

Allelopathic Activity of Leguminosae Plants

Archana Chakravarty¹, R. N. Yadava²

^{1,2} Natural Products Laboratory, Department of Chemistry, Dr. H. S. Gour Central University, Sagar – 470003 (M.P.) India

Abstract: The present study was conducted to investigate the allelopathic effects of stems of aqueous extracts of *Pithecellobium dulce* (Roxb.) Benth and stems of *Bauhinia racemosa* Lam at different concentration (0, 25, 50, 75 and 100 %). The results obtained from experimental findings shows that pure extract of *Pithecellobium dulce* (Roxb.) Benth, inhibited the growth of seeds germination of *Trigonella foenum-graecum*, whereas pure extract of *Bauhinia racemosa* Lam., promoted the seed germination of *Trigonella foenum-graecum*. Therefore these plants can be used as natural herbicides and natural fertilizers respectively.

Keywords: Allelochemicals, Allelopathic activity, Leguminosae, *Trigonella foenum-graecum*

1. Introduction

Allelopathy is described as both beneficial and deleterious biochemical interaction between plants and weeds, plants and microorganisms through the production of chemical compounds that escape into the environment and subsequently influence the growth and development of neighboring plants. Plants releases chemicals which show allelopathic potentiality are called allelochemicals. Allelochemicals are secondary plant metabolites they are single or mixture of chemicals of plants which can naturally suppress weeds. These allelochemicals are used as natural herbicide.[1] Allelochemicals can be present in various parts of plants including roots, rhizomes, leaves, stems, pollen, seeds and flowers[2]. Allelochemicals with negative allelopathic effects are an important part of plant defence against herbivory[3-4].

Allelopathy is the search and development of new herbicides through the isolation, identification and synthesis of active compounds from allelopathic plants[5-9]. The isolation, identification of these allelochemicals may provide chemical basis for the synthesis of new natural herbicides and natural fertilizer to control weeds and to promote growth of crop in more environment friendly and sustainable way for better crop production system.

2. Allelopathic Activity of Some Plants

2.1 Plant material

Pithecellobium dulce (Roxb.) Benth [10-13], *Bauhinia racemosa* Lam.[14-21] commonly known as “Vilayati imli and Kachnal” in Hindi respectively. These both plants belongs to Leguminosae family. The stems of *Pithecellobium dulce* (Roxb.) Benth and *Bauhinia racemosa* Lam. were procured from the Sagar region and were taxonomically authenticated by the Department of Botany, Dr. H. S. Gour University Sagar. The 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 stems of both plants, *Pithecellobium dulce* (Roxb.) Benth (4.5kg), *Bauhinia racemosa* Lam. (5.0 kg) were extracted with water in Soxhlet 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

2.4 Pot Study

Nine pots 1,2,3,4,5,6,7,8,9 were filled with the soil collected from the agricultural field and some seeds of plant *Trigonella foenum-graecum* were sown into each pot and irrigated with tap water (control). Different concentration (0, 25, 50, 75, 100 %) of aqueous extracts of P.D and B.R were prepared separately. Different concentration (0, 25, 50, 75, 100 %) of aqueous extracts of the plant P.D were added in pots 2 to 5 and in pots 6 to 9 various concentration (0, 25, 50, 75, 100 %) of aqueous extracts of the plant B.R were added respectively and allow to grow for 10 days.

2.5 Plant growth

Pot 5 which was treated with 100% aqueous extract of P.D showed maximum inhibition in plant growth (negative allelopathy effect). Growth of plant in the Pot 10 which was treated with 100% aqueous extract of B.R showed highest promoting i.e positive allelopathy effect.

3. Results and Discussion

Results obtained from experimental findings shows that the different concentration of aqueous extracts of P.D. suppressed and B.R. stimulated the growth *Trigonella foenum-graecum* seeds respectively. The allelopathic effects of these plants are presented in Table-I.

Table 1: Allelopathy Effects of Plant Extracts

Conc. of water extract (%)	Pot No.	Growth (cm) of <i>Trigonella foenum-graecum</i> seeds in presence of water extract of <i>Pithecellobium dulce</i> (Roxb.) Benth.	Pot No.	Growth (cm) of <i>Trigonella foenum-graecum</i> seeds in presence of water extract of <i>Bauhinia racemosa</i> Lam.
0	1 Control	8	1 Control	8
25	2	5.5	6	8.2
50	3	4.2	7	9.5
75	4	2.7	8	9.9
100	5	1.3	9	10.5

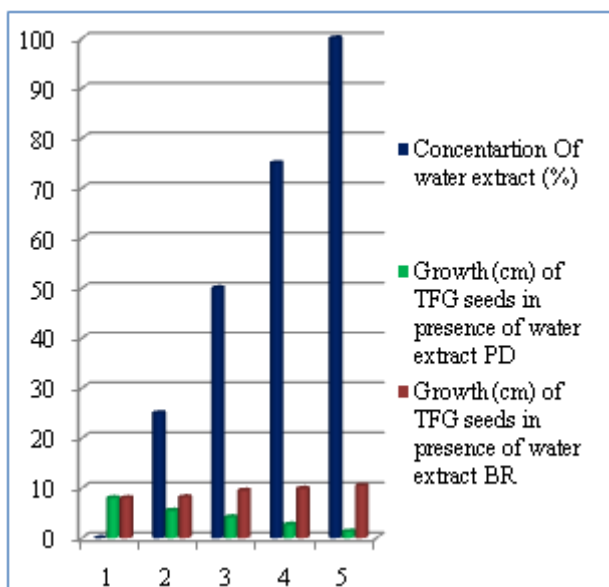


Figure 1: Graphical representation of growth of *Trigonella foenum-graecum* seeds with respect to concentration of water extract (%)

4. Conclusions

From above experimental findings we concluded that aqueous extracts of *Pithecellobium dulce* (Roxb.) Benth showed negative allelopathy effect, so it can be used as natural herbicides in weed control management system. Those chemicals responsible for natural herbicides can be isolated and refined for commercial use, whereas aqueous extracts of *Bauhinia racemosa* Lam. showed beneficial allelopathic effect (positive allelopathy effect) which can be used as natural fertilizer.

References

- [1] Md.Asaduzzaman, Md.M.islam, S.Sultana, Allelopathy and Allelochemicals in Rice Weed Management, *Bangladesh Res.Pub*; 4,1, 1 -14, 2010.
- [2] E. L. Rice, "Allelopathy, Second Edition edition. Academic Press, Inc., Orlando," 1984.
- [3] G. S. Fraenkel, "The Poison d'Etre of secondary plant substances, Science," 129, pp-1466-1476.
- [4] N. Stamp, "Out of the Quagmire of plant defence hypotheses," *Q. Rev Biol*, 78(1), pp-23-55, 2003.
- [5] S. O. Duke, "Potent phytotoxins from plants. In VII International Congress of Ecology" 19-25 July, pp-120, 1998.
- [6] 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, 1997.
- [7] F. A. Macias, J. M. G. Molinillo, A. Torres, R. M. Varela, D. Castellano, "Bioactive flavonoids from *Helianthus annuus* cultivars," *Phytochemistry*, 45, 683-687, 1997.
- [8] F. A. Macias, J. M. G. Molinillo, R. M. Varela, A. Torres, R. O.Trncoso, "Allelochemicals in sunflowers: Implications for crop and soil management in agroecosystems. In VII International Congress of Ecology," pp- 266, 1998.

- [9] F. A. Macias, R. M. Oliva, A. M. Simonet, J. C. G. Galindo, "Workshop on Allelopathy in Rice," pp- 69-79, 1998.
- [10] R .N Chopra, S. L Nayar and I .C Chopra, Glossary of Indian Medicinal Plants, CSIR, New Dehli, 196, 1956.
- [11] Dietrich Brandis, K.C.I.E, Indian Trees, Cnstable and Company Ltd. London, 273-274, 1921.
- [12] R.D.Gaur, Flora of The District Garhwal North West Himalaya, TransMedia, Shrinagar (Garhwal) U.P, 242, 1999.
- [13] D.A.Patil, Flora of Dhule and Nandurbar Dristicts, Bishen Sing Mahendra Pal Singh, Dehradun, 248, 2003.
- [14] R .N Chopra, S. L Nayar and I .C Chopra, Glossary of Indian Medicinal Plants, CSIR, New Dehli, 35, 1956.
- [15] K.R.Kirtikar, B.D Basu. Indian Medicinal Plants vol II, Periodical Experts Agency, Delhi, 894-895, 1991.
- [16] L.V Asolkar, K.K Kakkar, O.J Chakre, Glossary of Indian Medicinal Plants with active principles, part-I (A→ K), CSIR, NewDehli, 117, 1965-1981.
- [17] A. Chatterjee, S. Chandra Pakrashi, The Treatise On Indian Medicinal Plants, vol.2, CSIR, New Delhi, 21, 1992.
- [18] R.D.Gaur, Flora of The District Garhwal North West Himalaya, TransMedia, Shrinagar (Garhwal) U.P, 244, 1999.
- [19] S.P.Ambasta, K. Ramachandran, Thae Useful Plants Of India, CSIR, New Dehli, 69.
- [20] D.Brandis, K.C.I.E, Indian Trees, Cnstable and Company Ltd. London, 273-256, 1921.
- [21] D.A.Patil, Flora of Dhule and Nandurbar Dristicts, Dehradun, 223, 2003.