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Ovalisia festiva L (Coleoptera, Buprestidae): New devastating of the Thuja (Tetraclinis articulata (Vahl) Master) in the Occidental Mountains of Traras (Algerian Western North)

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ABSTRACT

Damages of golden beetle *Ovalisia festiva* over *Tetraclinis articulata* are caused by larvae which dig galleries of reproduction under the bark of the tree. The effect of group in populations of these woodborers leads to browning and death of branches, hence a total decay of the attacked subjects. The attack rate estimated to 58.33% shows favorable conditions to the development of this insect. A statistical study through the analysis of the variance to a factor at a significance level of 95% using SPSS package has displayed that, it exists a correlation between the attack rate of the golden beetle and stational and dendrometric characteristics.

Keywords: *Tetraclinis articulata*, *Ovalisia festiva*, damages, statistical study, stational parameters, dendrometric parameters, Occidental Mountains of Traras

INTRODUCTION

Over a total surface area of 9017.69Km2, the wilaya of Tlemcen covers a forest surface area of 137217ha of forest, while the remaining area consists of scrub and thick brush. The forest surface area occupied by occidental Traras is estimated to 6453ha, where 60% is of Aleppo pine,15% is of Eucalyptus,10% is of Thuja,5% is of cypress, and 10% of other formations, (Nichane,2011). In terms of resinous Thuja in particular is considered as a best example for the study of strategies this species can provide regarding the aggressions that vegetal structures confront. Sandarac trees assure an important role in the social and economic life of lakeside populations, (Hadjadj, 1995).The over exploitation of these populations either regularly or irregularly is best evidence. Its diverse categories of product are the reason of the development of handmade and commercial activities that constitutes a source of income and contributes to a social development, (Fennane, 1987; Fennane, 1988).

Besides the vicissitudes of climate and human action, these forests are subject to many factors of deterioration (overgrazing, fire, disease and parasites), (Anonymous, 2009).

Certain insect species may present abundant pululations and cause significant damage, it was necessary to achieve in a very short period of time a study as precise as possible over the behaviour and relationship of insect with regard the host plant, (Khous, 1992).

As far as we know, it is the first time that the damages caused by green beetle observed over the *Tetraclinis* of the zone of study. The purpose of this work is to deepen our knowledge over the biological behaviour of the insect in order to build a strategy of protection through the national territory.

MATERIAL AND METHODS

Presentation of the Study Zone

Mountains of Traras are located in the south west edge of the Mediteranian Sea. They belong to the coastal channels of western region of Algeria (Oranie), (fig. 1). The massive of Traras is a mountainous region with an average altitude varying from 500 to 1000 m. These mountains are characterized by a mediteranian climate; semi- arid hot with an average rainfall of 300 mm and

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average temperature of 18° C. The orography of the region is very specific, with a parallel extension of the cost of the main reliefs, thus forming relatively continuous barriers on the route of air masses coming from the sea, giving birth to very favorable topographical conditions to capture atmospheric moisture. This characteristic is also favored by the provision of the hydrographic network, (Medjahdi, 2001).The main sets constitute the substratum are the carbonate formations, non carbonate formations, volcanic formations, and quaternary formations, (Nichane, 2011).The game of litho logy of relief and climate allows an ecological stratification, as a result an important original ecological diversity to the region, (Medjahdi, 2001).

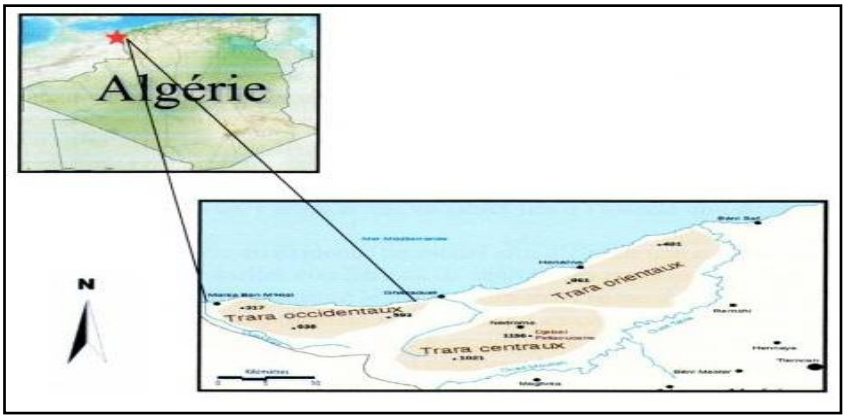


Fig1. *Location of the study area, (Medjahdi and al., 2008)*

METHODOLOGY OF SAMPLING

The method used in this work consists in a systematic inventory of small places following a mesh network of 100x100m.The inventory comprises two places of study set at the level of the massive forest of Souk Tleta. The technique used in the harvest of this insect is that of debarking. It eventually allows the harvest of the specimens in this arboreal green beetle which uses this place as a refuge shelters or as habitat, (fig. 2).

Fig2. *Debarking, (Nichane, 2011)*

A number of 20 trees of *Tetraclinis articulata* were taken into consideration. To cover the entire activity of this insect, the operation of cutting down trees was carried out in two periods; spring time period and summery period. From the basis of the felled tree, the diameter of the tree can be noticed at different levels over 4meters of height. The chosen diameter is noticed every 45 to 50 cm. Holes are counted per slices of 1meter.The distribution of attacks in terms of height was realized for each tree. The attack rate is one of the easy parameters to measure and gives reliable results on the health status of the population.

STATISTICAL ANALYSIS

Statistical analysis relied upon the data collected from the field. They were analyzed using graphical approaches and procedures of statistical analysis with the help of the analysis of ANOVA variance using the SPSS package.

RESULTS AND DISCUSSION

The main symptoms are observed in chronological order, browning leaves, drying and falling of leaves then a decay of the tree. Investigations done in the laboratory on harvested specimen's show that these damages are due to a xylophages' insect, in this case, a golden beetle in phase of hazardous pullullation. Hundreds or more xylophages' individuals are abundant over the Thuja and Cypress. The identification of this insect was done in collaboration with Pr.BOUHAROUA (laboratory of forest zoology).It concerns *Ovalisia festiva*.

BRIEF DESCRIPTION OF THE INSECT

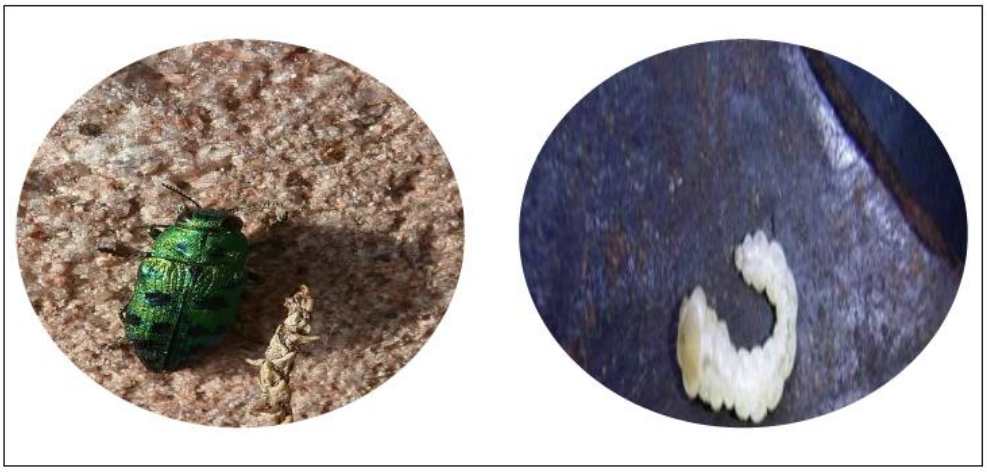
Origin

The insect is localized in France, Portugal, Spain, France, Portugal, Spain, Germany, Italy, Yugoslavia, Bulgaria, Hungary, Greece, Crete, Morocco, Algeria and Tunisia.

Green beetle of Thuja is a beetle belonging to a super order of *Polyphaga*, to the infra order of *Elateriformia*, to the super family of *Buprestoidae*, to the family of the *Buprestedae*, to the subfamily of *Buprestinae*, to the tribe *Dicercini*, (Anonymous, 2010).The green beetle of Thuja has many Latin synonyms mainly: *Lampra festiva*, *Ovalisia festiva*, *Palmar fetsiva*, *Scintillatrix festiva*.

Morphology

Adults measure 7 to 11 mm of length, they have an ovoid form. They are of green color with a metallic glints. The pronotum has a dark purple spot in each of the two lateral depressions. Elytrons have small spots in their basis and their apical segments and in the middle of the big macula. They have also observable marks and lateral edges finely denticulate. The head partially engaged under the prothorax is perpendicular to the body and is slightly mobile. Antennas are short and consist of 11 articles. Tarsi have 5 articles, flat larvae, apods, measuring up to 25 mm with a big head. Nymphs are naked, white, very soft, flat and hairless. (fig.3)



Adult *Larva*

Fig3. *Ovalisia festiva, (Nichane, 2011)*

Biology

The larvae develop in the basis of branches and in the trunk by digging sub cortical galleries, so they affect the conducting tissues. These galleries are sinuous, flat and wide. Larvae pupate in late of March and early April in the sapwood after making a turnaround or in the thick bark. Adults appeared from May to August. Heliophilous and thermophious are therefore active in the sun during the warm hours of the day. The rest of time they take shelter and remain immobile. Adults fly in the sun and are put down in the edges of branches. After mating, reproduction comes immediately. Females lay eggs in the cracks of the bark of the stems or trunk.

The cycle of the insect is annual with transition from winter to the larval state (Akiyama, 1987).Digging galleries, larvae prevent the flow of the sap and cause yellowing and browning of branches which eventually dry. With a little attention it can be observed on the branches starting from the trunk, oval holes that are related to the green bettle, (fig4).

Fig4. *Damage of the green beetle Ovalisia festiva over the Thuja, (Nichane, 2011)*

VARIABILITY OF RATE ATTACK RELATED TO STATIONAL PARAMETERS

The stational factors taken into consideration for the analysis of variance at 95% are: altitude, exposure, micro relief, and slope.

Attack Rate Relationship - Altitude

A possible attack rate relationship-altitude is highlighted throughout the analysis of the variance to a factor where the significance level is 95%.It appears that the attack rate presents a significant variability related to the altitude in so far as the observed »F » is significantly higher than the Theoretical « F ». In fact the rate attack diminishes as the altitude increases.

Table1. *Analysis of the Variance of the rate attack related to the altitude at a significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	6. 41230011	4.01870267	Significant

Attack Rate Relationship-Exposure

The analysis of the variance of rates attack related to the exposure presents a signification. Although this weak variability, the trees exposed to relatively high sunny periods are likely to be attacked by the golden beetle. Almost 3 out of 4 of inventoried trees deemed to be attacked by this insect are exposed to wards E-NE.

Table2. *Analysis of the variance of rates attack related to the exposure to the significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	3. 54895322	3.05213008	Significant

Attack Rate Relationship - Micro Relief

The structure of a micro relief contribute tremendously, in relation to the set of relief, to stational differences mainly of temperature, moisture and light, (Guinier, 1995).Throughout the analysis of attacks, 65% is recorded at the level of an intermediary micro relief.

Table3. *Analysis of the variance of rate attack related to the micro relief to the significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	3. 00110800	2.83116901	Significant

Attack Rate Relationship - Slope

The degree of the inclination of the field determines the soil stability and water retention, (Khanfouci, 2005).Results analysis show an increasing pace related to the slope of the field. In fact the rate attack is high in rough grounds (more than 25degrees)

Table4. *Analysis of the variance of rate attack related to the slope at the significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	3. 89567345	3.01342678	Significant

VARIABILITY OF RATE ATTACK RELATED TO DENDROMETRIC PARAMETERS OF THE TREE

The dendrometric parameters of the tree that are taken into consideration in this study are: height, circumference of 1.30 m and density.

Attack Rate Relationship -Tree Height

The variability of the attack related to the height of the tree is significant (F observed > F theoretical).

The calculated average attack rate concerning the trees varies from 16 % in first meters to 37% at third meters. At four meters the ate diminishes to 21% there where the crown begins to form generally. The thickness at this moment is thin limiting the penetrations of the golden beetle.

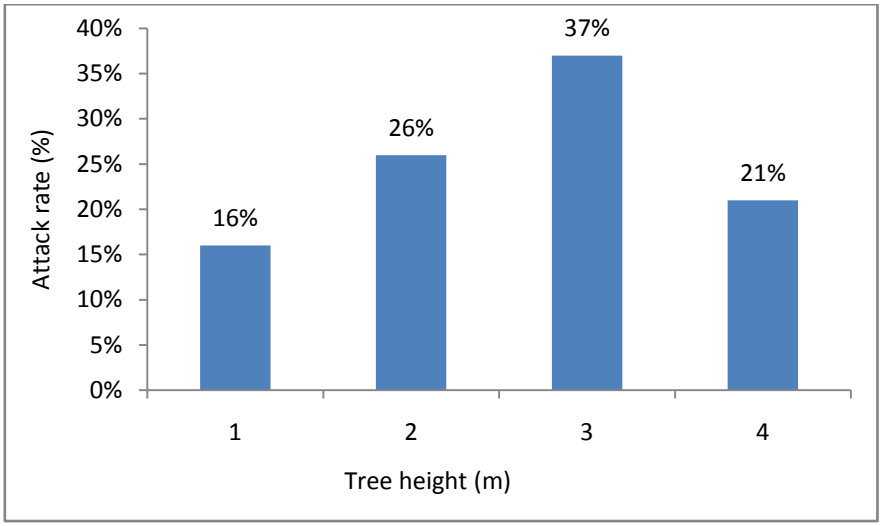


Fig5. *Average attack rate according to tree height*

Table5. *Analysis of the variance of rates attack related to the tree height at the significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	3. 00023510	2.45327601	Significant

Attack Rate Relationship - Circumference 1.30m

The analysis of variance to a factor at sigficance level of 95% proves to be very significant in so far as it was found that the big trees are the most attacked. This makes it possible to assert that the diameter and chemical cconstituants explain largely the choice of the females to give out eggs.

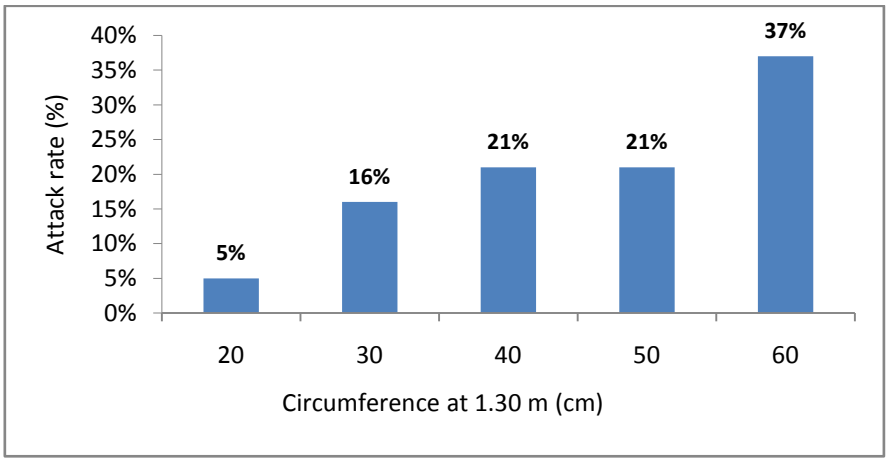


Fig6. *Average attack rate according to circumference at 1, 30 m*

Table6. *Analysis of the variance of rate attack related to the circumference at 1.30m of the significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	3.41409152	3.30138061	Significant

Attack Rate - Density

The density is an excellent criterion which expresses the level of competion between the individuals of a particular population. On the basis of density stratification, the analysis of the variance at a significance level of 95% shows an important difference. It is the notion of the living space.

Table7. *Analysis of the variance of rate attack related to the density of population at the significance level of 95%.*

	F observed	F theoritical	Signification
Attack rate	3.41409152	3.30138061	Significant

CONCLUSION

The attack of golden beetle causes browning and death of branches or all the plant. Under the bark there are galleries filled with brown sawdust, dug by larvae led to the top of the tree. Attacks vary from one tree to another. However the observed gradient attack related to heights on the considered trees is comparable for certain subjects and remains variable with regard several other trees. Trees are infested to relatively different degrees. Important movements occur during the annual cycle and over the years as well. The calculated attack rate which is 58.33% shows the right conditions for the development of this insect. The purpose through the analysis at a factor of a significance level of 95% is to evaluate the pace of the attack rate related to diverse variable dendrometric and stational. It appears that:

- The attack rate presents a significant variability with the altitude, as the altitude increases; the attack rate becomes less frequent.
- The attack rate varies slightly with the former position, nearly 3out of 4 of inventoried trees that are likely to be attacked by this insect are exposed towards the direction of E-NE.
- The attack rate presents significant variability related to micro relief, 65% is recorded at a level of an intermediary micro relief.
- The attack rate presents a weak variability with regard the degree of inclination of the ground. In fact the attack rate increases in rough grounds(more than 25 degrees)
- The attack rate presents a significant variability related to the tree height. Between the third and the fourth meter of the observed insect attack rate is important (37%).
- The attack rate varies significantly related to the circumference at 1.30m.It was found that from a diameter of 60cm, the rate attack is important.
- The attack rate shows a significant variability related to density. In fact the class of 150feet/ha is that of the most recorded attack rate (41%).

To implement a strategy for protecting these ecosystems against parasite attacks, researches should be oriented towards diver's multidisciplinary approaches (biological, physiological, pedagogical,

mycological,…) on the other hand, it should be comprehensive using several actions of sanitization, among others, the removal of dead trees from the forest to avoid contamination or to reduce the population level below an epidemic threshold. Reforestation of bare areas of the same type of trees and the permanent intervention of the forest warden are also considered as effective measures. In a broad of view surveillance and precautions are primordial for maintaining the health of Tetraclinis.

Studies made on insects devastating forest trees have concerned mainly the family trees of *Pinacea.*While the study of the entomofauna of *Cupressacea* is very limited. For this reason it is advisable to use this work as a link to coordinate with other works in order to delimit certain parameters in the future such as the deep study on the attack strategy of the green beetle.

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