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Research Article

INVESTIGATION OF ALLELOPATHIC EFFECT OF *PASCALIA GLAUCA* ORTEGA ON SEED GERMINATION AND SEEDLING GROWTH OF WHEAT

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ABSTRACT
The allelopathic potential of *Pascalia glauca* Ortega on seed germination and seedling growth of wheat (*Triticum aestivum* L.) was undertaken to assess their effects under laboratory conditions. The various concentrations (25, 50, 75 and 100%) of aqueous extracts of stem, leaves and flower were tested separately to find out the effect on seed germination and seedling growth. The aqueous leaf extract was highly influenced on seed germination at higher concentration i.e. 30.44% (100%) followed by 43.77% (75%), 50.00% (50%) and 69.66% (25%) seed germination than the stem (47.50%) and flower (40.00%) extract at higher concentration. The maximum inhibition of root length (0.76cm) put on record in the 100% leaf extract while in stem (1.28cm) and flowers (1.57cm) extract. The shoot length at higher concentration (100%) extract of stem, leaves and flower, nearly retarded the growth and were recorded same (0.73cm.) in leaf and flower extract while stem extract was only 0.45cm. The fresh and dry weight was also reduced in the 100% aqueous extract of stem, leaf and flower. The fresh weight was highly influenced (0.470 mg) in flower extract while dry weight more reduced (0.215 mg) in the leaf extract. The higher concentration of various extracts pose the growth that have strong distress influence, especially leaves extract than stem and flower.

Keywords: *Allelopathy, Pascalia Glauca Ortega, Triticum Aestivum L., Seed Germination*

INTRODUCTION
Allelopathy generally relevance to the beneficial or harmful effects of one plant on another plant, to escape chemical substances through leaching, exudation, volatilization and decomposition process from the plant. These chemicals forms warfare between the neighboring plants and competing for growth resources (Singh *et al.*, 2003). These chemicals are recognized as allelochemicals, causes toxicity and inhibitory effects on crops (Burhan and Shaukat, 2000; Zenab *et al.*, 2001). Every part of the weed plant capable to release the allelochemicals (Rice, 1984; Putnum, 1987; Singh *et al.*, 2003) have been sensitive to each other either positive or negative interaction in agro-ecosystem. They affect the crop plants at seed emergence and seedling growth level (Alam and Islam, 2002; Husain *et al.*, 2007; Nassem *et al.*, 2009). Most of the weeds becomes barrier in the field and allelopathy mechanism (Narval, 1994), they compete with crop (Bridges and David, 1992) that utilize resources to affect germination dynamics and growth of field crops (Qasem and Foy, 2001; Benyas *et al.*, 2010). They establish monothicket in the field and dominant over invade area (Heirro and Callaway, 2003) affecting pioneers, native species, crops, grasses and several natural successions (Rice, 1995; Singh *et al.*, 2001) that loss productivity. Anderson, (2003) pointed that, even in small infested weed area cause 10% yield.
Pascalia glauca Ortega (Asteraceae) native of Central and South America that widely spread in Chile, Brazil, Argentna, North Amertica, Southeast Europe, Australia, South Africa and India (Carrerio, 1988; Randoll, 2007; Mujawar Ilahi, 2013). In Argentina it is called as “Agricultural Plaque” and declared as a toxic pest to sheep, pigs, cattle, horses and goats (Ragnones and Milano, 1994; Soberero *et al.*, 2004). In India it was firstly reported from Tamilnadu (Bhattacharya *et al.*, 1995). Further, it was studied under taxonomical aspects (Mujawar Ilahi, 2013) and their detail field data along with toxicity for grazing

animals and effect on human health from Islampur area of Sangli district of Maharashtra (Mujawar, 2016). This is only one habitat from Maharashtra where it was spread very fast in every pattern of crop and loss in the quality and quantity of agricultural product due to this on the wane of farmer's socio-economy that stand warning signals and challenge to agriculture experts, researchers and veterinarians to confront the *Pascalia* from affected areas and stop the salvation of farmer's life. There is little work on crop influence and allelopathic potential of this weed (Soberero *et al*., 2004) and its chemistry (Oberti *et al*., 1980; Giannitti *et al*., 2013). Therefore, present work has been undertaken and the efforts have been made to investigate the allelopathic effect of aqueous extract of *P. glauca* Ortega on seed germination and growth of wheat under laboratory experiment. The results comes in hand are astonishing to real call it was 'agricultural plaque'. The seed germination, seedlings growth and their dry weight has been greatly reduced by increasing the concentration of aqueous extracts of stem, leaves and flower of *Pascalia*.

MATERIALS AND METHODS

Collection of Plant Material: The well grown plants of *Pascalia glauca* Ortega was collected from the affected area of the wheat crop field from Urun-Islampur in Walva taluka of Sangli district of Maharashtra. Then, it was thoroughly washed with tap water and was dried under shade at normal temperature. The stem, leaves and flowers then cut into small pieces and grind in home grinder for fine powder and stored into dry plastic bottles.

Preparation of the Extracts: The powdered material of plant parts separately used for preparation of aqueous extracts. It was prepared by soaking the 10 g powdered material of leaf, stem, and flower soaked into 100 ml distilled water for 24 hours. Then, it was filtered using Whatman filter paper No.1. The filtered solutions considered as stock solutions (100% concentration) stored in refrigerator for experiment. Stock solution (10w/v) was diluted by using distilled water made into different concentrations of 25, 50, 75 and 100%. The control treatments, distilled water were used (0%).

Procurement of Wheat Seeds: The seeds of wheat (*Triticum aestivum* L.) var. Lok-1 were procured from the registered seed shop from single batch. Seeds were surface sterilized with 0.1% $HgCl_2$ for 1 min and then thoroughly washed with tap water and repeatedly by distilled water to remove stress of $HgCl_2$.

Treatment for Bioassay: Healthy seeds of wheat were selected for seed germination bioassay, to perform the laboratory experiment in a completely randomized design with three replications. The concentrations of extract were made into 20, 50, 75 & 100% used for treatments. For control, seeds were soaked in distilled water.

For each treatment 15 seeds were kept in sterilized petri plate (9 cm diameter) lined with moist filter paper. They were regularly moistened filter paper whenever necessary with respected concentration of aqueous extract. Seeds were considered to have germinated when the radical emergence over 2 mm long. The seed germination percentage was determined after constant count. Root length, shoot length, fresh and dry weight was taken on 5^{th} day after germination.

RESULTS AND DISCUSSION

The study was carried out at Department of Botany, Tuljaram Chaturchand College, Baramati, district Pune of Maharashtra, India to investigate the response of poisonous weed *Pascalia glauca* Ortega aqueous extracts of stem, leaves and flower of different concentrations on seed germination growth of wheat (*Triticum aestivum* L.).

The result indicated that seed germination, root length, shoot length, seedling growth, fresh and dry weight of wheat seedling was greatly reduced by aqueous extracts of different parts of *P. glauca* Ortega as depicted in Table 1.

Seed Germination Percentage: The seed germination is considered as most critical stage to provide basic structure for growth and development through biochemical changes in plant. Aqueous extract of stem, leaves and flower showed inhibitory effect on seed germination due to allelopathic interaction between wheat and *Pascalia*. Aqueous stem extract recorded lowest seed germination (45.33%) in the 75% concentration treatment. The leaf extract much delayed seed germination percentage (30.44%) in the pure

extract. The inhibitions of seed germination continuous in flower extract and recorded 40.00% at higher concentration (100%).

Root Length: Hampering in the root length of wheat seedlings in all treatments of stem, leaves and flower extract. The maximum root length inhibition (0.76cm) was takes place in pure leaf aqueous extract. Aqueous stem extract measured 1.28cm root length and flower extract have 1.57cm at higher concentration (100%) as compared to the control.

Shoot Length: The shoot lengths of wheat seedling was diminishing with increasing concentration of aqueous extract of stem and nearly decline the growth of shoot (0.45cm) in the pure concentration. The leaves and flower extract recorded same 0.73cm shoot length in the 100% concentration treatment.

Fresh Weight: The maximum reduction in fresh weight was observed in higher concentration (100%) of all extracts. The aqueous extract of flower was more influenced on the fresh weight (0.470mg) than the stem extract (0.580mg) and leaves (0.650mg) extract.

Dry Weight: The degree of reduction in dry weight was observed at higher concentration (100%) over the other concentrations of treatment. The results showed more reduction in dry weight (0.215mg) in pure extract over the stem (0.230mg) and flower (0.240mg) aqueous extract.

The interpretation and analysis of results showed strong inhibition of seed germination and seedling growth dynamics of wheat under influence of different concentration treatments of *Pascalia glauca* Ortega weed parts.

Suppression in germination and delayed in growth due to its allelopathic compounds released, mostly they are water soluble that interfere with basic skeleton and functions of tested species (Duke and Dayan, 2006) and acting additively or synergistically (Einhellig, 1996). The degree of inhibition decreases with increase in extracts concentration that exhibiting a strong reciprocal correlation with dose response relationship.

The results of present work corroboratory with the findings of many well documented reports including Zenab *et al*., (2001); Tanveer *et al*., (2001); Bhatia *et al*., (1982); Singh *et al*., (1992); Nadal *et al*., (1999) and Patel *et al*., (2002). Ghodake *et al*., (2012) pointed that *Euphorbia genuculata* and *E. maicrophylla* inhibited seed germination of wheat. Root, shoot elongation and biomass accumulation were significantly retarded in wheat by applying the aqueous extract of *E. dracunculaoides* Lam. (Tanveer *et al*., 2012). Wasim Ahmad *et al*., (2014) stated that, the aqueous extract of *Avena fatula* showed significant allelopathic effect on seed germination and growth parameters of wheat. *Moringa* leaf, bark and root extract reduced seed germination and plumule length of wheat (Sharmin, 2014). Neem *et al*., (2012) reported the inhibition in seed germination and seedling growth of wheat in the treatment of aqueous extract of *Parthenium hysterophorus* L. The various weeds affected seed germination and seedling growth of wheat reported time to time by different workers including Gupta and Mithal (2012); Dhole *et al*., (2014) and Dongre *et al*., (2004).

The higher concentration level of aqueous extract of stem, leaves and flower of *Pascalia* attains allelopathic suppression due to water soluble phytotoxins released when preparing the extract in water is coincidence in early stages of growth. Our work is supporting to the work done by Sobrero *et al*., (2004) that *P. glauca* Ortega (*Wedelia glauca*) has allelopathic potential in germination and growth of tomato, cucumis and radish.

Our results obtained from present investigation provide strong evidence that, the poisonous weed *P. glauca* Ortega have more allelopathic potential in leaves than stem and flower. The increase in concentration dose of extract strongly inhibited the seed germination (45.33%) and growth of wheat while the shoot length and root length is highly reduced (0.45 cm and 1.28 cm) in the leaf and stem respectively as compared to control. The biomass reduction was correlated with seedling growth may be due to stunted and reduced seedling growth (Garcia *et al*., 2002). The dry weight of wheat was decreased in the higher concentration of leaves extract (0.215mg) than stem and flower. It indicated that, the leaves are main source of allelopathic chemicals. Therefore, *P. glauca* Ortega toxic weed as an important source of allelochemicals released by stem, leaves and flowers that has been significant factor in studied area make competition for resources to suppress the growth of wheat crop.

Table 1: Treatments of Various Parts of *Pascalia Glauca* Ortega of Different Concentrations on Wheat Seed Germination Percentage, Seedlings Growth and Dry Weight

Sr. No.	Parameters	Aqueous Extract	Treatments				
			Control	25%	50%	75%	100%
1.	**Seed Germination (%)**	Stem	98.50	74.33	49.55	45.33	47.50
		Leaves		69.66	50.00	43.77	30.44
		Flower		77.21	53.83	48.33	40.00
2.	**Root Length (cm)**	Stem	10.19	5.25	4.88	3.95	1.28
		Leaves		5.52	4.84	3.61	0.76
		Flower		7.1	6.31	4.9	1.57
3.	**Shoot Length (cm)**	Stem	8.66	4.75	4.74	2.72	0.45
		Leaves		5.61	4.24	2.7	0.73
		Flower		5.6	5.37	4.12	0.73
4.	**Seedlings Growth (cm)**	Stem	18.85	10.00	9.62	6.67	1.73
		Leaves		11.13	9.08	6.31	1.49
		Flower		12.7	11.68	9.02	2.3
5.	**Fresh Weight (mg)**	Stem	1.060	0.885	0.830	0.630	0.580
		Leaves		0.850	0.825	0.810	0.650
		Flower		0.865	0.850	0.600	0.470
6.	**Dry Weight (mg)**	Stem	0.315	0.265	0.255	0.270	0.230
		Leaves		0.270	0.250	0.260	0.215
		Flower		0.230	0.240	0.275	0.240

* Values are mean of three determinations.

Conclusion

The present investigation revealed that the aqueous extracts of leaves have more allelopathic potential than the stem and flower although; in higher amount its allelopathic effects enhanced or nearly ceased the seedling growth in early stage of wheat. So, it is suggested that *Pascalia glauca* Ortega produced allelochemicals which inhibited the seed germination and seedling growth that becomes main barrier in field responsible for competition for natural resources in wheat crop and should be controlled properly. The detail studies are essential to encompass the need and explore under the different physiochemical parameters for divulge the target role of weed *P. glauca* Ortega in the wheat crop field from studied area.

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