International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Allelopathic Effects of Some Leguminosae Plants

Prakrati Yadav[1], R. N. Yadava[2]

[1]Dr.H.S.Gour Central University, Sagar, India

[2]Dr.H.S.Gour Central University, Sagar, India

Abstract: ***Allelopathy refers to the beneficial or harmful effects of one plant on another plant, from the release of biochemicals, known as Allelochemicals. Allelopathic effects of some plants viz. Phaseolus trilobus Ait., Prosopis spicigera Linn., Albizzia Odoratissima Benth. and Tephrosia purpurea Linn., they showed positive and negative allelopathic effects, which can be used as natural fertilizers and natural herbicides respectively.***

Keywords: Allelochemicals, Allelopathic effects, Leguminosae, Tagetus erectus.

1. Introduction

The term "allelopathy" is from Greek meaning "to suffer from each other." Allelopathy has traditionally been considered only the negative chemical warfare of one organism upon another. Modern research suggests that allelopathic effects can be both positive and negative, depending upon the dose and organism affected. Allelopathy is the active or passive effects of chemicals released into the environment which influences other organisms. Chemicals released from plants and imposing allelopathic influences are termed allelochemicals[1-3]. Most allelochemicals are classified as secondary metabolites and are produced as offshoots of the primary metabolic pathways of the plant. Allelochemicals can be present in several parts of plants including roots, rhizomes, leaves, stems, pollen, seeds and flowers [4]. Allelochemical with negative allelopathic effects are an important part of plant defence against herbivory[5-6].

Allelopathy is the search and development of new herbicides through the isolation, identification and synthesis of active compounds from allelopathic plants[7-11]. These compounds are often referred to as 'natural herbicides'.

Plants may effect the growth and productivity of neighbouring plants directly through secondary metabolites. This phenonmenon is known as Allelopathy and the secondary metabolites are called allelochemicals. Allelocemicals are the bioactive compounds that influence growth of neighbouring plants. The production and accumulation of secondary metabolites, which inhibit or stimulate germination and development of other plants, is an important mechanism.

Chemicals with allelopathic activity are present in many plants and in various organs including leaves and fruits and have potential as either herbicides or templates for new herbicides classes

2. Allelopathic Activity of Some Plants

2.1 Plant material

Phaseolus trilobus Ait.[12-13], Prosopis spicigera Linn.[14], Tephrosia purpurea Linn.[15] and Albizzia odoratissima Benth.[16-17] commonly known as "Mugani", "Jhand", "Sarphonka", and "Kala siris" in Hindi which belongs to Leguminosae family respectively. The stem part of P.T., P.S. and T.P were procured from the Sagar region in the month of October, November and December 2012 respectively. The seeds of A.O were collected also from the Sagar region in the month September 2012. All plants were taxonomically authenticated by the Department of Botany, Dr. H. S. Gour University sagar. Voucher specimens have been deposited in the Natural Products Laboratory, Department of Chemistry, Dr. H. S. Gour University, Sagar (M.P.) INDIA.

2.2 Extraction

The shade dried and powdered parts of all four plants, Phaseolus trilobus Ait. (stem, 5.0 kg), Prosopis spicigera Linn. (stem, 5.5 kg), Tephrosia purpurea Linn. (stem, 6.0 kg) and Albizzia odoratissima Benth. (seed, 5.0 kg) were extracted with water in Soxhelt apparatus for seven days. The water soluble fraction of the plants were concentrated under reduced pressure to yield light brown viscous mass.

2.3 Allelopathic activity

2.3.1 Pot Study

Five pots A, B, C, D and E were filled with the soil, collected from the agricultural field and some seeds of plant Tagetus erectus belongs to family Compositae were sown into each pot and irrigated with tap water (control). Except pot A, treated aqueous extracts of all four plants were added into pots B, C, D and E and allowed to grow upto ten days.

3. Results and Discussion

Results obtained from experimental findings showed that the aqueous extracts of A.O. and P.S. suppressed the growth of Tagetus erectus but other two extracts of the plant P.T and T.P stimulated the growth than their normal growth. The allelopathic effects of these are presented in Table-I.

Table 1 : Allelopathy Effects of Plant Extracts

Date	*Normal growth (Pot A) (cm)*	*A.O. (Pot B) (cm)*	*T. P. (Pot C) (cm)*	*P.T. (Pot D) (cm)*	*P.S. (Pot E) (cm)*
12/01/13	1.0 (1 leaf)	×	1.5 (1 leaf)	1.8 (1 leaf)	×
13/01/13	-	×	2.0 (1 leaf)	2.3 (1 leaf)	×
14/01/13	-	×	2.0 (1 leaf)	2.5 (2 leaves)	×
15/01/13	1.5 (2 leaves)	×	2.5 (2 leaves)	2.8 (2 leaves)	×
16/01/13	-	×	3.0 (2 leaves	3.5 (3 leaves)	×
17/01/13	-	×	3.0 (3 leaves)	3.8 (3 leaves)	×
18/01/13	2.5 (3 leaves)	×	3.0 (3 leaves)	4.0 (4 leaves)	×
19/01/13	-	×	3.5 (3 leaves)	4.5 (4 leaves)	×
20/01/13	-	×	4.0 (4 leaves)	5.0 (5 leaves)	×
21/01/13	3.0 (3 leaves)	×	5.0 (5 leaves)	6.0 (5 leaves)	×

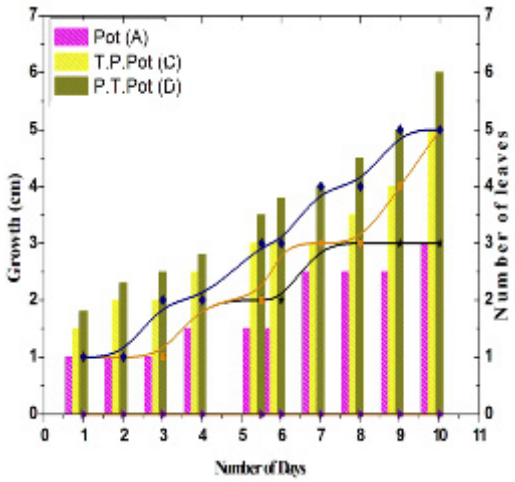

Figure 1

3.1 Plant growth

The water soluble extracts of Pot D showed highest promoting effect in comparision to Pot C and showed good positive allelopathy effect. But aqueous extracts of Pot B and Pot E inhibited the seed germination and showed negative allelopathy effect.

3.2 Leaf Yield

The water soluble extract of P.T increased the number of leaves in pot D and caused the greatest promotion but in pot C, the extract of T.P. also increased the number of leaves but less than P.T. The percentage of seed germination and leaf yield obtained zero in Pot B and E.

4. Conclusion

We concluded that out of four plants extracts P.S. and A.O. showed detrimental allelopathic effect (negative allelopathy). They can act as natural herbicides. Those chemicals responsible for natural herbicides can be isolated and refined for commercial use. Other two plants extracts P.T and T.P showed beneficial allelopathic effect (positive allelopathy) which can be used to increase the growth of any plant species more than their normal growth and can be used as natural herbicides.

References

[1] Einhellig, "Allelopathy - Current Status and Future Goals. In Allelopathy: Organisms, Processes and Applications, AmericanChemical Society," pp. 1-24, 1995(a).
[2] L.J. Corcuera, "Biochemical basis for the resistance of barley to aphids", Phytochemistry 33,pp-741-747, 1993.
[3] H. M. Niemeyer, "Hydroxamic acids (4-hydroxy-1,4-benzoxazin-3-ones),defence chemicals in the Gramineae", Phytochemistry, 27, pp-3349-3358, 1988.
[4] E. L. Rice, "Allelopathy, Second Edition edition. Academic Press, Inc., Orlando," 1984.
[5] G. S. Fraenkel, " The Paison d'Etre of secondary plant substances, Science," 129, pp-1466-1476.
[6] N. Stamp, "Out of the Quagmire of plant defence hypotheses," 78, pp-23-55.
[7] S. O. Duke, "Potent phytotoxins from plants. In VII International Congress of Ecology" 19-25 July, pp-120, 1998.
[8] F. A. Macias, D. Castellano, R. M. Oliva, P. Cross, A. Torres, "Potential use of allelopathic agents as natural agrochemicals. In The 1997 Brighton Crop Protection Conference," 1, pp-33-38.
[9] F. A. Macias, J. M. G. Molinillo, A. Torres, R. M. Varela, D. Castellano, "Bioactive flavonoids from Helianthus annuus cultivars," Phytochemistry, 45, 683-687, 1997b.
[10] F. A. Macias, J. M. G. Molinillo, R. M. Varela, A. Torres, R. O.Troncoso, "Allelochemicals in sunflowers: Implications for crop and soil management in agroecosystems. In VII International Congress of Ecology," pp- 266, 1998
[11] F. A. Macias, R. M. Oliva, A. M. Simonet, J. C. G. Galindo, "Workshop on Allelopathy in Rice," pp- 69-79, 1998b
[12] K.R. Kirtikar. and B. D. Basu, "Indian Medicinal plants," 1,794-795, 1935.
[13] R. N. Chopra, S. L. Nayar, I.C Chopra, "Glossary of Indian Medicinal Plants," pp-190, 1956.
[14] R. N. Chopra, S. L. Nayar, I.C Chopra, "Glossary of Indian Medicinal Plants," pp-256, 1956.
[15] R. N. Chopra, S. L. Nayar, I.C Chopra, "Glossary of Indian Medicinal Plants," pp-241, 1956.
[16] R. N. Chopra, S. L. Nayar, I.C Chopra, "Glossary of Indian Medicinal Plants," pp-11, 1956.
[17] The Wealth of India, 1, 44, 1948.