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Fight against the bruche bean *Acanthoscelides obtectus* (Coleoptera: Bruchidae) and the mite *Tineola bisselliella* (Lepidoptera, Tineidae) by the essential oils extracted from *Rosmarinus officinalis*

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ABSTRACT

In the present study we tested the insecticidal capacity of the essential oils extracted from *Rosmarinus officinalis*, on two devastating beetles, *Acanthoscelides obtectus* and *Tineola bisselliella* (coleopters and lepidopteres). Bioassays on *A. obtectus* were realized under the conditions of laboratory (temperature and relative humidity respectively maintained to 27°C and 75%), and on *T. bisselliella* has a temperature of 25°C and relative humidity of 75%. Essential oils were extracted from the leaves of *R. officinalis* by hydrodistillation (yield of 0,6%). The doses used out of essential oils on *A. obtectus* are 1 to 5 µ l/30g of seeds, and 1 to 5 µ L on *T. besselliella*. The results show that essential oils tested are very toxic on adulate *A. obtectus* with LD_{50} = seed 0,59µL/30g after 48h of exposure, as it appears that the mite *T. bisselliella* is also very sensitive with respect to essential oils with LD_{50} = 1,28 µ L.

Key word: *Acanthoscelides obtectus*, *Tineola bisselliella, Rosmarinus officinalis,* essential oils, insecticidal activity.

INTRODUCTION

Acanthoscelides obtectus is a ravageur of the tropical and subtropical zones which followed the recent importation of bean of the Central America to Europe (Serpeille, 1991).

Nowadays, the bean is cultivated in the whole world, the distribution of the beetle is cosmopolitan with a great migratory capacity because of its cycle of life polyvoltin. This characteristic makes of it a ravageur whose dispersion is very related to the human societies and whose expansion is, so potentially unlimited (Hossaert- McKey & Alvarez, 2003).

Tineola bisselliella is also called the mite of clothing. This well-known "mite" meets in the whole world. Apart from the dwellings, this species is univoltine. Whereas in the houses where it generally saw, up to 4 annual generations follow one another (Lepigre, 1951**)**. The caterpillar eats almost all the substances of animal origin: tease, fur, mainly containing keratin. In the dwellings where the ecological conditions are not very variable, the insect does not present a stop of development and it is possible to find eggs, caterpillars, nymphs, butterflies constantly of the year.

The insecticides represent one of the methods of fight the most used against the

devastating insects. But there are stocks of insects resistant to these insecticides, as well as the risks which he present on the health of the consumers (Field & Dyte, 1976; Subramanyam & Hagstrum, 1995; Wite & Leesch, 1995), and the high price of these pesticides thus encourages to seek alternative methods of fight.

The compounds allelochimic, in particular essential oils, were the subject of many research in order to reduce the losses caused by the devastating insects of the grains stored by their insecticidal effects (Tapondjou and al, 2003; Kellouche, 2005). Indeed, we proposed in the present study to test the biological activity of the essential oils extracted the aromatic plant *Rosmarinus vulgaris* on *A. obtectus* and *T bisselliella.*

MATERIAL AND METHODS

Breeding of *A. obtectus*

The breeding of mass of *the A.obtectus* was carried out in bottles out of glass of 15,5 cm height and 8 cm in diameter, on bean grains *Phaseolus vulgaris* of the average white variety, with a weight of 500g in each bottle.

The bottles were maintained with the darkness in a drying oven regulated at a temperature of 27°C and a relative humidity of 75%.

Breeding of *T. bisselliella*

The breeding of mass of the mite *T. bisselliella was* carried out in plastic bottles of 20 cm height and 23 cm in diameter, on wool affected beforehand by mites.

The bottles were maintained with the darkness in the drying oven regulated at a temperature of 25°C and relative humidity of 75%.

Collect and preparation of plant material

The leaves of *R. officinalis* were collected in Mars 2007, in the region of Méchria (180 km south of Tlemcen) The plant marerial was dried for a period of ten days at 25°C to extract essential oils by hydrodistillation for 5 hours.

Witness breeding

A. obtectus

We mixed 1ml acetone with 30g of bean seed in Petri box. After evaporation of solvent, we introduced five (5) couples of *Acanthoscelides obtectus* (aged 0 to 48h), with three repetitions. b-*T. bisselliella*

We use as food substrate of the white rabbit skins. These skins, settings to be dried, are then placed in the content of Petri box. We then introduced five (5) couples of *T. bisselliella* (aged 0 to 48h), with three repetitions.

Doses and salaries

Concerning the tests on *A. obtectus*, for each test, 1ml of an acetone solution containing each oil essential to 1, 2, 3, 4, 5 acetone µL/ml was added to seed 30g seeds contained in a box of plastic Petrie, and then all had been properly mixed. All boxes were not infested 5 couple *A. obtectus* (aged 0 to 48hours). The tests were repeated 3 times for each dose.

Concerning the mite *T.bisselliella*, we put in each Petri box a number of 5 couples of *T. bisselliella* (aged 0 to 48h), using a micro-pipette we deposited on the food support of oils essential to 1, 2, 3, 4 and 5 µL. The tests were repeated 3 times for each dose.

For the two insects tested, counting of the dead insects were carried out each 24heurs for one 6 days period, recorded mortalities were expressed after the correction by the formula of Abbott (Abbott, 1925).

The values of LD_{50} were calculated by the method of the probits.

Statistical analysis of data

The results are subjected to the tests of the analysis of the variance with two criteria of

classification (ANOVA 2)**,** useful for the study of the action of two factors (Dagnelie, 1970). We used this type of analysis to test the effect of the dose and the exposure time of essential oils on the mortality rate of the bruchids and the mites.

RESULTS

Effect of essential oils on the mortality of the bruchids

Fig. 1- Evolution of the mortality of *A. obtectus* adults with respect to the duration of exposure and dose of essential oils of *Rosmarinus officinalis*.

Concerning the factor proportions out of essential oils, It exists a variation between the mortality rates with F = 17,10 for P = 3,18.

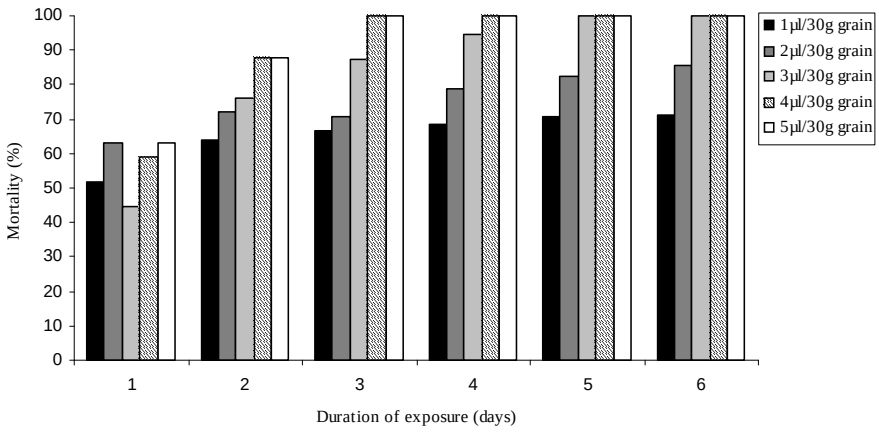

Fig. 1: Evolution of the mortality of *A. obtectus* adults with respect to the duration of exposure and dose of essential oils of *Rosmarinus officinalis*

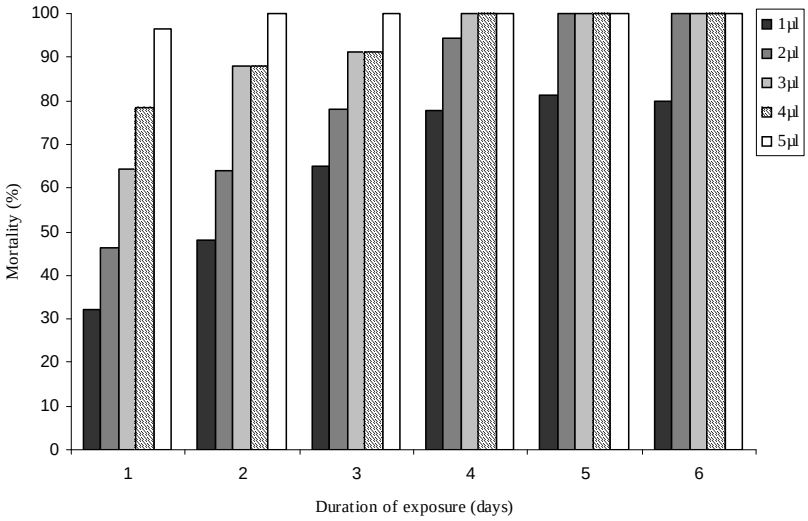

Fig. 2: Evolution of the mortality of the T. bisselliella adults according to the time and doses of essential oil of Rosmarinus officinalis

Concerning the factor exposure time, the statistical analysis showed a difference enter the mortality rates of the beetle with F = 20,35 for P = 3,18.

Effect of essential oils on the mortality of *T. bisselliella*

Fig. 2- Evolution of the mortality of the *T. bisselliella* adults according to the time and doses of essential oil of *Rosmarinus officinalis*

Concerning the factor proportions out of essential oils, It exists a variation between the mortality rates with F = 15,05 for P = 2,86.

Concerning the factor exposure time, There is a difference enter the mortality rates with F = 11,20 for P = 2,99.

Values of LD50

The calculated LD_{50} were of 1,69µL/30g seeds for *A. obtectus*, and 1,28 µ L for *T bisselliella*. These results show that *T bisseliella* is more sensitive than *A. obtectus* screw has life of the essential oils extracted from *R. officinalis*.

DISCUSSION

According to the results obtained we note that essential oils extracted of *R. officinalis*, represent a direct incidence on the mortality of *the A.obtectus* bruchid and the mite *T. bisselliella*.

The results obtained concerning the bioefficacity of essential oils on the mortality of *the A.obtectus* bruchid and the mite *T bisselliella*, show that the essential oils extracted the sheets of *R. officinalis* have an insecticidal effect over the two insects tested, which varies according to the dose used, and the exposure time what is confirmed by a statistical study. The values of DL_{50} after 48h of exposure, show that the essential oil extracted from *Rosmarinus officinalis* is most toxic on the adults of *T bisselliella* (DL50 = 1,28 µ L) comparatively has *A. obtectus* (DL50 = 1,69µL/ 30g). According to Atik Bekkara (2007), essential the oil components extracted from *Rosmarinus officinalis* of the region of Tlemcen are the á-pinene (23,1%), â-pinene (12%), camphor (14,5%), cinéole (5%) and á-terpineol (1,1%). Essential oil studied contains substances known for their insecticidal properties, which explains the results obtained. According to Ojimelukwe (1999), á-pinene revealed an interesting insecticidal effect against *Tribulium confusum,* and of the similar effects have was also noted with the á-terpineol, the cinéole and the limonéne (Prate and al., 1998). In addition, several authors (Klock and al., 1985; Haubruge and al., 1989; Weaver and al., 1991; Konstantopoulou and al., 1992; Kellouche & Soltani, 2004) reported that essential oils were found to be toxic to many insects.

CONCLUSION

By observing the results obtained, we deduce that these essential oils are effective against the attacks of the *A.obtectus* bruchid and the mite *T. bisselliella*. Indeed, it influences directly affects the mortality rates. The statistical analyses showed that the factor proportions out of oils essential with a highly significant incidence on the mortality of the two ravagers. This repulsive capacity of the essential oils extracted the sheets of *Rosmarinus officinalis* is due primarily to their chemical compositions. It is significant to avoid the disadvantages of the chemical fight, the use of the essential oils extracted the aromatic plants, having an insecticidal activity can constitute an at the same time effective and economic solution.

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