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Study of the natural and parasitic mortality of the white scale *Parlatoria blanchardi* targ., 1868 of the date palm in the region of Biskra

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Abstract
The date palm is the fruit tree par excellence of the Saharan desert where it plays a role in both an economic role thanks to the production of dates which are rich in nutrients, provides a multitude of secondary products, and an ecological role since it gives its structure to the oasis. However, this phoenicultural potential remains very fragile against certain formidable diseases and pests. The white scale is among the most dangerous pests that threaten on the date palm. This insect is provided with a mouthpiece type sucking sucker equipped with a rostrum allowing it to attach and feed sap. This leads to the weakening of the tree and causes a reduction in the yield and commercial quality of the dates. Abiotic factors (temperature) and biotic factors (predators) play a key role in the proliferation of the white scale. The natural enemies of *Parlatoria blanchardi* in the Biskra region are *Chrysopa vulgaris*, *Pharoscymnus numidicus*, *Pharoscymnus ovoideus*, *Cybocephalus palmarum* and a predatory mite.

Keywords: the white scale, biskra, date palm, natural enemies

Introduction
The date palm *Phoenix dactylifera* is synonymous with desert life, cultivated since ancient times in the Sahara and the warm regions of the globe because it represents the greatest adaptation to the climate of arid and semi-arid regions (Achoura, 2013) [3]. In Algeria's economy, the date palm is ranked second after oil as a source of foreign exchange. This fact is mainly due to the presence of the Deglet-Nour variety, ranked first in the world (Felliachi, 2005) [10]. But unfortunately, the date palm remains confronted with a certain number of constraints, the most important of which are those linked to diseases and pests, such as Bayoud (*Fusarium oxysporum* F. *sup albedinis*), date moth (*Ectomyelois ceratoniae* Zeller), Boufaroua (*Oligonychus afrasiaticus* Mac Gregor) and the white scale (*Parlatoria blanchardi* Targioni-Tozzetti) (Munier, 1973 and Smirnoff, 1957) [15, 17]. In Algeria, there is no phoenicultural region free from the attack by *Parlatoria blanchardi* (Idder, 1992) [12]. Indeed, the intense stand of *Parlatoria blanchardi* not only hampers the normal development of the plant, but it causes the premature drying of the djerids and can lead to the total loss of a plant as robust and resistant as the date palm (Balachowsky, 1926) [4]. The high temperature and predators influence the evolution of the white scale. The objective of this work is to study the natural and parasitic mortality of the white scale in the Biskra region during a year and also its natural enemies.

Materials and Methods
Study area
Our work was carried out on the Chebaani Bachir farm in the Sidi Okba commune (photo 01), which is 18 km east of the town of Biskra. This covers an area of 25 ha of which 2.5 ha is the area planted by the date palm with 289 palm trees of the Deglet Nour, Mich Degla, Ghars varieties and 2.5 ha for fruit growing (fig, olive, pomegranate, lemon, and apricot).

Fig 1: Study area

Biological plant material
To carry out our experiment, we chose the variety Deglet Nour. This variety is more infested with a white scale. The Deglet Nour variety is very rich in sucrose sugar which promotes the development of *Parlatoria blanchardi*.

Animal biological material
Our study was carried out on a Hemiptera such as the white scale *Parlatoria blanchardi* which is one of the most formidable insect pests of the date palm.

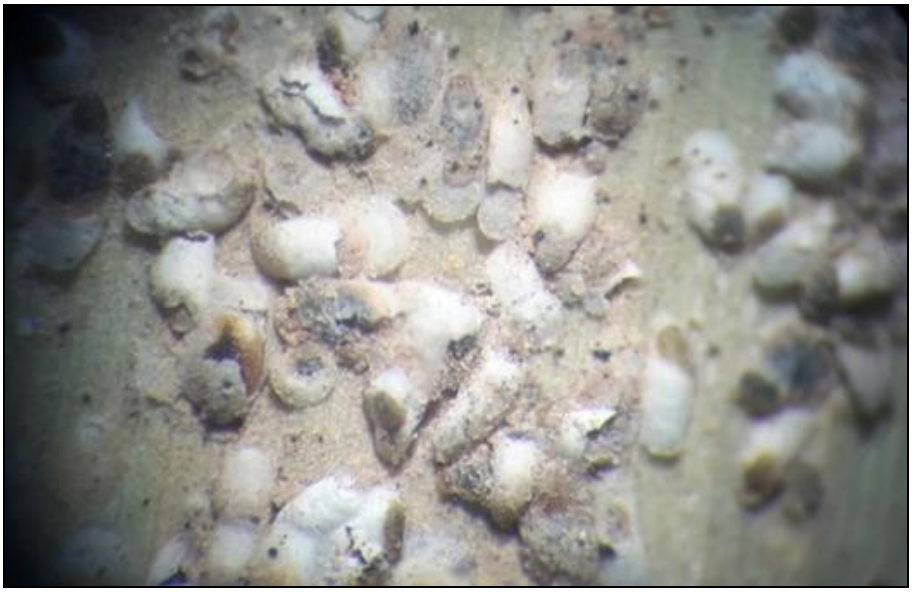

Fig 2: *Parlatoria blanchardi*

Methodology

Study of the population dynamics of *Parlatoria blanchardi*

sampling

For the realization of this study, we adopted the method of Vasseur and Schester in 1957 [18] which consists of a periodic and random sampling of samples using a pruner on three palm trees chosen at random. Each week, using a pruner, four leaflets are removed from the four orientations (North, South, East, and West) of the outer crown which is the most infested. In total at each sampling, we collected 12 leaflets (4 leaflets/palm tree × 3 palm trees).

This work started on 2 January 2017 and ends on 23 December 2018. Each leaflet is placed in a Kraft paper bag on which the palm number (P1, P2, P3) and the orientation of the palm are indicated.

Counting

In the laboratory and under the binocular magnifier at 40x magnification, we carried out a count of dead and alive individuals of Parlatoria blanchardi on the leaflet, we choose 3 places of 1 cm2. We count the number of dead adults, dead larvae of the white scale and also the number of parasitized females. At the end of each count, the results are reported in summary tables.

Collection of natural enemies of *Parlatoria blanchardi*

For the collection of the natural enemies of the white scale, the method used is the shaking using a stick a palm trees of study plot, on a sheet placed under a palm tree, place the insects in small plastic boxes to be identified in the laboratory.

The determination of the species harvested was carried out by Professor Tarai N at the university laboratory in Biskra.

Results and Discussion

Study of the mortality of *Parlatoria blanchardi* populations

During the winter period, we notice the low mortality of the populations of the white scale. During the spring period, larval mortality is estimated at 1.69% as of 24 April, that of adults with 4.37% as of 30 March.

The highest larval mortality rates were recorded during the summer with a percentage of in vi11.18% on 24 August and 5.06% for adults on 19 June.

From 19 September, we notice a decrease in the mortality rate of the larvae which reaches 0.21% on 29 November and 1.34% on 28 October for the adults of the white scale.

In the short of our study, the climatic conditions, particularly the temperature, affect the mortality of the cochineal population. Smirnoff (1957) [17] in Morocco reported that mortality from white scale begins from 38 ° C. Belkhiri (2010) [5] found that the highest adult mortality rate from the white scale in June was 39.80%.

According to Djoudi (1992) [9], the summer period is characterized by high natural mortality. Bensaid (2011) [6] reported that the highest mortality rate of larvae of orange scale insects was recorded during the summer season with 62.57% that of adults with 36.98% is recorded in August.

On the other hand, Boussaid and Maache (2001) [8] recorded that winter and spring mortality are the most important, with 83.33% in January and 70.97% in May. Achoura (1996) [1]. In the Outaya region and El-Kantara, reports that mortality is very important during the fall period. Females die after laying their eggs. According to Biche (1987) [7], Mehaoua (2006) [14], Gherbi (2006) [11] and Maatallah (2010) [13], females die naturally just after the expulsion of the eggs.

Predation rate

The percentage of female parasites is low during the months January and February. From 3 March, we notice an increase in the percentage of female parasites to reach 11.16% by 10 April. The month of June is characterized by a decrease in the number of parasitized females which reached 0.83% on June 19 under the effect of climatic conditions. The number of parasitized females recorded the value 4.34% on 11July then gradually decreases until the end of sampling which reaches 0%.

Through the results obtained, we found that the female constitutes the preferential stage of the parasites since the predators feed on the eggs of the females. Djoudi (1992) [9] notes that predators and parasites significantly decrease the populations of *Parlatoria blanchardi*.

The natural enemies of the white scale

During our experiments, we obtained predators from *Parlatoria blanchardi*. These are beetles, Neuroptera and a mite. Neuroptera is represented by a single species *Chrysopa vulgaris.* The beetles are *Cybocephalus palmarum*, *Pharoscymnus numidicus* and *Pharoscymnus ovoideus.*

The results also show that parasitism is very important during the spring period. According to Achoura (1996) [1] and Boussaid and Maache (2001) [8], spring is the season most favorable to the development of predators. Nadji (2010) [16] reported that the number of parasitized females peaked at 24 individuals /cm^2.

Tables and Figures

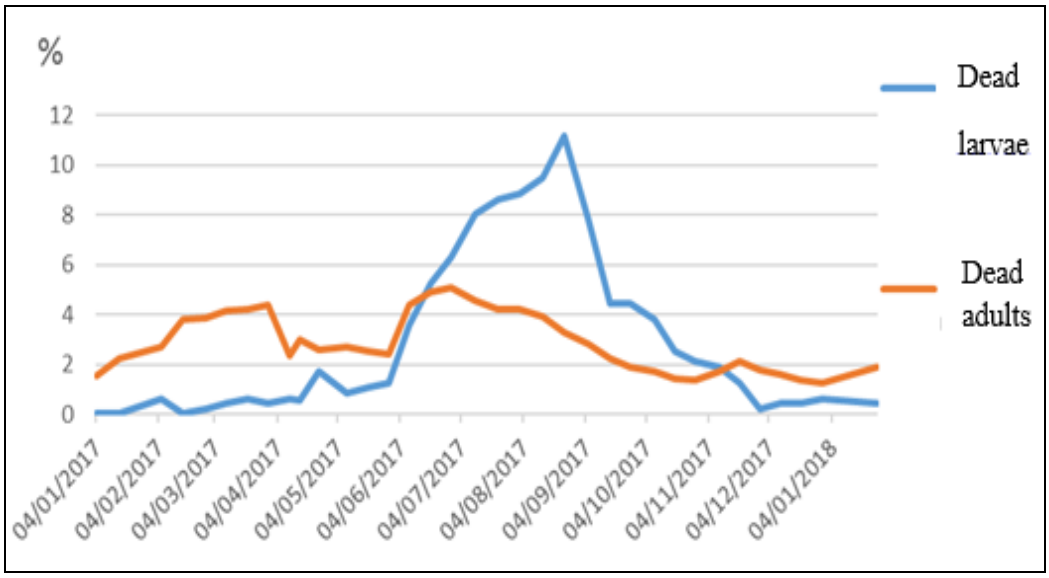

Fig 1: Mortality rate of white scale

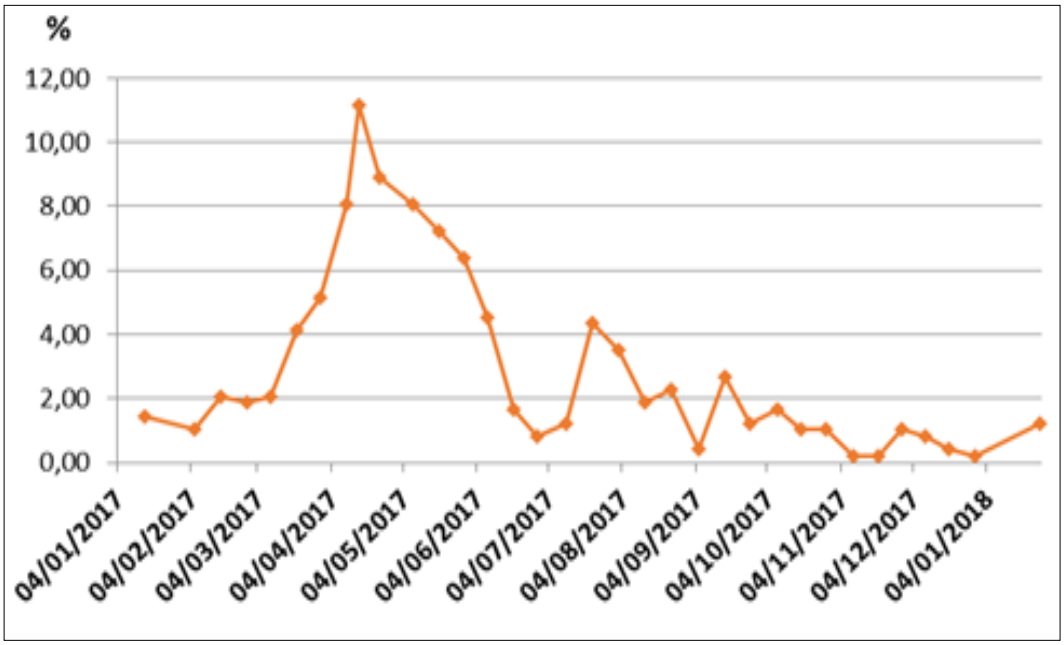

Fig 2: Rate of female parasitized *Parlatoria blanchardi*

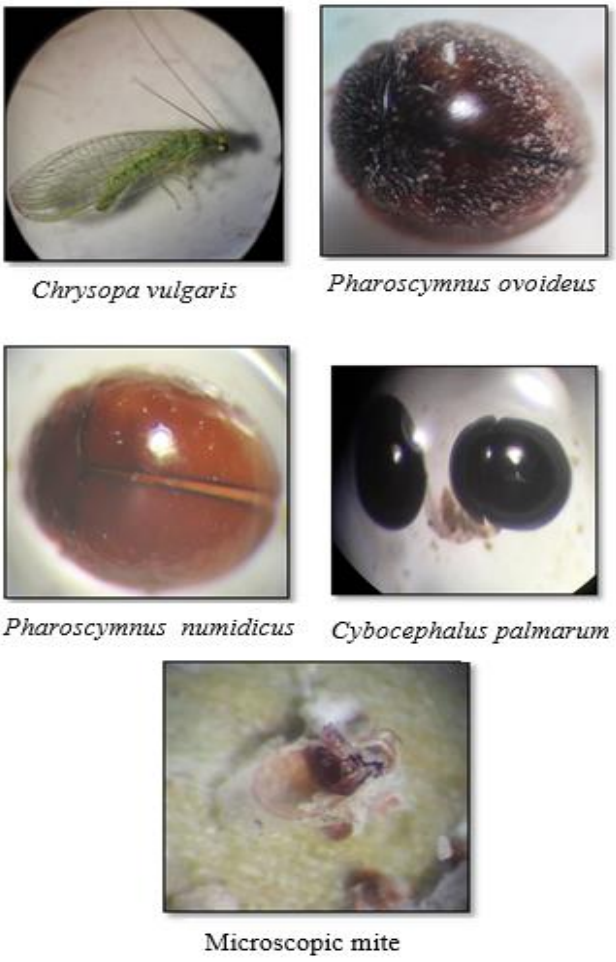

Fig 3

Conclusions

In the palm groves of the Biskra region, the development of the white cochineal is affected by abiotic factors such as high temperature, wind as well as biotic factors, especially predators. The results obtained show that the predatory activity is remarkable in the spring, it is the duration of laying of females of *Parlatoria blanchardi*. During the study period, we obtained the predatory species of white scale: *Chrysopa vulgaris*, *Cybocephalus palmarum*, *Pharoscymnus numidicus*, *Pharoscymnus ovoideus* and, a mite.

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