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Insecticidal effects of Thujaoccidentalis (Cupressaceae) essential oil on Rizoperthadominica(Col.:Bostrychidae) under laboratory conditions

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ABSTRACT: In order to find recyclable, environment friendly and easy accessible insecticides, the essential oils of Thujaoccidentalis L.(Cupressaceae), was used against the adult stages of Rhizopertadominicais the best danger pest of stored produc in Iran.The experiment was conducted in 6 replications using a completely randomized design of factorial experiment. The essential oil was prepared by water distillation method. Experiment was carried out at 30±2 °C and 60±5% R. H. under dark condition.The results was evaluated after 24h. LC_{50} and LC_{95} valuesforThujaoccidentalis L. essential oils were 259.8 and 561.8µl/l, respectively. LC_{25} valuefor acetone and essential oils of Thujaoccidentalis were 111.1 and 189.3 respectively. Combination of LC_{25} of essential oil and acetone observed mortality more than 50% (82/3 percentage), indicating synergistic effect between two substances.
Key words: Thujaoccidentalis, Rhizoperthadominica, Essential oil, fumigation

INTRODUCTION

Insects are a problem in stored grain throughout the world. Stored product insects cause serious losses in weight and quality of the stored products (Pugazhvendan et al., 2009).Crops loss due to insect pests varies between 10 and 30% for major crops (Ferry et al., 2004).Control of stored product insects relies heavily on the use of synthetic insecticidesand fumigants, which has led to problems such as environmental disturbances, increasing costs of application, pest resurgence, pest resistance to pesticides and lethal effects on non-target organisms, in addition to direct toxicity to users (Isman, 2006). Essential oils and their derivatives are recognized as an alternate means of controlling many harmful insects which are rapidly degradable in the environment and harmless to non target organisms (Pillmoor et al., 1993). Different types of aromatic plant preparations such as powders, solvent extracts, essential oils and whole plants are being investigated for their insecticidal activityincluding their action as repellents, anti-feedants and insect growth regulators (Isman, 2000; Weaver and Subramanyam, 2000). In the present study, we investigated fumigant toxicity ofessential oil of Thujaoccidentalis plants again t adults of RhyzopertadiminicaF.

MATERIALS AND METODS

Collect fruit Thujaoccidentalis

Fruit of Thujaoccidentalis in the yard insect Biology Department plant protection Department, College of Agriculture, University of Urmia, 15 km from the city of Urmia Nazlou in Cedar road, in the year 1390 and were used in the preparation of fruit.

Insect rearing

Preliminary population was obtained from laboratory stock cultures maintained at the Entomology Department, Urmia University, Iran. Wheat grains were purchased from local market and stored in a freezer −20 ˚C. They were then reared in 2.5 L glass jars covered by a fine mesh cloth for ventilation and containing 12% moisture content wheat grains for S. granarius. The culture was maintained in the dark in an incubator set at 26±1°C and 60±5% RH in the Department of Plant Protection, Urmia University. Adult insects, 1–7 days old, were used for fumigant toxicity tests.

Essential oil prepration

For essential oil prepration, fresh fruits moulated with tong and essential oils were extracted from these fruits (100gr fruit per 700ml water) and subjected to hydro distillation usingby modified clevenger type apporation at 100Ċ . The time of essential oil extract was 90 minutes. the excess water evaporated in a rotary evaporator – Buchi (R-3000) . Then the obtained oils were stored in dark brown vial coated with Aluminum paper at 4 Ċ.

The effect of essential oil of Thujaoccidentalison Rhizopertadominica adults

Bioassay trials carried out following Kita et al.,technique (Kita et al., 2009). In capped glass vials. thirty insects (1-7 days old) were placed in film bones that covered with ventilated lids. Then were placed in glass vials. Filter papers (2cm diamiters)were impregnated with the required concentration of essential oils (176.6, 205.5, 242.1, 283.7& 240 µl/l air) and they were placed in the cap of glass vials and covered. The number of dead insects was recorded up 24h in control and treatments % mortality calculated with Abbot formula. In this enperiment the insects that couldn't move their legs and antenna by using hot needles , were dead postulated. This research was carried out on compeletly random plot with six treatments at 30±2 Ċ, 60 ±5 RH at floot dark. The data were analyzed using the probitprocedareswith Spss and LC_{50} and LC_{95} values calculated. The means were seprated by using theTukeytest.

RESULTS & DISCUSSION

In this survey, the effect of essential oil had the most mortality on Rizoperthadominica adults as using 340 µl/l air couse 71.1% mortality variance analyzes of essential oil of Thujaoccidentalis showed that they are significants difference between treatments (F-value = 129.5 , P<00.1).LC_{50} and LC_{95}values were shown in Table 2. Container size used in this study was 300 mg per liter, These experiments Keita et al.,and Lee et al., respectively, 500ml and 3.4 liters. Obviously due to diffusion and low pressure steam power essential oils chamber volume increases. The amount of essential oil consumed LC_{50} and LC_{95} values will rise exponentially (13).Shukriet al.,CarumcopticumoilRizoperthadominicalooked after the calculated LC_{50} after 24h to 19.1 and after 48h 12.15 µl/l compared to that essential oils are more effective. In another study of Ebadollahiet al., Effect of plant essential household insecticides Lavandulastoechas L., against three species of stored product insects including Triboliumcastaneum, Lasiodermaserricorne, Rhyzoperthadominica,were applied to results of the study showed the high sensitivity of the RAS during 24, 48 and 72h with various doses of the essential oil was applied to duration and magnitude of increased mortality is also Rizoperthadominica, in 24 hours, well controlled so as an insect cache vegan and available and as safe for humans and the environment biological control of stored product pests is recommended. According to the results, whatever the dose used to enhance fatality rate also increased and oil LC_{50}24h with 259.8 µl/l was calculated. Table 1 LC_{50} and LC_{95} much oil in 24h is shown.

Table 1. LC_{50} and LC_{95} of Thujaoccidentalis essential oil the adult beetles in 24 hours Rev. (Rhizoperthadominica)

LC_{50}*	LC_{95}*	Slope ± Standard error of	the intercept ± SE	p- value	Chi-square	degrees of freedom
561.8	259.8	4.91±638.0	-4.291±1.192	94.0	38.0	3

* Values are microliters per liter of air

Table 2. Mean % mortality of fruit essential oil of cedar (Thujaoccidentalis) Rev. beetle (Rizoperthadominica)

176.6	205.5	242.1	283.7	340	Concentration of per ml
577.±0^{e}8/8 1	577.±0^{d}32.2	577.±0^{c}5 .45	732. ±1^{b}/656	577. ±0^{a}1.17	losses mean ± standard error

Dissimilar letters indicate significant differences cantat the 5% level by the Tukey test

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