

### SEMINAR- 3

## CURRENT STATUS AND PROSPECTS OF ALLELOPATHY IN AGRICULTURE

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### Summary

Austrian plant physiologist, Hans Molisch, coined the term allelopathy in 1937. Allelopathy comes from the Greek *allelo* means each other or one another, and *patho* or *pathos* means suffering or intense feeling. Later, Rice (1984) defined allelopathy as the effect(s) of one plant (including microorganisms) on another plants(s) through the release of a chemical compound(s) into the environment. This definition includes both stimulatory and inhibitory effects, depending on the concentration of the compound(s).

Plants produce a myriad of metabolites of no known utility to their growth and development. These are often known as 'secondary' metabolites. These *metabolites* or allelochemicals may be released directly or indirectly from live or dead plants (including microorganisms), and may favorably or adversely affect other plants. These compounds have been known to affect the growth and development of many crops as well as weeds. There have been considerable efforts in designing alternative weed management strategies because of the concern in increase in the number of herbicide-resistant weeds.

Rotational or smoother crops such as rye (*Secale cereale*), wheat (*Triticum aestivum*), buckwheat (*Fagopyrum esculentum*), black mustard (*Brassica nigra*), sorghum-sudangrass hybrid (*Sorghum bicolor*) are used in weed management. Allelochemicals that are reported to play a role in weed management are: allyl isothiocyanate (*Brassica nigra*), fatty acids (*Fagopyrum esculentum*), isoflavonoids and phenolics [clovers (*Trifolium spp*); sweet clover (*Melilotus spp.*)], phenolic acids and scopoletin [oat (*Avena sativa*)], hydrozamic acids (cereals), phenolic acids, dhurrin, sorgoleone (sorghum, sudangrass). Crop residues can provide selective weed control through their physical presence on the soil surface and through the release of allelochemicals.

The disappearance of *Secale cereale* residue and allelochemicals, DIBOA (2,4-dihydroxy-1, 4-benzoxazin-3-one), DIBOA-glycoside and BOA from *Secale cereale* residues was established in detail. Thus, duration of cover crops residue on the soil surface often determines the extent of an effective weed control period.

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Allelopathy can be separated from weed competition by many of the techniques such as plant residues, Replacement Series, Stair-step-method, allelochemicals separation from leachate and others.

The seminar would focus on the role of allelopathic cover crops, weed residues, natural compounds, and allelopathic crop cultivars in natural weed management. Many of the research techniques used in separating allelochemicals from donor plant will be discussed. Future research areas on allelopathy will also be highlighted. In summary, we cannot eliminate the use of herbicides in crop production. However, their use can be reduced or limited by exploiting allelopathy as an alternate weed management tool for crop production against weeds and other pests.