TOXIC PROTEINS FROM VEGETAL AND MICROORGANISM: SPECIFICITY AND POTENTIAL USE IN INSECT-PEST CONTROL

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Biotechnological advances based on genes for insecticidal proteins have open up alternatives to solve agriculture problems. A broad number of genes coding those proteins are today known due to their potential use in plant genetic engineering aiming insect pest control, emphasizing the *Bt* toxin genes obtained from *Bacillus thurigiensis*, proteinase and α-amylase inhibitors genes and proteins like lectins genes from vegetal sources. Cry toxins are the most studied insecticidal proteins and have been used successfully since 1996 in commercial genetically modified (GM) crops. They have individually a defined spectrum of insecticidal activity, normally restricted to insects order (dipteran, coleopteran, lepidopteran,). Among the advantages related to the use of those genes coding to Cry proteins include i-) the low toxicity on humans and mammalian; ii-) a rapid degradation in the environment; and, iii-) the high specificity level to target insect, minimizing the impact possibility onto non-targeting insect such as: pollinating and natural enemies. The hydrolytic digestive enzymes inhibitors vastly founded in vegetal seeds constitute another class of important proteins to be considered in the insect pest control. These inhibitors are polypeptides, which exhibit the capacity to bind the insect proteolytic enzymes, blocking their enzymatic activities and consequently interfering in the digestive process. At present, different strategies are being applied in GM plants with the objective to increase the level of crops protection and avoid the insect's resistance development. Recent studies have been demonstrated that the expression of more than one toxin or protein in the same plant (pyramidal strategy) could substantially increase the time for developing resistance in the exposed insect populations. Among the new strategies are also included the use of hybrid proteins (fusion), resulting in a significant toxicity increase; likewise, the use of *in vitro* molecular evolution technique, which allow the generation and selection of molecules with high activity and more specificity to target insects. The use of these new strategies in the insect pest control will be discussed.
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