ARTICLE

Allelopathic Effect of Shampoo Ginger; *Zingiber zerumbet* (L.) Smith against the Germination of Bengal gram; *Cicer arietinum* (L.)

[1*]Santhoshkumar, R., [1]Rajesh Kumar, T., [1]Raveendran, P.B., [2]Lalithambika, R., [1]Arya, S.

Received on 15-6-2017
Accepted on 20-8-2017

Abstract

In the present study is an attempt to assess the Allelopathic effect of shampoo Ginger (*Zingiber zerubet*) on early seed growth parameters of Bengal gram (*Cicer arietinum*). The aqueous rhizome extract of shampoo ginger showed inhibitory effects on seed germination and shoot length. All the above parameters were found to be decreased with increasing the aqueous extract of rhizome. The maximum percentage of germination was recorded at control condition as compared to all other conditions. The minimum percentage was recorded at 100% concentration of the extract of rhizome. The conclusion of present study showed that inhibitory effect of the extract of ginger rhizome may be due to the presence of various allelochemicals.

Key words : Shampoo ginger, Germination, Allelochemicals

Introduction

The phenomenon of allelopathy, where a plant species chemically interferes with the germination, growth or development of other plant species. In other words Allelopathy is a mechanism in which chemicals produced by some plant species may increase or decrease the associated plant growth (Jabeen and Ahmed, 2009). The earliest writing on allelopathy are attributed to Theophrastus (300 B.C), who noticed that harmful effect of Cabbage on a Vine and suggested that such effects were caused by "Odours" from cabbage plant (Willis., 1985). A more appropriate definition for allelopathy includes "The positive and negative effects of chemical compounds produced mainly from the secondary metabolism of plants, micro-organisms and fungi that have an influence upon the growth and development of agricultural and biological ecosystems (Kruse *et al*., 2001). In 1996, the International Allelopathy Society defined allelopathy as follows: "Any process involving secondary metabolites produced by plants, micro-organisms, viruses, and fungi that influence the growth and development of agricultural and biological systems (excluding animals), including positive and negative effects" (Torres *et.al*. 1996). Chemicals released from plants and imposing allelopathic influences are termed as allelochemicals or allelochemics.

Zingiber zerumbet is a perennial rhizomatous herb with about one metre height. From autumn until spring it goes dormant above ground as the leafy stems shrivel and die away, leaving the pale brown, creeping stems (rhizomes) at ground level. The leaves and leaf stalks, which are also fragrant, were used in different traditional purposes. It is commonly used as shampoo and conditioner for the hair. The clear, slimy juice present in the mature flower heads is excellent for softening and bringing shininess to the hair. It can be left in the hair or rinsed out. The present study was conducted to assess the possible allelopathic effects of the extract of rhizome of Shampoo ginger on the germination of *Cicer arietinum*.

[1]Post Graduate Department and Research Centre of Botany, Mahatma Gandhi College, Thiruvananthapuram, Kerala, India.
[2]Post Graduate Department of Economics, Mahatma Gandhi College, Thiruvananthapuram, Kerala, India
email: santhoshkumar30576@gmail.com (Corresponding author)

Materials and Methods

Plant material

The fresh rhizome of shampoo ginger (*Zingiber zerumbet*, family, *Zingiberaceae*) was procured in the month of July 2017 from the Campus of Mahatma Gandhi College, Thiruvananthapuram, Kerala, India. Just after procurement, the rhizome was ground mechanically into small pieces for use in the study.

Preparation of extract and Preparation of Test concentration of extract

Freshly collected rhizome was extracted with the help of mixer grinder. The pure extract is used for the preparation of different concentration of extract. Water was used for the preparation of different concentration of extract. Stock extracts were diluted with water to get different concentrations of 5%, 10%, 25%, 100%, in addition to this a control was also maintained.

Collection and preparation of seeds

Healthy uniform seeds of gram (*Cicer arietinum* L., family: Fabaceae) were purchased and used for the experiment. The seeds were soaked in water for about two hours before sowing to the cotton. For the experiment in pure extract, the seeds of Bengal gram soaked in pure extract of the rhizome of shampoo ginger for a few minutes, and then these seed were also sown in cotton.

Exposure to text samples

The indicating parameters viz., germination percentage was calculated by the following formula:

Germination percentage = Number of germinated seeds/Total number of seeds ×100

Result and Discussion

The Percentage of germination was found to be decreased with increased concentration of all four aqueous extracts with respect to control. An analysis of variance indicates that there was a significant difference in the germination percentage of Bengal gram seedlings between control and all other concentrations of different parts of the ginger extract.

The germination percentage of *Cicer arietinum* in different concentration of rhizome extract of *Zingiber zerumbet* is presented in Table 1. The maximum percentage of germination was recorded in control (98%) compared to that of all the other concentrations. The maximum percentage of seed germination in rhizome extract was recorded in 5% concentration (82%) followed by 10% and 25% (78% in two concentrations). Whereas the minimum percentage of germination in rhizome extract was found to be at 100% concentration (0%). The length of shoot (data taken after one week of sowing; control, 5% concentration, 10% concentration, 25% concentration were used, however, 100% concentration was not used for this measurement) is presented in Table 1. The maximum length of shoot was noticed in 5% concentration followed by control, 5% concentration, 10% concentration and 25% concentration. This result showed that up to 5% concentration of the extract of shampoo ginger may not affect the length of the seedlings, but it may affect the percentage of germination.

The present findings demonstrated negative allelopathic effects of extract of shampoo ginger on the germination and growth of *C. arietinum*. The most frequently reported allelochemical-induced gross morphological effects on plants include inhibited or retarded seed germination, effects on coleoptile elongation and on radicle, shoot and root development (Kruse *et al.*, 2000). Here, germination percentage was recorded to monitor the allelopathic behaviour of shampoo ginger. According to Han *et al.* (2008) phytotoxic effect of stem extract of ginger is more on soybean and chive and rhizome extract is least effective.

Table 1.

Concentration of the extract of Rhizome	Percentage of Germination	Length of Shoots (in cm)
Control	98%	12.16 cm
5%	82%	16.28 cm
10%	78%	9.86 cm
25%	78%	2.68 cm
100%	0%	Germination percentage – 0% So there was no data is available for this column

Conclusion

From the present investigation, it can be concluded that the rhizome extract of shampoo ginger exhibited remarkable negative allelopathic potential by significantly affecting the germination of Bengal gram. To the best of our knowledge, this is the first report of allelopathic effect of shampoo ginger. Further studies are necessary to determine the exact chemical constituents of shampoo ginger accounting for its allelopathic activity. Allelopathic effects of shampoo ginger under field conditions also need further research in pursuit of a new effective natural herbicide.

Acknowledgement

The authors are thankful to Mr. Ebenezer for various helps during the period of collection of samples.

References

Jabeen, N., and Ahmed, M. (2009). Possible Allelopathic Effects of three different Weeds on Germination and Growth of Maize cultivars. Pak. J. Bot. 41 (4): pp1677-1683.

Han, C. M., Pan, K. W., Wu, N., Wang, J. C., and Li, W. (2008). Allelopathic effect of Ginger on Seed germination and Seedling growth of Soybean and Chive. Scientia Horticulture.116:pp 330-336.

Kruse, M., Strandberg, M., and Stranberg, B. (2000). Ecological Effects of Allelopathic Plants. A Review. Dept of Terrestrial Ecology. Silkeborg, Denmark. Rep.no-314:pp.

Torres A, Oliva RM, Castellano D, Cross P. First world congress on allelopathy, a science of the future.Cadiz, Spain: SAI (University of Cadiz); 1996.

Willis, R. J. (1985). The historical basis of the concepts of allelopathy. J. Hist. Biol. 18: pp17-102.