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Research Article

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

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Abstract

Pascalia 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 allelochmicals 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).

Pascalia glauaca 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 allolopathic 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 *Pascalia 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 5^{th} days. After 7^{th} 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 Parthasarthi *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. Pytotoxicity 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 *Pascalia 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 *Pascalia 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.

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