

Allelopathic Effect of Rice Aqueous Extract on Different Weed Species and Identification of the Potential Allelopathic Compounds

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ABSTRACT

The herbicidal effects of aqueous leaves, stem, root, hulls and straw extracts of eight rice cultivars from different part at different growing stage were evaluated against germination and growth of seven weeds and rice. Experiments were conducted to screen nine phenolic derivatives compounds in 3 rice cultivars (Sakha101 straw, Sakha103 straw and Yasmin hull) using HPLC. The results showed that, the hull aqueous extract from Yasmin gave the highest reduction of *Brassica niger* germination and fresh weight, it gave 66.65% and 23.72% decrease respectively. Sakha 103 leaf aqueous extract at six-leaf stage and at flowering stage gave the highest reduction in plant germination to tested weeds followed by Sakha 104 and Giza 177. Also within plants, *Lactuca sativa* was the most affected plant by the aqueous extract at six-leaf stage followed by *Echinochloa colonum*. In addition, *Echinochloa colonum* was the most affected one by the aqueous extract at flowering stage. Sakha 101, Sakha 102 and Sakha 103 were the most affected straw aqueous extract to all plant and weeds, followed by Giza 177 and Sakha 104 without significant deference between them. The HPLC analysis revealed that, ferulic acid was abundant component in Sakha101straw, Sakha103straw and Yasmin hull and the corresponding concentration were 4.826, 5.401 and 2.097 mg/g, respectively. This study may be a key step for determination many allelochemicals in rice cultivars and showed the effect of aqueous extracts for different parts of rice against some weeds.

Key Words : *allelo chemicals, rice allelopathy, phenolic derivatives, HPLC.*

INTRODUCTION

Allelopathy is defined as the directly or indirectly harmful or beneficial effects of one plant on another through the production of chemical compounds that escape into the environment (Fang *et al.* (2009); Chen *et al.*, 2008; Fageria *et al.* (2008); (Kong, 2008) and Chung *et al.* (2001a). The term Allelopathy was coined by Molisch in (1973) and as a new method of weed control could lead to reduce labor costs and increased efficiency Chung *et al.* (2003).

The substances with allelopathic potential are present in virtually in all plant tissues, including stem, leaves, roots and seeds, there substances released through different processes such as volatilization, root extraction, leaching and decomposition of plant residues Reigosa *et al.* (1999), Chung *et al.* (2001b) and Chung *et al.* (2003), this phenomenon could be an alternative weed control method. For example, aqueous extracts of rice plant inhibited the growth of root and shoot of lettuce (*Lactuca sativa*), alfalfa (*Medicago sativa*), *Digitaria* sp. and duck salad *Heleranthera limosa* (Salam *et al.* (2009), and Ebana *et al.* (2001). Also, hull extract of 5 cultivars were highly inhibited the barnyard grass seedling growth Asghori *et al.* (2006). On, the other hand aqueous methanol extracts of Bangladesh rice (*Oryza sativa* L. cv. BR17) inhibited the growth of roots and shoots of cress (*Lepidium sativum*), lettuce (*Lactuca*

sativa), alfalfa (*Medicago sativa*), timothy (*Phleum pratense*), *Digitaria sanguinalis*, *Echinochloa crus-galli* and *Echinochloa colonum* Salam *et al.* (2009). Many positive studies of Allelopathy as a mean of ecological weed control by selecting rice cultivars with higher allelopathic potential have been concluded (Ahn and Chung, 2000); Anjen *et al.* (2005); Ko *et al.* (2005), Uremis *et al.* (2005) and Javaid *et al.* (2006).

Weed management is a key element of the most agriculture system, but there has been increasing herbicide resistance in weeds and wide spread concern about adverse environmental effects from herbicide use, Chung *et al.* (2003). For this reason, the use of allelopathic rice varieties may provide an alternative way to minimize the risk to agroecosystems by serving in a complementary fashion with herbicides.

Rice (*Oryza Sativa*), is one of the principal food crop in Egypt, it is an annual summer crop, its production is characterized by the heavy use of fertilizers, herbicides, and pesticides, which may lead to environmental problems in both water and soil of the paddy field, some rice cultivars have demonstrated for allelopathic potential against most of the troublesome weed species in paddy fields Asghori *et al.* (2006).

Allelopathy can be used in weed management in two ways. First, by selecting an appropriate rice variety or incorporating an allelopathic character into a desired crop variety. Second, by applying