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Insecticides and predatory lady beetles: Characterization of lambda-cyhalothrin resistance in *Eriopis connexa*

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Natural enemies are considered the major natural mortality factor of pests in different agricultural ecosystems. Despite resistance in natural enemies is a rare phenomenon, the occurrence of resistant populations of natural enemies could be beneficial because this biological control agents could prevent the population growth of the pests by control the escaping pests of insecticide exposure. *Eriopis connexa* is a key predator of soft-bodied arthropods mainly aphids. To control pest complex in many agro ecosystem are required multiple insecticide applications or broad-spectrum insecticides recommendation. The pyrethroid lambda-cyhaothrin is a broad-spectrum insecticide recommended against defoliators, but lacking efficacy against aphids; requiring the preservation of such predators as *E. connexa*. Recently, four populations of *E. connexa* were recorded as resistant to pyrethroid insecticide lambda-cyhalothrin. The lambda-cyhalothrin resistance in *E. connexa* is inherited as autosomal factor with incomplete dominance so heterozygous individuals could present resistant phenotype. The reduction of the level of resistance to lambda-cyhalothrin in *E. connexa* using piperonyl butoxide (PBO) and S, S, S-tributyl phosphorothioate (DEF) synergists indicated metabolic mechanism of resistance. Also, *in vitro* assays and native-PAGE pointed to high B-type carboxylesterase activity of resistant population being decreased by eserine, PBO, and methyl paraoxon inhibitors. In addition, resistance to lambda-cyhalothrin in *E. connexa* has allowed high survival under field rate of this insecticide applied against boll weevil in cotton and to field rate of other pyrethroids. Thus, physiological selectivity mediated by resistance to lambda-cyhaothrin has been detected in populations of *E. connexa* from Brazil.

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Impact of endocrine disrupters on the synthesis and metabolism of thyroid hormones

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Endocrine disruptors are compounds able to interfere with the synthesis, transport, effect or metabolism of hormones. Flavonoids are endocrine disruptors of natural origin, they are polyphenolic compounds produced by plants found in human diet. Although flavonoids produce many beneficial effects, they have been described to be detrimental to thyroid function. We and others have described that some flavonoids affect the activity of enzymes important for thyroid homeostasis, such as thyroperoxidase, the key enzyme for thyroid hormone biosynthesis, and deiodinases, enzymes that convert the prohormone T4 to the metabolically active hormone T3. Despite that, we have shown that the flavonoid rutin is able to increase thyroid iodide uptake, a feature that could make this flavonoid useful as adjuvant in radioiodine therapy. It is known that part of the patients with thyroid cancer lose the capacity to concentrate iodine, due to dedifferentiation of the cancer cells. Thus, a compound able to increase iodide uptake could render these cells susceptible to radioiodine therapy. Synthetic endocrine disruptors include plasticizers, such as bisphenol A and phthalates, which have been described to act as obesogens. Thyroid hormones are the main regulators of basal metabolic rate, thus a disruption in the synthesis or metabolism of thyroid hormones could predispose the individual to gain weight. In fact, we have found that some plasticizers are able to inhibit deiodinase activity. Therefore, the reduced production of T3 locally in target tissues could contribute to decrease the metabolic rate and thus might contribute to the increment in the prevalence of obesity.

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