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# Biological data on *Pollinia pollini* (Coccoidea: Asterolecaniidae) on Olive tree in Mitidja (Algeria)

Noureddine MENZER*, Khaoula AROUA, Aissa Mokabli, Abdelmadjid BENZEHRA & Mohammed BICHE

Département de Zoologie agricole et Forestière, Ecole Nationale Supérieure Agronomique (E.N.S.A.), El Harrach, Alger, Algeria.

*Corresponding author: n.menzer@ensa.dz

**Abstract**

This work was carried out for two years (2013 and 2014) on some biology aspects of *Pollinia pollini* Costa, 1828 ; olive bioagressor in Guerouaou (36 ° 31 ' N, 2 ° 53' E) in the plain of the Mitidja . The study revealed that the globular mealybug is bivoltine with imaginal hibernation. The specie is more active in spring and summer when conditions are favorable because the population of the cochineal achieved 38%, all stages mingled. She affected, also, the most sun-exposed areas, that is, the South (33%) and East (29%) of the tree. On the other hand it average fertility is very low, witch not exceeding 4 eggs / female, in the best conditions.

**Keys words**: Olive tree, *Pollinia pollini*, Biology, Mitidja, Algeria

## 1. Introduction

Algeria's olive-growing area ranks first compared with other fruit crops; well before the date palm (20.9%), citrus fruits (8.4%) and the fig tree (6.5%). In 2006, it covers 226,337 ha, whether 33% of the tree area and has 16,070,800 trees. However, the tonnage of olives harvested only slightly above a quarter of fruit production. Algeria is among the countries with modest production 4100 020q of olive oil and 587 980q table olives. The low productivity of olive cultivation is due in part to phytosanitary problems. Indeed, mealybugs prominently among biological pests both in its original range (Mediterranean) (Demirozer *et al.*, 2009) that in his new regions of operation (Daane *et al.*, 2005; Taylor and Burt, 2007). In Algeria, the main scale insects that cause damage is no less important are: *Parlatoria oleae*, *Octaspidiotus nerii*, *Lepidosaphes flava*, *Saisseta oleae* and *Pollinia pollini*.

The asterolecanids include three genera and seven species among which we quote, *Mycetococcus corticis* (Townsend and Cockerell), *M. ehrhorni* (Cockerell), *Pollinia pollini*(Costa), *Sclerosococcus bromeliae* (McKenzie), *S. chilensis* (Lambdin), *S. ferrisi* (McKenzie) and *S.tillandsia* (Lambdin) which are important pests of olive trees, oaks and tropical plants of the bromeliad family. They are characterized by tubular shaped ducts eight and legless. Their antennas are reduced to one segment while the anal ring is pore-free or bristles (McKenzie, 1958; Lambdin, 1980; Gill, 1993).

The eggs of *P. pollini* like those asterolecanids are oval, nearly spherical; they become elliptical when larvae are formed. They have a yellow color and are 1 to 1.5 mm long. Adult females are orange to red and covered with a grayish waxy substance that protects entire colonies observed in the twigs and branches, or in crevices or cracks in the bark (Murua and Fidalgo, 2001; Barros,

2006; Orecchia *et al.*, 2007).The males are elongated, winged whose nymphs are found on the leaves.

*P. pollini* was reported for the first time in Italy in 1828 by Costa (Lindinger, 1912).According to Ben Dov (2006), cochineal has a wide geographical distribution in the world. It occupies the Palearctic, where it is subservient to the olive-growing countries of the Mediterranean basin (Della Beffa, 1949). In North Africa, it has been reported, particularly in Tunisia in 1952 (Damiano, 1963) and in 1968 in Algeria (Loussert and Brousse, 1978). Cochineal has been located in the olive groves of Cap Djinet (Biche, 1987) and Mila region (Harrat, 1988). It was accidentally introduced into California in the Nearctic (Armitage and Mc Kenzie, 1952) and enters the Neotropic where she was reported in Argentina and Chile (Mauricio *et al.*, 1989).

Considered secondary pest, the damage of *P. pollini* are episodic manner, which can be economically unbearable for farmers (Loussert and Brousse, 1978). In contrast, in Tunisia, this rather cochineal is the most important pest after the olive fly and both attack the fruit that the tree itself. Its damage is characterized by dwarfism, the development of sooty mold and leaf distortion, which causes them to fall (Damiano, 1963).

Despite limited research undertaken on *P. pollini* however, it is worth mentioning the important work of no less Arambourg (1986) on the insect fauna of the olive, the bio ecology in general mealybugs (Mauricio *et al.*, 1989) and methods of struggle (Kamoun, 1971; Alexandrakis, 1980; Ahmed, 2012). In Algeria, apart from the brief study on the dynamics of populations in Mitidja(Mahmouche, 1992; Ould Aissa, 1993), *P. pollini*, remains a matter of much research on its ecology not only organic, but also on methods of struggle when it becomes dangerous.

## 2. Materials and methods

### *2.1. Site study*

The olive grove is located in Guerouaou (36 ° 31 ' N, 2 ° 53' E) in the plain of the Mitidja. Aged over 50 years, it consists of 165 trees of the variety “Rougette Mitidja “distant from each other 7meters. It is limited by the massive and hills of the “Tell Atlas” in one hand and, secondly, by the Sahelian wrinkle (Mutin, 1977). It rises at an altitude of 154 m and is characterized by low soil evolved hydromorphe trend whose structure is clay loam (Duchaufour, 1976). The summers are hot and dry and winters are rainy (699mm / year) and humid.

### *2.2. Samples and counts*

The sampling method applied is that reported by Vasseur and Schvester (1957), Benassy (1961) and Fabres (1979) which consists of three 20cm branches sampling length from ground level, according to the cardinal directions including crown center of the tree. Samples are collected from 12 trees randomly taken and put in paper bags on which mentioned the date and the cardinal direction. The counting of eggs, larvae and adults living or dead are performed in the laboratory using a loupe magnification X 40. The sampling period is two consecutive years from January 2013 to December 2014.

## 3. Results and Discussion

### *3.1. Population dynamics*

The results show that infestations are slightly higher and rising up to 753 individuals in May 2014 against 666 individuals, during the same period, a year before. The Mann-Whitney test gives a bilateral non-significant difference between the two years of sampling, since the populations have the same variations from one year to another.

The *P. pollini* counting populations results (Figure1a, b, c and d) distinguish two generations per year. The first has more staff, while confused stage, and lasts only about five months. It begins in March and ends in June. However, the second generation starts from the month of August, having

smaller numbers. Overwintering of the cochineal is exclusively in the form of adult female. These observations agree largely with those reported by Alexandrakis (1980) in Greece, Ertem and Pehlivan (1995) in Izmir (Turkey) and Ahmed (2012) in Egypt, where they noted the overwintering stage young female. Note that the build number is probably under the influence of climatic conditions. Thus, in Spain the second generation is considered accidental. By cons, in Italy, in the area south of Sicily, cochineal is monovoltine (Liotta and Sammartano, 1981) and would biennial Verona in the north (Arambourg, 1964).

*3.2. Control seasonal population*

The climate is a limiting factor for outbreaks of pests in general and specifically the mealybugs. Indeed, the lowest numbers are noted in winter which not exceeding 10%. Note that the population consists essentially of older individuals that are more resistant to hard conditions of winter. For cons, the spring and summer, are more favorable for the population of the cochineal high as 38%, all stages during the two years of study. The Student t test applied to a sample gives a significant difference, in other words, seasonal variations in populations are different. Moreover, the seasonal behavior of populations of *P. ziziphi* is more favored by the spring and summer conditions in which the most important infestation rate (Belguendouz *et al.*, 2011). However, Radwan (2012) demonstrated that the combination of the maximum and minimum temperature and relative humidity significantly affect the duration of cochineal palm *Fiorinia phoenicis* seasonal activity in Egypt. Thus, infestations varied between 58.2 up to 74.8% in autumn, and 66.9 to 74.8% in the summer for larvae. For adults, they vary between 53.9 to 76.3% and from 84.9 to 87.9% during the same seasons.

*3.3. Influence Exposure*

Unlike *Lepidosaphes flava* seeking the shade of the tree (Biche et Bourahla, 1993), *P. pollini* seems fond of the most sun-exposed areas. Indeed, the highest rates were noted in south (33%) and East (29%) of the tree. Other orientations are less populated by cochineal, much less in the center of the tree that displays a maximum rate of 11.69% observed during the first year of sampling. Similar results are reported on *P. oleae* on the olive tree in the Cape Djinet region (Biche, 1987) or *P. pollini* in Blida (Mahmouche, 1992). Sun exposition is an important factor but not limited to insect activity. Thus, *Parlatoria blanchardi* on the date palm fled south orientation because it is exposed to prevailing winds in Biskra, (a southern region of Algeria) (Saighi *et al.*, 2015). Schvester (1956) considers that the host plant acts as an ecological factor, whose action is superimposed on that of climatic factors.

*3.4. Fertility*

Rising temperatures at the end of February is the first sign of the onset of oogenesis. Females swell and take on a pearly yellow coloring. The beginning of spawning occurs in the beginning of March until last of June. After a brief stop in July, it then resumed in the month of August to stop in October. The incubation period is very short since the first larvae appear, also in March and stay until September.

Fertility calculated on the basis of the relationship between eggs and crawlers on one hand and on the other nesting females shows that the cochineal has a very low fertility with average values ranging from 1 (in summer) to 4 eggs per female (in the spring) (Figure2). This compared mealybug diaspines such as *P. ziziphi* whose average fertility exceeds, generally, 10 eggs per female; in a natural habitat (Smirnoff, 1950; Chapot et Delluchi, 1964; Praloran, 1971).

## 4. Conclusion

Observations on 2 consecutive years clearly show that *P. pollini* installs only on twigs in the axils are moving preventing the normal flow of the sap flow. This results in lowering the production and drying of the shaft.

Cochineal evolves in two generations per year: spring and summer. The first, from April to March and the second from August to September. Overwintering takes place at the stage where fertilized female prefers to settle in the sunniest places. Fertility is relatively low throughout the year but its impact on the physiology of the plant remains important because it hinders the circulation of the sap. This probably increases with the absence of auxiliary.

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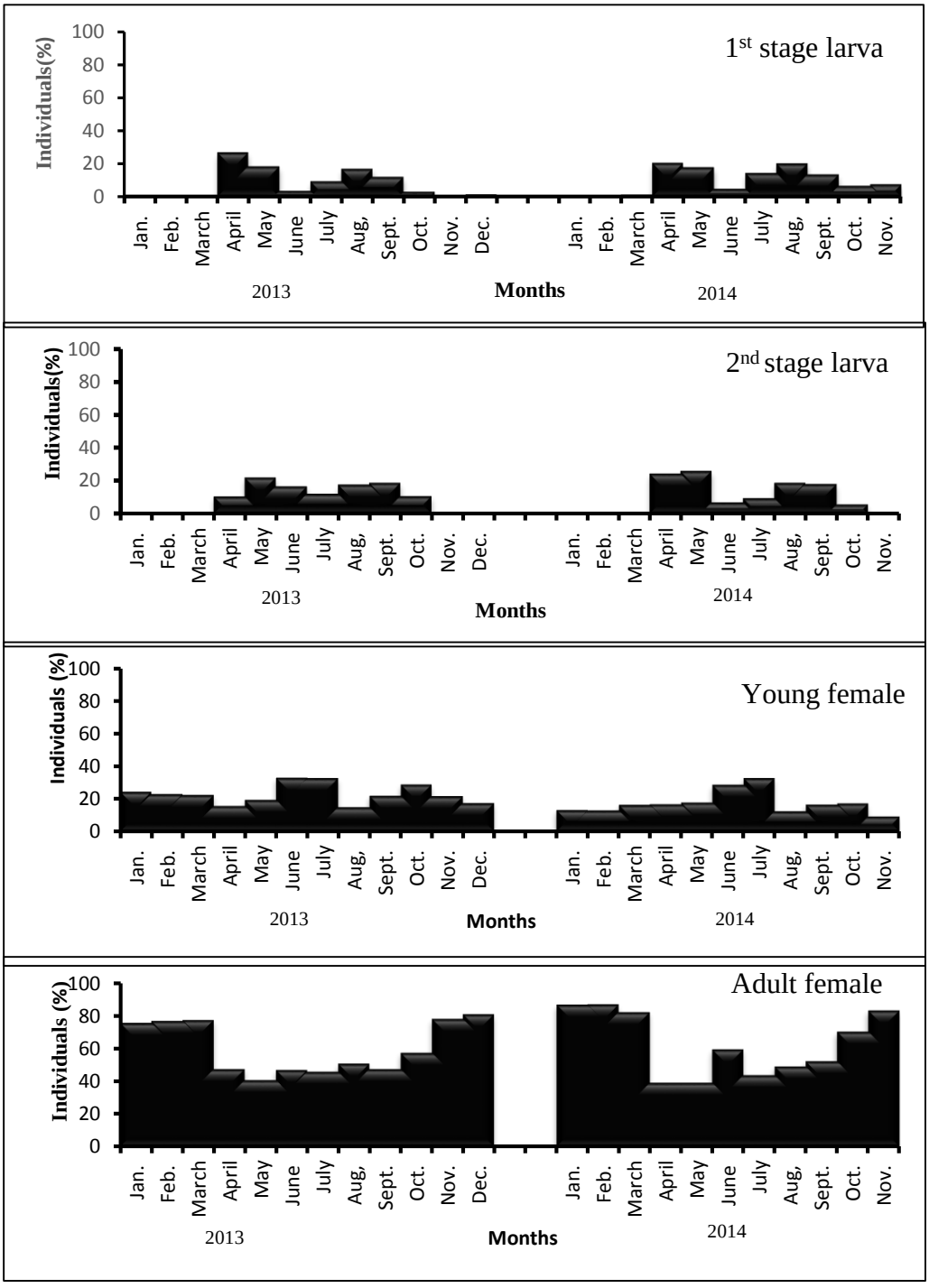


**Figure 1 :** Monthly evolution of the different stages of *Pollinia pollini* on olive tree in Guerouaou (Mitidja)

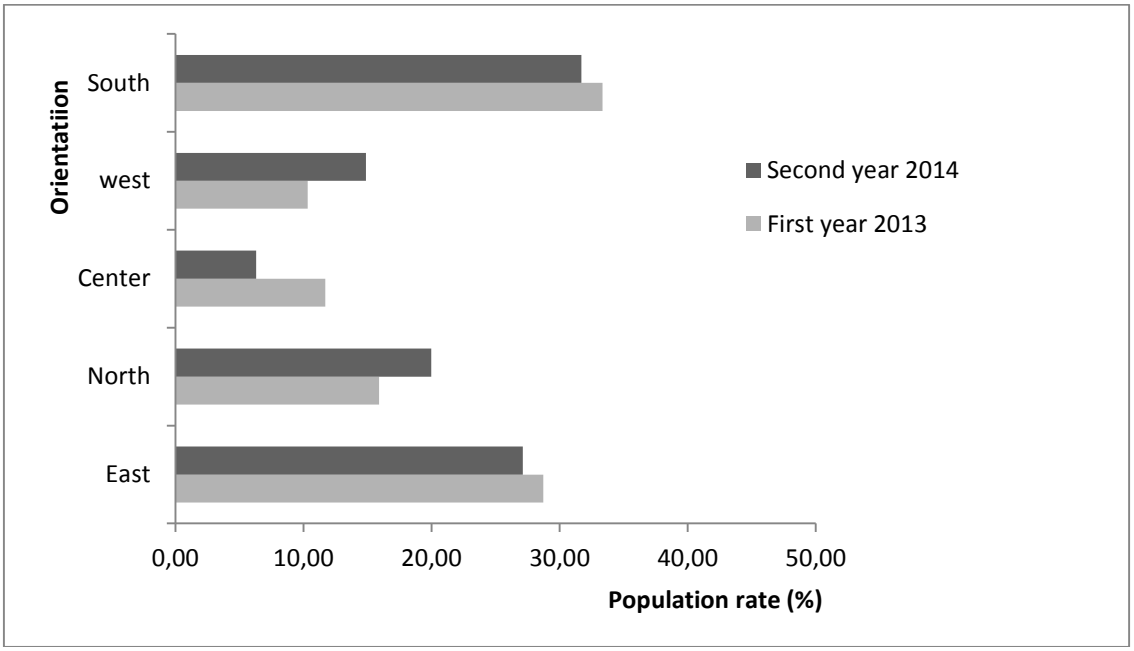


**Figure 2:** Cardinal distribution of *Pollinia pollini* populations on olive tree in Guerouaou (Mitidja)