

PROGRESS AND CHALLENGES OF DETECTING BIOMARKERS FOR THE DEVELOPMENT OF PESTICIDE BIOSENSOR IN RICE PLANTS

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41.1 INTRODUCTION

Pests have been known to cause a significant reduction in the yield and quality of rice crops and could in turn create a food shortage. The use of pesticides as a modern agricultural practice, which is known as the “Green Revolution” in many nations, has significant effects on global food security as it has been reported to show advantages in reducing crop losses and increasing production yields (Carballo et al., 2012). Pesticides have been widely used as there are about 800 species of insects present in rice fields, while around 100 species among these have been reported to have the ability to cause a reduction in rice yield. Therefore, over the last decade, about half of the insecticides sold have been used for rice. The most widely used pesticides throughout the world are insecticides with 44% followed by herbicides 30%, fungicides 21% and, others 5% (Aktar et al., 2009). The phenomenon of extensive and repeated use of insecticide has led to the build up of resistance against these products by the insects present in the rice fields, thus, making the existing insecticides increasingly impractical for insect pest control and management; numerous insecticide resistance cases have been reported since the 1940s (Sparks and Nauen, 2015).

Pesticides can be introduced into the human body through direct exposure or indirectly through the consumption of food containing residue materials from pesticides. Pesticide exposure is caused through poor handling of pesticides used in agriculture which leads to the contamination of food, and also by the extensive use of this chemical in and around the residence (Tebourbi et al., 2011). Various types of pesticides can be transferred into rice grains from field spraying of pesticides during crop cultivation or from long-term storage (Jamil et al., 2005). The residue materials from pesticides then remain as a residue in the rice grains (Tsochatzis et al., 2010). A study carried out on