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Bio-efficacy of oils and powders of some medicinal plants in biological control of the pulse weevil (*Callosobruchus chinensis*)

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ABSTRACT

Each year, the chickpea suffer's from significant losses in both quantity and quality. These losses are observed particularly in stocks, which are principally due to attacks by weevils. The most devastating is the Chinese weevil (Callosobruchus chinensis). In the context of biological control as an alternative to chemical control, three plants were tested for their possible role organic insecticide, namely Thymus vulgarus, Santolina chamaecyparissus and Anagyris foetida. The leaf powders and oils of these plants that was extracted by hydro distillation were tested for their effect on the biology of C. chinensis such as fertility, longevity and sex ratio. The results showed that oils and powders of three different plants tested possess insecticidal activity against C. chinensis. By comparing these oils, thyme oil at a dose of 10 µl exhibited great biocidal power against insects as we experienced 100% mortality after only hours of exposure to treatment, hard tan l 'oil santolina also had 100% mortality but at a dose of 20 µl. Regarding the powder, that of Santoline when compared to other powders at a dose of 1 g significantly reduces longevity (2.9 days), fecundity (3.06) and fertility (3.33). It even has an ovicidal effect. For 10 repetitions, we have recorded a single outbreak. This allows us to move forward so that the oils and powders tested plants can be used as bio insecticide for control of C. chinensis populations of pests of stored foodstuffs.

Key words: *Callosobruchus chinensis*, *Cicer arietinum*, *Thymus vulgarus*, *Santolina chamaecyparissus*, *Anagyris foetida* and bio-insecticide.

INTRODUCTION

Chickpea is an important legume in India as well as Rajasthan, however, due to some causes, the production of this plant has declined recently, resulting to over 40% of annual power losses (Labdi, 2002). One of the causes of the decline is the damage caused by the Chinese weevil (*Callobruchus chinensis*) A bruchid that infests both pods in the field and seeds in storage [Stoll,

1988]. According to Singh et al. (1978), 100% of cowpea seeds were infested after 3 -5 months of storage in India. Among the insect pests attacking stored products, pulse beetle is a serious one [Sherma,1889]. Pulse weevil is a small beetle in which the female lays eggs on the pods of crops and attacks the stocks. This attack may cause a significant yield loss. The heavy infestation of grains by these insects, makes them lose their germination capacity and therefore become unfit for human consumption. Both quantitative as well as qualita-tive losses occur due to *Callosobruchus chinensis.L*. To reduce the infestation of this insect pest, this research was conducted in order to test the insecticidal activity of medicinal plants as an alternative to chemical control. Powders and oils of three wild plants were tested as organic insecticides thyme; *Thymus vulgaris*, Santoline; *Santolina chamaecyparissus* and Anagyris; *Anagyris foetida* at different doses. To test the powders, we used doses of 0.1, 0.5 and 1 g and for testing oils extracted from different plants; the doses of 0.5, 10 and 20 µl were used. Every dose (powder and oil) of various plants was tested on different biological aspects of the insect in a constant temperature (28°C) and relative humidity (72%±5). The interest in this kind of work is the search for plants that can be used locally as biopesticide for protection of this precious commodity. Oils extracted from plants have been extensively used in tropical countries for crop protection [Singh et al., 1978; Dabiré, 1993]. Aromatic species, particulary those in the family of Labiatae or Lamiaceae are among the most widely used plants in insect pest control [Lambert et al., 1985; Morton, 1981; shaaya et al., 1997]. The use of powders aromatized with essential oils , has a twofold advantage due to the combined effects of mechanical action, blocking the insect's articulations [Ramaswamy et al.,1995]. Several research projects around the world have therefore been made for the same purpose [Arnason et al., 1989; Brunetton, 1997; Schivanna et al. 1994; Allawati, 2002] and others.

EXPERIMENTAL SECTION

Livestock insect

The strain of *Callosobruchus chinensis* has been reared in the Laboratory of Zoology of the Research unit of the Laboratory Research on Entomology, IBAS, Sikar. The emerged adults aged 0 - 24 times, obtained from a mass rearing, were kept in glass jars filled with chickpeas of about 300 seeds per jar and on which adult males and females different ages are high. The experimental device was presented throughout the test in an oven under controlled temperature (28°C) and humidity (72%±5). The substrate used was composed of grains of chickpea variety CSJ-104 obtained directly from the Agricultural Research Station Sikar. The plants used are: *Thymus vulgaris*, *Santolina chamaeyceparissus* and *Anagyris foetida* and were harvested directly from the surrounding of the study area. To obtain fine powders, a significant amount of leaves of different plants were dried in the open air and then crushed and sieved. The extraction of oil was done by hydrodistillation.

Treatment of seeds powder In this study, 200 chickpea seeds distributed in 10 Petri dishes were infused with powdered leaves at different doses or (0.1, 0.5 and 1 g) for each of the plants used. A couple aged 0 - 24 h was added to each Petri dish.

Treatment of seeds oils The experiment is closely related to that of the previous one except that instead of powders, we soaked the seeds with the oil of each plant at different concentration of 0.5, 10 and 20 _l. The purpose of our tests is the comparative study of the biocidal effect of Righi-Assia et al. (1475) powders and oils extracted from leaves of different plants on different biological parameters of the weevil namely longevity, fecundity, fertility and the cycle of development.

Study of the effect of powder on the longevity
For each of the plants tested for each dose, 0.1, 0.5, 1 g, 10 repetitions were performed to estimate the lifespan of males and females. Each individual male or female was isolated in a Petri dish containing 20 seeds of each chickpea impregnated powder. The control was performed daily.

Study of the effect of powder on fecundity
10 couples aged 0 - 24 h were each isolated in a Petri dish containing 20 seeds of each chickpea treated with powder, to estimate the number of eggs laid per female. The experiment was repeated for all doses of different plants and the number of eggs was observed daily.

Study of the effect of powder on fertility The purpose of the test was to determine the percentage of eggs hatched after treatment with different doses of powder already tested in the setting fertility using the same experimental device.

Study of the effect of powder on the cycle of development
The study of this parameter is the continuity of the observation setting fertility. It therefore followed the eggs from spawning until the emergence of imagos always under the same conditions of temperature and humidity.

Study of the effect of oil The same experimental protocol was conducted to study the effect of powder on the arious parameters of the insect used for this study. Only oils replaced the powder using doses of 0, 5, 10 and 20 _l. All results were subjected to treatment analysis of variance (ANOVA) for all parameters studied in ugly Staticf software, Version5.

RESULTS AND DISCUSSION

It is clear from the results, that individuals treated with the powder of leaves of different doses and different plants have a longevity that varies significantly with sex, when compared to the control. We recorded an average shorter lifespan of females as a result of santolina dose of 1 g, estimated at 2.3; 5.8 days for thyme; 5.9 days for 9.7 days Anagyris in the witness. While males have an average lifespan that varies between 5.4, 4.6 and 1.5 days, respectively for doses of 0.1, 1.5 and 1 g as a result of powdered thyme 8.3 days for the witness. Concerning the action of santolina, we noted an average lifespan of 6, 3.1 and 2.3 days. For Anagyris, the results do not show an influence of the powder of this plant on the longevity of adults *C. chinensis*.For other studied biological parameters such as fecundity, fertility and the cycle of life it was noticed that the average punters, as a result of treatment with powders of different plants, had a low intake

witness (58.8). The lowest oviposition was recorded for individuals treated with santolina (13.8, 14.5 and 3.6 eggs) respectively for doses of 0.1, 0.5 and 1g, seconded by Anagyris then by thyme. The fertility rate was lowest among determined individuals who have undergone treatment with powdered thyme by contributing to the control (44.85%), respectively for doses of 0.1, 0.5 and 1g which matched rates fertility of 20.6, 0.25 and 0.5%. These results were highly significant CF = 5.07 and Fth = 3.80 this time assisted by powder santolina (26.2, 9.11 and 3.33%). These results were very significant. Under the effect of dust on this parameter, *Anagyris* result of variance showed that there was no effect. Schortes tlife cycle duration was 3 days under the action of Thyme and Santoline under the effect of the amount of 1g against 27.4 days in the control. Studying the action of essential oils on different biological parameters revealed, from the results illustrated, that thyme oil has a lethal effect on males and females at doses of 10 and 20 _l. The effect is very significant seconded by oil santolina dose of only 20 _l. 100% mortality was recorded under the action of thyme oil, a result that has spared us the study of other parameters. Regarding oil santolina latter, it has the same effect because even with the punters there was a record of ovicidal effect. It is thus clear from the results that the powder of the three plants tested above; that of santolina and thyme in doses of 0.5 and 1g play the role of bio insecticide for testing their biocidal effect to varying doses on different Righi-Assia et al. (1477). Ovicidal action of some leaves of *Nicotiana tabacum*, *Ocimum gratissum* [Ofuya, 1990] and powdered neem, Azederachna indica [Seck et al, 1991] was shown on the cowpea weevil by the various authors. Our results, with regards to the pea weevil, are similar to those found by these authors. Similarly, Oseckr and Anery (2002) tested the effect of some powder of leaves of trees and herbs that contain higher or lower high essential oils. Their tests showed a positive effect on the cowpea weevil. Pandy and Singh (1977; 1995) confirmed that the powder of neem reduce damage from this pest. Similarly, Mansour (1997) shows that 0.5% of Neem azal-S gives 100% mortality of different stages of insect development. Al Lawati et al. (2002) demonstrate the great power inhibitor extract powder of Annona squamosa *C. chinensis*. The plant, Anagyris, contains a very small amount of oil that we were not allowed to do this test. Pacheco et al. (1995) and Rajapakse and Vanemden (1997) have demonstrated the effectiveness of treatment with different oils against *Callosobruchus maculatus* in reducing longevity and egg lying without affecting the germination of seeds. Saluki et al. (2005) have shown that flavonoids significantly reduce egg laying and fertility in *C. Chinensis.* Similarly Jacob and Sheila (1990) argued that treatment with neem oil against *C. chinensis* reduces mortality to less than 60%. The essential oils have therefore been the subject of much research to reduce losses caused by pests of stored food products [Varma and Pandy, 1978; Hill and Van Schoonhoven, 1981; Shaaya et al., 1991; Mahdjoub, 1992; Gbolade and Adebayo, 1994; Ramzan, 1994, Hall and Menn, 1999 and Keita et al., 2001, Kallouche and Soltani, 2003 and many others].

CONCLUSION

Our temptation to use the powder of the leaves and oils extracted from three spontaneous plants tested (thyme, cypress and santolina small Anagyris) as natural organic insecticide against the weevil chickpea led to satisfactory results. Thyme oil, a wide biocidal effect on individuals recorded 100% mortality after one hour of exposure. Only oil santolina, an ovicidal effect that even with an egg fertilit was zero at 10 and 20 _l. Powders 0.5 and 1 g significantly reduced

fertility and the cycle of development. Our findings agree with those of several authors including Rajapakse (1996), who showed the same effect of oil of *Piper nigrum* on weevil cowpea or with the use of essential oils of citrus by Donpedro (1996). It is recommended that other doses and other plants should be used later to try and produce a range of organic insecticides that can be used at any time when the pest occurs. Preservation of the nutritional quality of this precious commodity is very important, therefore any attempt to study in this area by using natural substances is very justified.

REFERENCES

[1] A Kellouche; N Soltani, *Int. J. Trop. Insect. Sci*., **2003**, 24(1): 184 -191.
[2] AA Gbolade; TA Adebayo, Insect sci. App., **1994**, 15: 185-189.
[3] AI Pacheco; DE Castro; F Paula; D Lourencao, **1995.** *J. Stored Product Res.*, 19: 57-62.
[4] Al Lawati; K Azam; MLM Deadman, *Agric Sci*., **2002**, 7(1), 37-45.
[5] C Dabire, Thiam A, Ducommun G. (Eds), Protection naturelle des végétaux en Afrique Editions Enda, Dakar, Sénegal, **1993**, pp. 45-55.
[6] D Seck; B Sidibe; E Handruge; C Gaspar, *Med Fac. Landbou wweet. univ. Gent*, **1991**, 56: 1217-1224.
[7] EA Oseckr; JN Anery, *Plant Prot. Bull.*, **2002**, 42: 9-10.
[8] FR Hall; JJ Menn, *In methods in biotechnology (5) Ed. By Hall FR, Menn JJ, Totowa New Jersey, Human Press*. **1999**, pp. 1-10.
[9] J Hill; A Van Schoonhoven, *J. Econ. Entomol.*, **1981,** 74: 478-479.
[10] J Brunetton; Médicinales, Technique Documentation. Lavoisier, Paris. **1997**, p. 915.
[11] J Lambert; JT Arnason; BJR Philogène, *Insect Sci. Appl*. **1985**, 6: 167-170.
[12] JF Morton. *Thomas Springfield, IL*, **1981**, pp. 761-763.
[13] JT Arnason; BJR Philogène; K Morand. *ACS Symposium Series, Wachington, DC*. **1989**, p. 387.
[14] KN Don Pedro. *Interest pest control*., **1989**, pp. 31-34.
[15] KS Ohsawa; H Kato; Honda; I Yamamoto. *J. Agric. Sci*., **1990,** 34: 253-252.
[16] M Labdi. *Seminaries National surliest leguminous aliment Aires*, **2002**. p. 296.
[17] MH Mansour. H Kleebergand; CPW, Zebitz (Eds), pp. 189-200.
[18] NK Pandy; SC Singh. *Utlar Pradesh. J. Zool*., **1995**, 3: 162-164.
[19] Rajapakse RHS. *F. Entomonm*., **1996**, 21: 211-215.
[20] Ramzan M **(1994)**. *J. Insect. Sci*., 7: 37-39.
[21] RHS Rajapakse; HF Vanemden. *J.* Stored Res., **1997**, 33 (1): 59-68
[22] Righi-Assia; E Shaaya; U Ravid; Paster; B Juven; U Zisman; V Pissarev. *Insects J. Chem. Ecol*., **1991**, 17: 499-504.
[23] S Jacob; MK Sheila. *Plant Prot. Bull.*, **1990**, 42: 9-10.
[24] SA Mahjoub. *Egypt J. Agric. Res*., **1992,** 70: 4-487.
[25] SB Ramaswamy; S Sch; Monroe, WA Goire. I **1995**. *Inter. J. Insect. Morphol.*, 24: 51-61.
[26] SM Keita; C Vincent; JP Schmidt; JT Arnason; A Belanger. *J. Stored Prod. Res.*, **2001**, 37: 339-349.
[27] TI Ofuya..*J. Agric. Sci*., **1990**, 115: 343-345.