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## BIOACTIVITY OF OIL FROM *Croton grewoides* ON THE CONTROL OF MEDITERRANEAN FRUIT FLY

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### ABSTRACT

*Ceratitis capitata* is known worldwide as a pest of fruit trees, present in Brazil in all its territorial extension. The aim of this study was to evaluate the effects of different concentrations of essential oil of *Croton grewoides* quince in controlling *C. capitata*. The experiment was conducted at the Laboratory of Entomology, Department of Crop and Environmental Sciences UFPB - Areia, PB. Pupae from rearing in the Laboratory of Entomology, were sprayed with essential oil and quince in the following concentrations: 0.0 (control), 1.0, 2.0, and 3.0%, with the aid of sputtered Manual 500 mL in Petri dishes containing sterilized sand. Then sprayed pupae were placed separately by treatment, in rearing cages for assessment of adult emergence. The evaluation was performed 7 days after application. The experimental design was randomized, with five replicates per treatment, each replicate consisting of 25 pupae. The concentrations LC50 and LC90 were estimated at 0.29 and 0.95, respectively. Therefore, low concentrations of oil quince, applied to soil, are effective in controlling pupae of *C. capitata*. The results of this study demonstrate that the quince oil significantly affected the mortality of pupae, which allows this tactic could be used more as an alternative measure in the management program of this insect pest.

**Keywords:** Alternative control; *Croton*; Fruit fly.

### RESUMO

#### BIOATIVIDADE DE ÓLEO DE *Croton grewoides* NO CONTROLE DA MOSCA DO MEDITERRÂNEO

*Ceratitis capitata* é conhecida mundialmente como praga da fruticultura, presente no Brasil em toda sua extensão territorial. O objetivo deste trabalho foi avaliar os efeitos de diferentes concentrações do óleo essencial de marmeleiro *Croton grewoides* no controle de *C. capitata*. O experimento foi realizado no Laboratório de Entomologia do Departamento de Fitotecnia e Ciências Ambientais da UFPB – Areia, PB. Pupas, provenientes de criação mantida no Laboratório de Entomologia, foram pulverizadas com óleo essencial de marmeleiro nas seguintes concentrações: 0,0 (testemunha); 1,0; 2,0; e 3,0%, com auxílio de micropulverizador manual de 500 mL, em placa de Pétri contendo areia esterelizada. Em seguida as pupas pulverizadas foram acondicionadas, separadamente por tratamento, em gaiolas de criação para avaliação da emergência dos adultos. A avaliação foi realizada após 7 dias da aplicação. O delineamento experimental utilizado foi inteiramente casualizado, com cinco repetições/tratamento, sendo cada repetição constituída de 25 pupas. As concentrações CL<sub>50</sub> e CL<sub>90</sub> foram estimadas em 0,29 e 0,95, respectivamente. Portanto, baixas concentrações de óleo de marmeleiro, aplicadas via solo, são eficazes no controle de pupas de *C. capitata*. Os resultados deste estudo demonstram que o óleo de marmeleiro afetou significativamente a mortalidade de pupas, o que permite que essa tática possa ser utilizada como mais uma medida alternativa em programas de manejo deste inseto-praga.

**Palavras-chave:** Controle alternativo; *Croton*; Mosca-das-frutas.

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## 1. INTRODUÇÃO

Brazil stands as the largest producer of fruits, but its share in exports is still small, in part, due to phytosanitary requirements imposed by importing countries, partly by the occurrence of fruit flies. The fruit flies are recognized worldwide as pests of fruits, found in Brazil, particularly species of the genera *Anastrepha* and *Ceratitis* (WRITE; ELSON-HARRIS, 1992; MALAVASI; ZUCCHI, 1999). *Ceratitis capitata* (Diptera, Tephritidae) is a pest more frequent and of greater economic importance to fruit growers, by attacking reproductive organs in plants, flowers and fruits with pulp (WHITE; ELSON-HARRIS, 1992; WHITE, 1996), constituting a major barriers for export of fruit to cause direct damage to production (DUARTE; MALAVASI, 2000; OLIVEIRA, 2010).

The direct losses can be observed by decreased production, increased production costs, lower production value and a shorter shelf life. Fruit grown in infested areas cannot be exported to countries with quarantine barriers (MALAVASI, 2001). The attack of fruit flies begins when the fruit is the mature-green, beginning to yellow. Eggs are laid inside the fruit and after hatching, the larvae feed on the pulp and facilitate entry of saprophytic organisms, like fungi and bacteria and cause rot and fall fruit (VIEIRA NETO, 2002).

The use of pesticides in fruit growing should be done under special care, avoiding whenever possible the application of these products (OLIVEIRA et al., 2010a). When pesticides are applied, its action is not restricted to the target pest, or to the application site. The programs of integrated pest management in fruticulture have encouraged the use of various methods and tactics of control, such as cultural methods, the use of attractive, resistant varieties, biological control and use of alternative products, which should be used in order to reduce the population density of insect pests and to promote the increased population of natural enemies, thus minimizing the ecological imbalances (OLIVEIRA et al., 2010b).

The quince belonging to the genus *Croton*, which in turn is one of the largest family Euphorbiaceae with nearly 1,300 species widespread in tropical and subtropical regions. The species *Croton grewioides* Baill is easily found in the Caatinga Biome in the states of northeastern Brazil. Because of their potential bio-insecticide, this plant species has attracted the interest of researchers and producers. Therefore, studies which highlight the efficacy of essential oil of *C. grewioides* in pest control are of paramount importance. The aim this study was to evaluate the effects of applications of different concentrations of essential oil of quince in the mortality of *C. capitata*.

## 2. MATERIAL AND METHODS

The research was conducted at the Laboratory of Entomology, Department of Crop University Federal of Paraíba - UFPB, Campus II, Areia-PB. The establishment of *C. capitata* is maintained at an average temperature of  $25\pm 1^{\circ}\text{C}$ , relative humidity of  $70\pm 10\%$  and photophase of 12 hours, the adults of *C. capitata* are kept in photophase 24h stimulus for oviposition.

To conduct the study were used pupae of fruit flies originating from reared in the laboratory, according to the method described by Brito (2007). Twenty pupae, aged 5 days were placed in Petri dishes containing vermiculite sand type. Was performed topical application of essential oil from *C. grewioides* in the following concentrations: 0.0 (control), 1.0, 2.0, and 3.0%. The essential oil was obtained by extraction of leaves and twigs using the process of hydro-distillation for 4 hours, with clevenger-type apparatus, as described by Barbosa Silva (2009). The application was done with the aid of a manual sprayer.

We observed the mortality of pupae after seven days. Mortality data (%) of the treatments and the control were subjected to the formula of Abbott  $Ma = (Mt - Mc) / (100 - Mc) \times 100$ , where Ma = corrected mortality according to treatment; Mt = observed mortality treatment with

insecticide and Mc = mortality observed in the control (ABBOTT, 1925). The experimental design was completely randomized. We used five replicates, each replicate consisted of 25 pupae for each treatment (oil and concentration), total of 125 pupae per treatment, more control. Data were analyzed by probit analysis (FINNEY, 1971).

## 3. RESULTS AND DISCUSSION

The results of this study propose that the oil significantly affected the mortality of pupae of *C. capitata*. The concentrations  $LC_{50}$  and  $LC_{90}$  were estimated at 0.29 and 0.95, respectively (Table 1). The mortality was 100% in tested concentrations of 2 and 3% in pupae of *C. capitata*. The pupae which received topical application of oil in concentrations of 1% showed a mortality rate of 91.83%. Therefore, low concentrations of oil from *C. grewioides* applied to soil are effective in controlling pupae of *C. capitata* (Figure 1).

Similar results have been reported by other researchers. However, the higher or lower activity of an insecticide is associated with the plant part used in the preparation of products or even the species of insects used in the bioassay (TRINIDADE et al., 2000). The results of this study allowed to register high rates of mortality of pupae of *C. capitata* at low

concentrations of oil *C. grewioide*. Randau et al. (2004), studying some species of *Croton*, said the terpenoid substances that may be associated with the insecticide effect, are found in all parts of the plant, and the predominance of these substances in the leaves and roots.

Morais et al. (2006) comparing the LC<sub>50</sub> and LC<sub>95</sub> values of oils from species of *Croton*, observed with the essential oil of *C. zenhtneri* was shown to be high active against *Aedes aegypti* L (Diptera: Culicidae), and its main constituent was anethole (94.09%), a phenylpropanoid. The main components were methyleugenol and

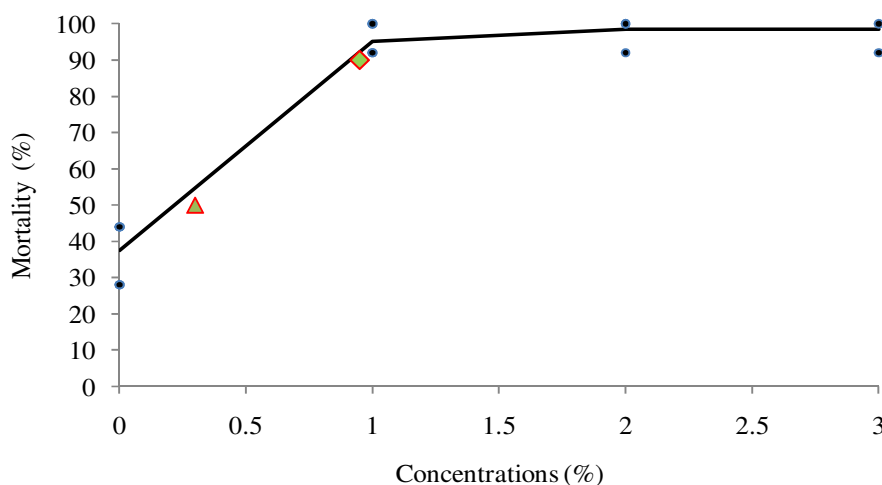
a-copaene for *C. nepetaefolius* (LC<sub>50</sub> of 84 ppm); a-pinene and b-pinene for *C. argyrophyloides* (LC<sub>50</sub> of 102 ppm); and a-pinene, b-phelandrene, and trans-caryophyllene for *C. sonderianus* (LC<sub>50</sub> of 104 ppm).

The results of this study demonstrate an alternative technique for control of tephritid species in semi-arid regions of Brazil. For the species *C. grewioides* represents an easy plant to obtain the field at the producer level, and can be used efficiently and economically.

**Table 1.** Activity of oil from *Croton grewioides* on the control of *Ceratitis capitata*.

Product	Stage	Slope±SE	LC <sub>50</sub>	LC <sub>90</sub>
Oil from <i>Croton grewioides</i>	Pupae	5.48±0.83	0.29	0.95
95% FL	-	-	(0.23-0.31)	(0.80-1.07)

LC - values and slopes (in %) were estimated by probit analysis.



**Figure 1** - Mortality of pupae of *Ceratitis capitata* induced by different concentrations of essential oil and *Croton grewioides*. Observed (dots) and predict results (line model). LC<sub>50</sub>(▲) and LC<sub>90</sub>(◆).

#### 4. CONCLUSION

The results obtained in this study showed conclude that low concentrations of oil *C. grewiooides* quince provide high mortality of pupae of *C. capitata*.

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