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THE POTENTIAL ROLE OF ALLELOPATHY IN WEED CONTROL

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INTRODUCTION

Allelopathy is derived from two Greek words; allelo means "mutual or each other" and pathos means "suffer". The detrimental effects of one plant or organism on the germination, growth, development and metabolism of another plant species or organism due to release of chemicals (allelochemicals) either through residue decomposition, root exudates, leaf leachates, seed leachates or volatilization etc. Allelopathy can also be used as a tool to combat the challenges of pollution via herbicide application and herbicide resistance development. Crop cultivars which are having allelopathic chemical compounds can be grown to control weeds under field conditions and they can be intercropped with other suitable crops to smother weeds.

POTENTIAL OF ALLELOPATHIC CROPS

Allelopathic crops can be cultivated either as cover crops or mulch crops to suppress the weed growth and development. Rotating a base crop with an allelopathic crop for particular period is another way of allelopathic weed control. Several weeds as well as crops express allopathic effect on weed plants by releasing allelochemicals (Secondary compounds). Sorghum, sunflower, rye, maize, barley etc. crops can show the effect on weeds and controls by inhibiting different physiological and biochemical processes. Benzoxazinones in rye; sorgoleone, phenolics, and dhurrin in sorghum; glucosinolate in brassicae plants; gramine in barley and phenolic compounds in sunflower are responsible for allelopathic action against several weeds (Jabran et al., 2015).

These allelochemicals could be used as herbicides as they are naturally available and free from pollutants unlike synthetic herbicides. Generation of new herbicides also would be possible by using their chemistry. Creation and development of new herbicide formulations and their mode of action into the market become more difficult, expensive and time taking process. These allelochemicals check non point source of pollution thus they reduce ground water contamination. Microorganisms also release many secondary metabolites as plants do. Only 3% of possible 4 lakh secondary metabolites from plants and microorganisms were identified. Among these, only some compounds have the capability to act as herbicides or bioregulators (Narwal and Haouala, 2012).

Allelochemicals affect several physiological and biochemical activities inside of targeted plants such as inhibition of cell division and elongation by cinnamic acid and coumarins; growth inhibition by polyphenols; Inhibition of photosynthesis and disruption of stomatal function by quinones, scopoletin and polyphenols; respiration disruption by benzoic acids, phenols and aldehydes; protein synthesis inhibition by cinnamic and ferulic

acid and enzyme inhibition by phenols, polyphenols and benzoic acids etc.

Some of the weeds also emit allelochemicals to control other weed and crop growth. For example, *Parthenium hysterophorus* shows allelopathic effect on several flora, grass weeds and crops also. *Euphorbia* sp and *Commelina alyssum* shows effect on flax crop. *Cyperus rotundus* exert allelopathic effect on sorghum and soybean crops etc. Allelopathic effect of crops on weeds such as maize on *Chenapodium album*; cassava on *Amaranthus* sp. and *Digitaria*; sorghum on *Amaranthus hybridus*, *Setaria viridis* and *Abutilon theophrasti*; rye on *Digitaria sanguinalis, Ambrosia artemisifolia* and *Chenapodium album*; cucumber on *Echinochloa crusgalli* and sweet potato on *Cyperus rotundus* and *C. esculentus* etc.

The straw extract of wheat had somehow variable amount of allelopathic compounds on the germination and seedling growth of some weeds. This extract stimulated the germination in the weeds viz., carpet weed, barnyard grass, and crowfoot grass, however it inhibited the germination in pigweed and sunberry. The dried lucerne plants extract inhibited the seed germination *of C. album* and *Abutilon theophrasti*. Saponin of 'cimmaron' in alfalfa found to inhibit the shoot and root growth of *Echinochloa crusgalli* and cheat (Narwal and Haouala, 2012).

CONCLUSION

Advantages of allelopathy on weed control is i) Reduction of the population of herbicide resistant weeds by avoiding continuous application of same mode of action chemicals over several years ii) Reduces weed shifts iii) Controls environmental pollution, and iv) Less contamination of resources and food with herbicide residues.

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