Central Asia region. However, it is now found throughout the Mediterranean countries and the Middle East (Smartt & Simmonds, 1995). Although some problems caused by insects have been reported on this plant species, especially during the first stage of the crop, in Spain, pistachio cultures are considered essentially pest free so far (Couceiro-López et al., 2017). The area dedicated to pistachio cultivation has visibly increased in Spain, particularly in recent years. It currently comprises around 55,000 ha, of which more than 80% are located in Castilla - La Mancha (Central Spain). Pistachio crops in this region are essentially rainfed. Most of these crops are

concentrated in the province of Ciudad Real, with over 12,300 ha, followed by the provinces of Toledo, Albacete and Cuenca (MAPA, 2021).

Sunflower (*Helianthus annuus* L.) belongs to the family Asteraceae Bercht. & J. Presl. It is widely cultivated in many temperate countries. In 1510, early Spanish explorers encountered the sunflower in the Americas and carried its seeds back to Europe (Putt, 1997). According to the last published data, there are 660,521 ha of sunflower crops in Spain, of which more than 90% is cultivated in rainfed conditions. Castilla - La Mancha sums up 158,249 ha of sunflower crops, of which most of them are located in the province of Cuenca (MAPA, 2021).

*Platystolus surcularius* (Bolívar, 1877) is a large size saddle bush-cricket (Orthoptera: Tettigoniidae: Bradyporinae) endemic to central Iberian Peninsula. It has been reported from the provinces of Ciudad Real, Toledo, Cuenca and Madrid (Peinado-de Diego & Mateos-Martín, 1987). The localities of Madrid where the species has been recorded have undergone drastic urban changes in recent years, so the species could be extinct here. On the other hand, the location of the Laguna de Monte Hueco (Peinado-de Diego & Mateos-Martín, 1987), where *P. surcularius* has also been reported from, possibly refers to Laguna de Peña Hueca, in Toledo, and not in Guadalajara as indicated by Barat (2007).

According to Peinado-de Diego & Mateos-Martín (1987), the adults of this polyphagous species can be found from April to late September. Nevertheless, phenology in Toledo and Cuenca appears to be shorter, from late May to mid-August (own data). The known habitats of *P. surcularius* are cereal crop fields and associated ruderal plants (especially thistles). However, despite the fact that in the Iberian context, classical studies have mostly dealt with Caelifera pests (Collar-Urquijo *et al.*, 2002; Gómez-Ladrón de Guevara *et al.*, 2009; Coca-Abia *et al.*, 2010), specially *Doclostaurus* (*Doclostaurus*) *maroccanus* (Thunberg, 1815) (v.g. Del Moral-de la Vega, 1986; Arias *et al.*, 1993), in this paper we report a Ensifera species in sunflower and pistachio fields for the first time, where possible damage to the crop is assessed.

## Materials and methods

The sampling was carried out on 5th July 2021 from 10:30 to 13:00 by means of transects located in sampling areas with several pistachio and mixed (pistachio and sunflower) plantations (Table 1). They were located in the municipality of Valparaíso de Abajo (Campos del Paraíso, Cuenca, Spain), where farmers had warned about pest levels of this species at the end of June 2021.

The sampled plots of pistachio and sunflower were mainly surrounded by arable crops like cereals. Both cultures were managed on bare soil, being its visual effect particularly significant on pistachio plantations (Fig. 1a). The individuals collected were kept in captivity and deposited in "El Chaparrillo" Research Centre's reference collection (1 male and 1 female) and in the second author's collection (2 males and 3 females). Identification was carried out using main morphological characters provided by Barat (2007), like dorsal teeth from VI-IX tergites, titillators and cerci shape in males, and shape of oviscapte subasal tubercule in females.

Table 1. - Location and characteristics of the sampling areas.

Sampling area	Geographic coordinates (lat, long)	Altitude (masl)	Area sampled (ha)	Crop
1	40.031636, -2.655349	879	0.4	Pistachio and sunflower
2	40.009757, -2.652584	855	0.5	Pistachio
3	40.015292, -2.659035	860	1.3	Pistachio and sunflower
4	40.011277, -2.661870	856	1.4	Pistachio and sunflower

## Results and discussion

During sampling, 21 mature individuals of *P. surcularius* were detected (3 males and 18 females), of which 7 were collected. Despite the high number of females in comparison to males, additional males could be heard singing in nearby areas at sampling area 1. All specimens were found in a static position, resting on leaves (Figs. 1b and 1d), on the branches (Fig. 1c), or on the plant garden stakes (Fig. 1a). Three of the detected females had ingested all or part of the spermatophore, of which part remained in their subgenital plate (Fig. 1c). Although there was visible damage, just a small proportion of plants were affected, even with one or two specimens per plant (Fig. 1). Other Orthoptera species located in the area of our study were *Oedipoda caerulescens* (Linnaeus, 1758) (sampling areas 1, 2 and 3), *Platycleis affinis* Fieber, 1853 (sampling areas 1 and 3), *Sphingonotus* sp., *Tessellana tessellata* (Charpentier, 1825) and nymphs of *Calliptamus* Serville, 1831 (all at sampling area 3).

Other individuals of *P. surcularius* were detected crossing the access road to Valparaíso de Abajo, which runs along Valparaíso river through pistachio and sunflower fields, as well as in nearby localities (Carrascosa del Campo, El Hito and Saelices) with similar crop fields, although they have not been taken into account, since they were outside the study area.

Moreover, local farmers told us about other sightings on pistachio crop fields from other localities in Castilla-La Mancha, such as Tresjuncos (Cuenca) (25-VI-2021) and Villanueva de Alcardete (Toledo) (27-VI-2021). Those records were determined by photographs in which diagnostic characters were shown (see Barat, 2007).

The typical damage of this species on the pistachio plants consists of small bites throughout the stem that, in some cases, break off the shoots. Regarding sunflowers, the damage was made on the leaf (Fig. 2). Even so, in the case of pistachio, the damage was limited to one shoot per plant and it was only observed on average in four trees per ha sampled. Regarding sunflowers, no more than one or two leaves per plant were affected on average in five plants per ha. Although farmers who owned the sampled plots were frightened about harms caused by these insects (since the first detection of the saddle bush-cricket, insecticidal treatments have been applied every 16 days during the activity period of the insect two successive years, firstly using the pyrethroid lambda-cihalotrin and secondly with the organophosphorus compound fosmet, without visible effect on them), our conclusion is that damage is despicable according to the data mentioned above and could be compared with those reported on *Pycnogaster (Pycnogaster) graellsii* Bolívar, 1873 in other unspecified crops (Pantel, 1886).

Other Orthoptera linked to pistachio are *Schistocerca gregaria* (Forsskål, 1775), *Lyrotyloides viridis* Bey-Bienko, 1956 (Davatchi, 1958; Sabuncu *et al.*, 2021) or *Odontura* spp. (Chebouti-Meziou, 2010), but no other member of the family Tettigoniidae has been reported feeding on *P. vera* crop so far. Regarding sunflower crops, they have been linked to several species of Tettigoniidae, such as *Tettigonia caudata* (Charpentier, 1845), *Decticus verrucivorus* (Linnaeus, 1758), *Parapholidoptera indistincta* (Bolívar, 1899) (Rajamohan, 1976) or *Ruspolia differens* (Serville, 1838) (Khaemba & Mutinga, 1982). All reports are in a non-Iberian context, so this is the first occasion where an Iberian endemism is found feeding on pistachio and sunflower crops.

## Acknowledgments

We thank Guillermo García-Saúco Sánchez for his support, Carlos Valenciano Zafra and Jesús Vara Moral for allowing us to sample in their crop fields, Jesús Mateos-Aparicio Díaz de los Bernardos for supporting us during the sampling. We also thank Jorge Gutiérrez Rodríguez and David Lluçà Pomares for their review and editorial committee for their useful advices. The present study was co-funded by EAFRD (European Agricultural Fund for Rural Development), Ministerio de Agricultura, Pesca y Alimentación (MAPA) and Junta de Comunidades de Castilla-La Mancha (JCCM), through an innovation

pilot project in plant health area, promoted by 16.2.2 operation under Rural Development Programme of Castilla-La Mancha, for 2014-2020 period.

## References

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Arias, A., Alvez, C., García, F., Martínez-de Velasco, D., Olivera, J., Prieto, A. & Santos, R. 1993. La lucha contra la langosta marroquí (*Dociostaurus maroccanus* Thunb.) en Extremadura durante el decenio 1983-1992. *Boletín de Sanidad Vegetal y Plagas*, **19**: 425-453.

Barat, J. 2007. Revisión taxonómica de los Ephemeroptera (Orthoptera: Tettigoniidae: Bradyporidae) de la Península Ibérica e Islas Baleares. I. Géneros: *Callicrania* Bolívar, 1898; *Neocallicrania* Pfau, 1996; *Platystolus* Bolívar, 1898 y *Synephippus* Navàs, 1905. *Boletín de la Sociedad Entomológica Aragonesa*, **40**: 55-118.

Chebouti-Meziou, N. 2010. *Intérêt bioécologique et économique des ennemis du pistachier fruitier (Pistacia vera L.) dans quelques stations en Algérie*. Thèse de Doctorat. École Nationale Supérieure Agronomique El-Harrach - Alger. 278 pp.

Coca-Abia, M.M., Tenas-Pérez, I., Giménez-Legarre, S. & García-Muñoz, E. 2010. A preliminary study of the biology of the grasshopper *Calliptamus wattenwylanus* (Orthoptera: Acrididae). *Boletín de Sanidad Vegetal y Plagas*, **36**: 149-155.

Collar-Urquijo, J.L., Celma Calamita, J., Blandford, S. & Thomas, M.B. 2002. Control de *Dociostaurus maroccanus* y *Calliptamus italicus* (Orthoptera: Acrididae) mediante aplicaciones en campo de *Metarhizium anisopliae* var *acridum*. *Boletín de Sanidad Vegetal y Plagas*, **28**: 185-192.

Couceiro López, J.F., Guerrero Villaseñor, J., Gijón López, M.C., Moriana Elvira, A., Pérez López, D. & Rodríguez de Francisco, M. 2017. *El cultivo del pistacho*. Mundi-Prensa Libros. Madrid, España. 772 pp.

Davatchi, G.A. 1958. Étude biologique de la faune entomologique des *Pistacia* sauvages et cultivés. *Revue de Pathologie Végétale et d'Entomologie Agricole de France*, **37**(1): 1-166.

Del Moral de la Vega, J. 1982. Discusión sobre la situación actual de la plaga de langosta (*Dociostaurus maroccanus* Thunb.) en Badajoz y resultados de un ensayo de insecticidas para su control. *Boletín de Sanidad Vegetal y Plagas*, **12**: 221-235.

Gómez Ladrón de Guevara, R., Pavón Benito, J. & Presa, J.J. 2009. Outbreak of *Acinipe deceptor* (Bolívar, 1878) and *Acinipe segurensis* (Bolívar, 1908) (Orthoptera: Pamphagidae) in Castilla-La Mancha (Iberian Peninsula). *Anales de Biología*, **31**: 33-35.

Khaemba, B.M. & Mutinga, M.J. 1982. Insect pests of sunflower (*Helianthus annuus* L.) in Kenya. *International Journal of Tropical Insect Science*, **3**(4): 281-286.

MAPA. 2021. *Encuesta sobre rendimientos y superficies de cultivos*. Ed. Ministerio de Agricultura, Pesca y Alimentación. 45 pp.

Pantel, J. 1886. Contribution à l'orthoptérologie de l'Espagne centrale. *Anales de la Sociedad española de Historia Natural*, **15**: 237-287.

Peinado de Diego, M.V. & Mateos Martín, J. 1987. El género *Platystolus* Bolívar en la Península Ibérica (Orthoptera, Ephemeroptera). *Eos*, **62** (1986): 175-186.

Putt, E.D. 1997. *Early history of sunflower*, pp. 1-19. In: Schneiter, A.A. (ed.). *Sunflower Technology and Production*. Agronomy Monographs, vol. 35. Madison, Wisconsin: American Society of Agronomy. 834 pp.

Rajamohan, N. 1976. Pest complex of sunflower—a bibliography. *Pans*, 22(4): 546-563.

Sabuncu, Y., Mamay, M. & Özgen, İ, 2021. Overwintering insect (Arthropoda: Insecta) biodiversity in pistachio orchards of the Middle Euphrates Valley, Turkey. *Harran Tarım ve Gıda Bilimleri Dergisi*, 25(2): 185-192.

Smartt, J. & Simmonds, N.W. (eds.). 1995. *Evolution of crop plants*. 2nd Ed. Longman Scientific & Technical, Longman House, Burnt Mill, Harlow, Essex CM20 2JE, England. 531 pp.



**Fig. 1.-** Some *Platystolus surcularius* adult specimens found on the crops. **a.-** Female on pistachio tree garden stake surrounded by bare soil. **b.-** Male on *Pistacia vera* leaf. **c.-** Female with part of the spermatophore remaining in their subgenital plate. **d.-** Female on *Helianthus annuus* leaf.



**Fig. 2.** - Damage caused by *Platystolus surcularius*. **a-c.** - On *Pistacia vera* stems. **d.** - On a leaf of *Helianthus annuus* where a female specimen was resting on the underside.