Environment & Ecology · GS - III

What is allelopathy? Discuss its role in major cropping systems of irrigated agriculture.

EXAM YEAR	PAPER	SUBJECT
2016	GS - III	Environment & Ecology

MARKS	WORD LIMIT
12.5	~200 words

Answer Hint

Allelopathy; biochemical interactions; crop residues; weed suppression; crop rotation; irrigated agriculture; soil health; sustainable weed management

Model Answer

Introduction

Allelopathy refers to the influence of chemicals released by one plant or microorganism on the germination, growth or development of another organism. These substances may be released through root exudates, decomposing residues or other plant tissues.

Role in Irrigated Cropping Systems

- **Weed suppression:** Allelopathic crops or residues can inhibit the germination and growth of certain weeds, potentially reducing herbicide requirements.
- **Rice-based systems:** Rice residues and water-management practices can influence weed emergence, although effects vary by cultivar, residue condition and weed species.
- **Wheat systems:** Crop residues and extracts from some plants may suppress selected weeds, but field results depend on environmental conditions.
- **Crop rotation:** Rotating crops with complementary biological effects may help manage weed populations and disrupt their life cycles.
- **Cover crops and mulches:** Suitable cover crops can release allelochemicals while also suppressing weeds through shading and physical soil cover.

- **Reduced chemical dependence:** When integrated with other methods, allelopathy may contribute to more sustainable weed management.

Limitations and Risks

Allelochemicals may also inhibit the next crop, affect beneficial soil organisms or produce inconsistent results under field conditions. Their activity depends on soil moisture, temperature, decomposition and chemical concentration.

Way Forward

Select compatible crop varieties, test residue-management practices locally and integrate allelopathy with crop rotation, mechanical weeding and carefully managed herbicide use.

Conclusion

Allelopathy offers a potential biological tool for weed management in irrigated agriculture. Its practical value depends on scientific validation and integration with broader, locally appropriate farming systems.

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