



PYRETHROIDS TOXICITY BIOASSAY IN *COFFEA ARABICA* L. SEEDS

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INTRODUCTION

The chemical contamination of the foods by chemical products for the control of plagues has been an object of public health concern, justifying the need of toxicological tests of safety and usage these for foods, animals and applicators. The usage of these substances in the seeds in general is a threat to the normal development of the foods, also because of the soil adsorption mainly when it is rich in organic matter, a fact that can generate strong environmental impacts, like the bioaccumulation in aquatic ecosystems (Philippi Jr, Romero and Polish, 2004; Katzung *et al.*, 2006).

The synthetic pyrethroids are derived substances of the pyrethrins, natural insecticides derived of some chrysanthemum species. This synthetic class is insoluble in water and not very movable in the atmosphere, even though it may strongly bind to organic fractions of the soil and can stand in the atmosphere for long periods (Newby and Mulder, 2007). These chemicals show low toxicity for mammals, fish and birds, what explains its agricultural and domestic applicability.

According to Santos (2006), pyrethroids dominate the current market of insecticides for domestic usage, being marketed in several ways, as solutions and aerosols. In the vegetables, this insecticide class is stabilized by several natural antioxidants presents in the leaves. This insecticide class is used thoroughly in the culture of coffee (*Coffea arabica* L.), however, there is lack of toxicological studies to certify the safety of these for the seeds.

The biomonitoring is a tool of the environmental impact studies that consists in the biomarkers use for evaluating the environmental impacts caused by the human action, seeking the necessary corrections to revert or to soften the effects of these impacts (Vasconcellos *et al.*, 2005). This tool has high applicability in studying the toxicity of several chemicals in any life form, what allows a larger transparency for the use of this class of substances, avoiding mistakes that can generate environmental consequences of significative impacts and costs (Philippi Jr, Romero and Polish, 2004).

Pyrethroids can increase the quantity of free calcium in the nervous terminations through the inhibition of Ca²⁺-ATPase and calmodulin, what increases neurotransmitters release in a deregulated way: sodium channels opening is extended (increasing neuronal excitability) and chloride ion voltage - dependent channels are closed, potentiating the effects generated in sodium channels.

Prallethrin, chemically (S) - 2 - methyl - 4 - oxo - 3 - prop - 2 - inilciclopent - 2 - enyl(1R) - cys - trans - 2,2 - dimethyl - 3 - (2 - methylprop - 1 - enyl)ciclopropanencarboxilate (C₁₉H₂₄O₃), classified as class III toxicological agent (or slightly poisonous), it is used as insecticide with vast domsanitary use (ANVISA, 2007).

Cypermethrin, chemically (RS) - - cyan - 3 - fenoxibenzil - (1RS,3RS; 1RS,3SR) - 3 - (2,2 - dichlorevinyl) - 2,2 - dimethylciclopropan carboxilate (C₂₂H₁₉Cl₂NO₃), classified as class II toxicological agent (or moderately poisonous), is used in leaves of cotton, peanut, rice, potato, coffee, onion, pea, bean, tobacco, watermelon, corn, cucumber, cabbage, soy and tomato (ANVISA, 2007).

Imiprothrin, chemically a mixture of 20% of 2,5 - dioxo - 3 - prop - 2 - inilimidazolidin - 1 - ilmethyl(1R) - cis - 2,2 - dimethyl - 3 - (2 - methylprop - 1 - enyl) - ciclopropan - carboxilate and 80% of 2,5 - dioxo - 3 - prop - 2 - inilimidazolidine - 1 - ilmethyl(1R) - trans - 2,2 - dimethyl - 3 - (2 - methylprop - 1 - enyl) ciclopropan - carboxilate(2,5 - dioxo - 3 - (2 - propinyl) - 1 - imidazolidinyl)methyl(1RS) - cys - trans - crisantemate, it is used for cockroaches control (INE, 2008).

OBJECTIVES

This study aimed to assess possible damages caused in coffee seeds by the administration of Prallethrin, Imiprothrin and Cypermethrin associated, through the evaluation of the possible alteration of morphologic characters that may indicate toxicity of this association.

MATERIAL AND METHODS

20 seeds in good state were acquired at a local store, and were distributed in 4 petri covered plates. Volumes of 1, 5 and 10ml of the association of the pyrethroids were added to the system, with 1ml of distilled water, with a group control. These volumes represent minimum medium amounts and maxims of application of this insecticide class in seeds of coffee through the traditional manual methods. The pyrethroids association (SCJohnson)-Cypermethrin 0,1%, Imiprothrin 0,03%, and Prallethrin 0,03%- was acquired at a local store.

The plates were incubated to $35 \pm 2^{\circ}\text{C}$ (insufficient temperature for combustion of the association) in incubator by 7 days, simulating the conditions of the soil of the State of Minas Gerais.

The plates were monitored with observations in the 1st, 3rd, 5th and 7th days after the incubation of the seeds, and removed of the incubator on the 7th day, proceeding to the morphologic evaluation of the seeds.

RESULTS AND DISCUSSION

There was total evaporation of the sample of seeds with 1ml of the pyrethroids association; the sample with 5ml of the association had evaporation, but the humidity of the seeds was preserved, and the sample with 10ml of the association had evaporation of 7,5ml of the liquid content, with preservation of the humidity of the seeds.

Morphologic alterations were not seen in the tegument of the analyzed samples in none of the observation days, probably because of the pyrethroids neutralization or stabilization through coffee alkaloids (as the caffeine) and flavonoids, being this last chemical class notably known by their scavenger activity.

CONCLUSION

Once there was absence of morphologic alterations, it can be concluded that the pyrethroids administration in seeds of this species of coffee doesn't exhibit apparent toxicity. However, chronic toxicity tests with animals are needed, using the liquid presentation of the obtained coffee seeds treated with the pyrethroids, and so the evaluation of the germination of these seeds. We believed that the low toxicity for mammals is also fact for the tested seeds, justifying the large usage in the cultures of coffee and other species.

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