



Allelopathic potential of *Pascaliala Glauca* Ortega aqueous extract against seed germination and seedling growth of groundnut

Ilahi Mujawar, Mahadev Kanade¹ and Chandrashekhar Murumkar¹

Department of Botany, Smt. K.R.P. Kanya Mahavidyalaya, Urun-Islampur, Dist. Sangli, Maharashtra, India

¹Department of Botany, PG Research Center, Tulajaram Chaturchand College of Arts, Commerce and Science, Baramati, Dist. Pune, Maharashtra, India
milahi10@gmail.com

Article Info

Received: 12-11-2016,

Revised: 12-12-2016,

Accepted: 26-12-2016

Keywords:

Allelopathy, *Pascaliala glauca* Ortega, *Arachis hypogea* L., seed germination.

Abstract

Pascaliala glauca Ortega belonging to family Asteraceae, poisonous alien weed reported from Islampur in Walwa taluka of Sangli district of Maharashtra, India. It has been scrutinized for its allelopathic potential against groundnut (*Arachis hypogea* L.). The laboratory experiments were conducted to assess seed germination and seedling growth attribute of groundnut after treating different concentrations (25, 50, 75 and 100%) of stem, leaves and flower aqueous extracts. The results were flashing lighted that seed germination was nasty inhibited (52.83%) in pure leaves extract than stem (28.50%) and flower (56.66%) aqueous extract. The higher concentration (100%) of leaves extract explicitly observed drastic decrease in length of root and shoot. The fresh weight (4.180 mg) and dry weight (0.885 mg) was reduced in 100% concentration of stem extract. To make an inference from present investigation evinced that the degree of increase in concentrations of aqueous extracts of stem, leaves and flowers slacken the seed germination and seedling growth of groundnut.

INTRODUCTION

Weeds are a mostly belligerent redundant plant that grows in superfluous places, upheaval the crop sociability and cause wastage of natural resources and loss in yield. Although, they were grown as an integral component with crop and enjoy lucrative business which crop receive and simultaneously release some chemical compounds. These compounds interfere with crop metabolism thereby reducing crop yield, change their sociability through embracing local weed races and become dominant. Majority of weeds hamper the growth of main crop through escaping chemical substances, that present almost in all parts of plant (Rice, 1995; Singh *et al.*, 2003) called as allelochemicals (Batish *et al.*, 2007). They often affect germination dynamics and growth of crop (Kadiolgue *et al.*, 2005; Rency R.C *et al.*, 2015). These allelochemicals

have ability to cease metabolic functions including photosynthesis, respiration, mineral nutrition and such others (Rice, 1984; Saxena *et al.*, 2004) through allelopathic mechanism (Qasem and Foy, 2001; Benyas *et al.*, 2010). Allelopathy signifies the interaction between the plants either negatively or positively, resulting either inhibitory or stimulatory potential on neighboring plants (Patil *et al.*, 2015; Rency *et al.*, 2015; and Thombre *et al.*, 2016).

Pascaliala glauca Ortega (Asteraceae) is recently introduced new alien species (Salunkhe *et al.*, 2002; Mujawar Ilahi, 2013) from Islampur crop fields as a poisonous weed in Walwa taluka of Sangli district of Maharashtra, India. It is widespread perennial weed native from South America that spread in pumpas of Argentina and declared as toxic to domestic animal (Callazo and Riet Correa, 1996) and recognized as

“Agricultural pleaque”. It is dangerous for grazing animals due to presence of hazardous chemicals (Oberti *et al.*, 1980) and causes acute lethal hepatotoxicosis when ingested (Giannitti *et al.*, 2013). The *P. glauca* presented high intense allelopathic potentiality and marked inhibition in horticultural species from Santiago, Argentina (Soberero *et al.*, 2004). There is no more information about allelopathic potential against any crop from Indian sub-continent, so we intend to concentrate on these facts in our observations. After invading the studied area, it grows satiety and spreads very fast due to its stoloniferous multiplication that pernicious all patterns of crops and even it perishes local weed. Further, the death of domestic animals reported and badly affected quality and quantity of agricultural crops (Mujawar Ilahi *et al.*, 2016) and also hazardous for health of farmers during intercultivation (Mujawar Ilahi, 2013, Mujawar Ilahi *et al.*, 2016a). Hence, the present work has been undertaken to evaluate the allelopathic influence of stem, leaves and flower aqueous extracts on seed germination and seedling growth of groundnut.

MATERIALS AND METHOD

Poisonous weed *Pascalialia glauca* Ortega were collected from groundnut fields of Islampur, Sangli district of Maharashtra, India and shade dried at normal temperature. Dried parts were separated into leaves, stem and flowers, ground it and stored separately in tied plastic jars. The extract were prepared taking 10 gm of fine powder of each part and poured in 100ml distilled water as pure extract, stock solution. From this extract, made different (25, 50, 75 and 100%) concentrations for treatments while distilled water used as control (0%). Healthy seeds of groundnut were selected that procured from registered seed shop. The 10 seeds were placed in each treatment petri plates (9.0 cm diameter) containing blotting papers with triplicates. The seeds were treated with 10 ml of respected aqueous extracts and distilled water serves as control. They were moistened when required. The bioassay experiment was conducted at normal laboratory conditions. The seed germination was observed and root-shoot length was measured up to 5th days. After 7th days germination, 5 seedlings are randomly selected from each treatment plate for fresh and dry weight.

RESULTS AND DISCUSSION

The results of effect of aqueous stem, leaves and flower extract of *P. glauca* Ortega on seed germination percentage, length of root and shoot, fresh weight and dry weight of groundnut seeds is depicted in Table 1. The gradual inhibition has been recorded with increasing the concentration of treatments. The reduction in seed germination percentage was highest (25.83%) in pure extract of leaves followed by 28.83% in stem and 56.66% in flower aqueous extract. The similar trend of inhibition of root and shoot length was recorded (1.96 cm) in stem and leaf extract. The fresh weight was more reduced (4.180 mg) in pure stem extract followed by leaves extract (4.935 mg) and flower extract (5.685 mg) at 100% concentration. The highest reduction (0.885 mg) in dry weight has been occurring in the treatments of pure stem extract. The biomass reduction was correlated with seedling growth may be due to stunted and reduced seedling growth (Garci'a *et al.*, 2002). The 100% concentration treatment of leaves extract was recorded 1.010 mg while flower extract recorded 1.095 mg dry weight of groundnut seedlings. The reduction in values of different parameters was gradually change at 25%, 50% to 75% concentration but from 75% to pure extract treatment was abruptly inhibited seed germination percentage, reduction in root and shoot length and fresh and dry weight. The aqueous leaves extract showed worst influenced on seed germination and root-shoot length of groundnut while aqueous stem extract affects on fresh and dry weight. It was most important and helpful for crop cultivation managements, to keep weed free field before seed germination and development of crop. The recorded values at higher concentration showed inhibitory effect due to water soluble chemical substances released when preparing aqueous extract. It was also observed that leaves extract treatments delayed all studied parameters in receptor crop groundnut than the stem and flower extract. Our results confirmed with results of Lawan *et al.*, (2011), inhibitory effect increased with increasing concentration of *Eucalyptus* leaf extract on groundnut. These results correlated with findings of Parthasarathi *et al.*, (2012) who were concluded that, groundnut seeds are not germinated in higher concentration of leaf extract of *Parthenium hysterophorus* L. Sarita and Sreeramulu (2013) stated that *Celosia argentea* L. leaf extract showed more inhibitory effect with increasing concentration on seed germination and seedling growth of

groundnut. Phytotoxicity of allelochemicals present in the leaf extract of *Excoecaria agallocha* L. may cause synergistic activity on retardation of growth of groundnut (Kavitha *et al.*, 2012). Different workers reported allelopathic effect of various weeds on different crops including Gupta and Mithal (2012); Dhole *et al.*, (2014); Ghodake *et al.*, (2012); Mahammad *et al.*, (2012); Patil, B. J. and Khade H. N., (2015); Thombre S. S *et al.*, (2016) and Salgude *et al.*, (2015). The results from present investigation firmly supports that allelopathy is concentration dependent phenomenon, as concentration increased the extend of inhibition also increased (Haque *et al.*, 2003; Ahmed *et al.*, 2007; Siddiqui *et al.*, 2009). Weeds have synchronizing the biological clock and

sociability with that of crop and ecological races within weed population (Zimdhal, 2008).

The aqueous leaf extract of *Pascaliala glauca* Ortega was proved to be most potent germination inhibitor in present study. The least inhibitory were shown by flower extract. Our findings were emphatically proved that, it has been trustworthy for the inhibition of seed germination and reduction in the seedling growth of groundnut with progressively increase in concentration of leaves, stem and flower aqueous extract. Therefore, present investigation recommended that, some eco-friendly preventing measures should be taken to minimize the deleterious effects of *P. glauca* Ortega at the time of growing crops.

Table 1 : Treatments of various parts of *Pascaliala glauca* of different concentrations on groundnut seed germination percentage, seedlings growth and dry weight.

Sr.No.	Parameters	Aqueous extract	Treatments				
			Control	25%	50%	75%	100%
1.	Seed germination percentage	Stem	94.99	67.16	59.50	55.00	28.50
		Leaves		57.33	51.83	49.00	25.83
		Flower		83.33	77.49	65.83	56.66
2.	Root length (cm.)	Stem	8.84	6.17	5.6	3.6	2.19
		Leaves		4.6	4.37	3.58	1.96
		Flower		3.88	3.23	3.52	2.59
3.	Shoot length (cm.)	Stem	9.92	6.51	5.32	4.55	2.19
		Leaves		5.5	4.37	3.58	1.96
		Flower		5.02	5.04	3.52	2.6
4.	Seedlings growth (cm.)	Stem	18.76	12.68	10.92	8.15	4.38
		Leaves		10.1	8.74	7.16	4.56
		Flower		8.9	8.27	7.04	5.19
5.	Fresh weight (mg.)	Stem	7.180	5.825	5.750	5.545	4.180
		Leaves		6.065	5.925	5.375	4.935
		Flower		6.765	6.845	5.810	5.685
6.	Dry weight (mg.)	Stem	1.575	1.400	1.110	1.130	0.885
		Leaves		1.270	1.335	1.275	1.010
		Flower		1.690	1.610	1.470	1.095

* Values are mean of three determinations.

REFERENCES

Ahmed R,Uddin, MB, Khan MAS, Mukul SA and Hossain MK, 2007. Allelopathic effect of *Lantana camera* on germination and growth behavior of some agricultural crops in Bangladesh. *J. Fores. Res*, 18(14):301-304.

Benyas E, Hassanpouraghdam MB, Salmasi SZ and Oskooei OSK, 2010. Allelopathic effects of *Xanthium strumarium* L. shoot aqueous extract on germination, seedling growth and chlorophyll content of lentil (*Lens culinaris* Medic.). *Rom. Biotech. Lett*,15:5223-5228.

- Batish DR, Lavanya K, Singh HP and Kooqli RK, 2007.** Phenolic allelochemicals released by *Chenopodium murale* affect the growth, nodulation and macromolecule content in checkpea and pea. *Plant Growth Regulation*, **51**:119-128.
- Callazo L and Rits-Correa, 1996.** Experimental intoxication of sheep and Cattle with *Wedelia glauca* Ver. *Human Toxicol*, **38**(3):200-203.
- Dhole JA, Lone KD, Dhole GA and Bodle SS, 2013.** Allelopathic effect of aqueous and ethanolic extracts of some common weeds on seed health of *Triticum aestivum* L. (Wheat). *Int. J. Curr. Microbiol. and Appl. Sci*, **2**(6):254-260.
- Garci'a C, Moyna P, Ferna'ndez and Heinzen H, 2002.** Allelopathic activity of *Ammi majus* L. fruit waxes. *Chemoecology*, **12**:107-111.
- Ghodake SD, Jagtap MD and Kanade MB, 2012.** Allelopathic effect of three *Euphorbia* on seed germination and seedlings growth of wheat. *Ann. Bio. Res*, **3**(10):4801-03.
- Giannitti F, Margineda CA, Cid MS, Montobbio C, Soteras CI, Caffacrena RD and Diab SS, 2013.** Fatal *Wedelia glauca* intoxication in calves following natural exposure. *Veterinary Pathology*, **50**93:530-533.
- Gupta Ankita and Mittal Chabbi, 2012.** Effect of allelopathic leaf extract of some selected weed flora of Ajmer district on seed germination of *Triticum aestivum*. *L. Sci. Reas. Repo.*, **2** (3):311-315.
- Haque A, Romel AI, Uddin M and Hussan M, 2003.** Allelopathic effects of different concentration of water extracts of *Euphorbia odoratum* leaf on germination and growth behavior of six agricultural crops. *J. Biol. Sci.*, **3** (8):741-750.
- Kadioglu L, Yamhar Y and Asav U. 2005.** Allelopathic effects of weed leachates against seed germination of some plants. *J. of Env. Biol*, **26**:169 – 173.
- Kavitha D, Prabhakaran J and Arumugam K, 2012.** Allelopathic influence of *Excoecaria agallocha* L. on seed germination and seedling growth of some pulses and millets. *Int. J. Phar. & Res*, **3**(20):757-766.
- Patil BJ and Khade HN, 2015.** Allelopathic effect of *Parthenium hysterophorus* L. extract on seed germination and seedling growth of *Vigna aconitifolia* (Jacq) Marechaland *Trigonella foenum –graecum* L., *International Journal of Research in Botany*, **5** (1):6-8.
- Lawan SA, Suleman K and Iortsum DN, 2011.** Effect of allelochemicals of some Eucalyptus species on germination and radical growth of *Arachis hypogea* L. *Bayero J. Pure & Appl. Sci.*, **4**(1) 59-62.
- Mujawar Ilahi 2013.** *Wedelia glauca* (Ortega.) Hoffm ex Hicken (Asteraceae): Poisonous weed from Urun-Islampur of Sangli District of Maharashtra, India. *Ind. J. Funda. and Appli. Life Sci.*, **3** (1):92-94.
- Mujawar Ilahi, Mahadev Kanade and Chandrashekhar Murumkar, 2016a.** A Review on *Pascalial glauca* Ortega as poisonous weed barrier in crop fields of Sangli District, Maharashtra *Procc. Int. Conf. on 'Plant Research and Resource Management'* T.C. College, Baramati, Pune, MS, India 11 to 13 Feb., 2016:181-183.
- Mujawar Ilahi, Mahadev Kanade and Chandrashekhar Murumkar 2016b.** Investigation of allelopathic effect of *Pascalial glauca* Ortega aqueous extract on seed germination and seedling growth of wheat. *Ind. Jour. Fund. and Appli. Life Sci.* **6**(3):50-55.
- Mohaammad M, Hassan HM, Daffalla SO, Yagoub MG, Osman ME, Abdel Fani and AL Gabar E Babiker, 2008.** Allelopathic effect of some botanical extracts on germination and seedling growth of *Sorghum bicolor* L. *J. Agri. Techn.*, **8**(4):1423-1469.
- Oberti JC, Pomilio AB, Gros EC, 1980.** Diterpenos and sterols from *Wedelia glauca*. *Phytochemistry*, **19**:1051-1052.
- Patil BJ and Khade HN, 2015.** Allelopathic effect of *Parthenium hysterophorus* L. extract on seed germination and seedling growth of *Vigna aconitifolia* (Jacq) Marechaland *Trigonella foenum –graecum* L., *International Journal of Research in Botany*, **5** (1):6-8.
- Qasem JR and Foy CL, 2001.** Weed allelopathy, its ecological impacts and future prospects. *Jour. Crop Production*, **4**:43-119.
- Rency RC, K Vasantha and A Maruthasalam, 2015.** Identification of bioactive compounds from ethanolic leaf extracts of *Premna serratifolia* L. using GC-MS. *Bioscience Discovery*, **6**(2):96-101.
- Rice EL, 1984.** *Allelopathy 2nd* Ed. Academic Press, New York, London.
- Rice EL, 1995.** *Biological control of weeds and plant diseases: Advances in applied allelopathy.* Norman, USA, University of Oklahoma.
- Salunkhe CB, Shimple VB, Sardesai MM and Yadav SR, 2002.** Some new records of Asteraceae to the state of Maharashtra. *Jour. Bom. Nat. Hist. Soci.* **99**(3):555-557.

Saxena SK, Sharma S, Kumar NK and Rao PB, 2004. Interference of three weed extracts on uptake of nutrient in three different varieties of paddy through radio tracer techniques. *J. Environ. Biol.*, **25**(4):387 – 393.

Salgude P, Pol M and Kanade MB, 2015. Allelopathic effect of *Cuscuta reflexa* Roxb. on some physiological aspects in wheat. *Bioanano Frontier*, **8**(2):179-181.

Sarita, P and Sreeramulu A, 2003. Allelopathic effect of *Celosia argenta* L. Leaf extract on crop plant seed germination. *Int. J. LifeSci. Bt. & Pharm. Res.* **11**:56-64.

Siddiqui S, Bhardwaj S, Saeed SK and Meghvanshil MK, 2009. Allelopathic effect of water extract of *Prosopis juliflora* leaf on seed germination and radical length of wheat (*Triticum*

aestivum var. Lok-1) *American Eurasian J. Sci. Res.*, **4**(2):81-84.

Singh HP, Batish DR, Kaur S and Kohli RK, 2003. Phytotoxic interference of *Ageratum conyzoides* with *Triticum aestivum*. *J. Agro. Crop Sci.*, **189**:341-346.

Sobrero MT, Ochoa M delC, Chaila S, 2004. Allelopathic potential of *Wedelia glauca* effect on horticultural species. *Plant Daninhas*, **22** (1):1/6-6/6.

Thombre SS, Kalamkar SS, Shaikh MN, Torawane SD and Mokat DN, 2016. Studies on rhizosphere fungi and allelopathic potential of *Santalum album* L.. *Bioscience Discovery*, **7**(2):158-161.

Zimdhal R, 2008. Weed crop competition review “Corvallis O.R.” Int. Plant. Center, Oregon State University.

How to Cite this Article:

Ilahi Mujawar, Mahadev Kanade and Chandrashekhar Murumkar, 2017. Allelopathic potential of *Pascalina Glauca* Ortega aqueous extract against seed germination and seedling growth of groundnut. *Bioscience Discovery*, **8**(1):35-39.