ALLELOPATHIC EFFECT OF COGONGRASS (*IMPERATA CYLINDRICA* L.) ON GERMINATION AND SEEDLING GROWTH OF WHEAT, ONION AND SOME ASSOCIATED WEEDS

By

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B. Sc., Agric. Sci., (Plant protection), Fayoum Univ., ٢٠١٠

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ABSTRACT

The purpose of the present study was to determine the allelopathic potential of aqueous and p. ether extracts of cogongrass, *Imperatacylindrical* L. on seed germination and seedling growth of onion, wheat, wildoat, fieldbind, goosefoot and sowthistle. The inhibitory effect of cogongrass residues either rhizome and foliage into the soil on seedling dry weight and physiological processes of the recipient species were also evaluated. In addition to isolation and identification the allelopathic compounds which called allelochemicals from cogongrass extract.

The obtained results showed that seed germination and seedling growth of goosefoot and sowthistle were the most sensitive plants to the aqueous and p. ether extracts of cogongrass based on the IC_{50} values whereas wheat and onion were the least. This indicated that cogongrass extracts contained allelopathic compounds and that their phytotoxicity is likely species-specific and could be used as natural selective herbicide.Also, there are differences in the sensitivity among plant species to the residues of cogongrass (rhizome and foliage) in soil. Therefore, seedling growthof dicotyledonous species such as sowthistle and goosefoot weeds exhibited greater sensitivity to the residue than monocotyledonous ones such as wheat and onion crops. For example, the decrease in dry weight for sowthistle weed (٧٢.٧%) was more pronounced than wheat crop (٣٣.٠%) by rhizome residue at ٨%, w/w compared with control. These variations in response may be due to the selectivity of allelochemicals to support possibility control these weeds which grow in monocotyledonous crops by selective toxicity of cogongrass.The reduction in seedling growth of the recipient species resulted in decrease the total chlorophyll, total carbohydrates and protein contents particularly at higher concentrations. Consequently the maximum decrease in total carbohydrates reached to

٥٩.٨% for goosefoot by rhizome residue and ٤٤.٨% for sowthistle by foliage residue at ٨% concentration level under the control. Also, the amount of total protein significantly decreased to ٣٦.٧ and ٤٨.٦% in goosefoot leaves by rhizome residue as the concentration levels increased from ٤ to ٨%, w/w under the control respectively to reveal that this decrease was concentration dependent. Conversely, proline content was increased with increasing concentration levels of residue in soil. Incorporation ٨%, w/w of cogongrass residues into the soil induced significant increases in free proline content of fieldbind, onion and goosefoot leaves up to ١٥.٠, ٣٢.٥and ٤٠.٣% by rhizome residue and ١٩.٥, ٣٤.٠ and ٢٧.٨% by foliage residue over the control respectively. Hence, the increase in free proline might be the adaptation strategy of the recipient species to avoid environmental stress produced by allelochemicals present in the residue of cogongrass.Moreover, the crude aqueous extract of cogongrass yielded five fractions onTLC plate having the following R_f values: ٠.٤٠, ٠.٦٤, ٠.٧٧, ٠.٨٧ and ٠.٩٦ by rhizome extract and ٠.٤٢, ٠.٦٥, ٠.٧٣, ٠.٨٠ and ٠.٩٦ by foliage extract. The two fractions withR_f values of ٠.٦٤ and ٠.٦٥ were the most effective when tested on seed germination and seedling growth of goosefoot. Withal, The crude p.ether extract of cogongrass appeared six fractions with R_f values of ٠.٠٣, ٠.٠٦, ٠.١٧, ٠.٣٨, ٠.٧٩ and ٠.٨٨ by rhizome extract and ٠.٠٥, ٠.١١, ٠.١٩, ٠.٣٢, ٠.٧٢ and ٠.٩٠ by foliage extract. Both frations(R_f= ٠.٧٩ and ٠.٧٢) were the most active.Theactive fractions have allelopathic compounds were selected and subjected to analysis by LC/MS and GC/MS to identify its allelochemicals. These allelochemicals were identified as phenolic compounds like vanillic acid, ferulic acid, (-)-epigallocatechin-٣,٥-digallate, coumaric acid, caffeic acid and Chlorogenic acid. In addition to oil constituents among them: n-tetradecane, n-pentadecane,١,٧-dimethylnaphthalene, ٢-methylhexadecane-١-ol, ٣-trifluoroacetoxypentadecane, ٢-methylenecholestan-٣-ol and ٢,٦,١٠-

trimethyldodecane. These results suggest that rhizome and foliage of cogongrass may contain allelochemicals and may possess allelopathic potential.

Keywords:Allelopathy, Cogongrass extract, Residues, Chemical constituents, Germination, Seedling growth, Weeds, Crops, Allelochemicals.