Allelopathic Effect of Pascalia glauca Ortega. Aqueous extract on Photosynthetic Pigments of Triticum aestivum L. and Arachis hypogea L. Seedlings

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Abstract

Pascalia glauca Ortega is an intrusive noxious and poisonous weed (Asteraceae), which newly introduced and settled in Walwa taluka in Sangli district of Maharashtra. The crop field area overview watched that the presence of weed persisted and that can have an effect on associated weeds and crops. Observations made to reflect on consideration to take a look at the allelopathic impact of aqueous concentrates of stem, leaves and flower on the photosynthetic pigments of wheat (Triticum aestivum L) and groundnut (Arachis hypogea L.) Under research facility stipulations that investigated the fifth day old seedlings. The investigation uncovered that the higher concentrations of aqueous extract of *P. glauca* Ortega. i.e. 20% was greater inhibitory effect than control. The gradual and impeccable impairment of all studied photosynthetic pigments repressed in wheat from decrease to higher concentration of aqueous extract of stem, leaves and flower as in contrast to control. The highlighted recreation has been an expeditious look in groundnut that aqueous extract of flower expressed greater stimulatory response to step up the values of total chlorophyll at 5% (1.918) and 10% (1.925) comparable to control (1.905). An accelerated concentration of extract diminished the photosynthetic pigments in *Triticum aestivum* L. and *Arachis hypogea* L.Thus, *Pascalia glauca* indicated detrimental allelopathic influence on photosynthetic pigments.

Key Words: *Pascalia glauca* Ortega, allelopathy, wheat, groundnut, photosynthetic pigments.

Introduction

Weeds are undesirable and most belligerents' agricultural threats where they are not required that badly reflects development and yield of crops, dependably winds up plainly imperative segments of biological neighborhood and acknowledged to have co-evolved with crops. They have conceivable versatile potential to transferring ecological conditions, utilization of natural sources and strong allelopathic potentiality (Qasem and Foy, 2001). It is conjectured that the achievement of the intrusive propensities of the weed are due to the fact of

its allelopathic properties has been one of the feasible approach has empowers them to colonize and prevailing the attack region (Heirro and Callaway, 2003). They have an effect on crops, neighborhood species, grasses, pioneers and a number of natural ecosystems (Rice, 1995; Singh et al., 2001). The admire earnings by means of locals and yield all the whilst discharge some secondary substances exhibit in an assortment of plant parts including root, stem, leaves, flowers, fruits and even rhizome and seeds (Singh *et al*., 2003; Ahmad *et al*., 2011) referred to as allelochemicals (Batish *et al*., 2007). They affect with nearby vegetation (Rebaz *et al*., 2001; Rency *et al*., 2015) that have an impact on emphatically or potentially contrarily and communicated either stimulatory or additionally inhibitory impact on crops (Ilahi Mujawar *et al*., 2017). Such influence depends upon their concentration exhibit in the donor weed plant (Asuduzzaman *et al*., 2010). Through the activity of allelochemicals endless capacities and biochemical responses are influenced, for example, seed germination, cell division and cell extension (Kumbhar and Patel, 2012; Thombre *et al*., 2016). Wheat (*Triticum aestivum* L) has became out to be essential nourishment and groundnut (*Arachis hypogea* L.) has most necessary oil yielding product utilized as a part of day by day consume through human population in Maharashtra. *Pascalia glauca* Ortega is one of the poisonous weed has a area with family Asteraceae that recently introduced and attack in Islampur field vicinity of Sangli district of Maharashtra, India (Mujawar Ilahi 2013). Therefore, we select paid attention to investigate their allelopathic potentiality. It is terrific as harming species to domastic animals and humans (Collazo and RietCorrea, 1996; Soberero *et al*., 2004; Mujawar Ilahi *et al*., 2016a, 2016b) and that have been confirmed as allelopathic possibility (Ilahi Mujawar *et al*., 2017). In this manner, present work has been featured to investigate allelopathic impact of stem, leaves and flower extract on photosynthetic pigments of wheat and groundnut seedlings.

Material and Methods

Pascalia glauca Ortega was collected from infested crop field of wheat and groundnut of Urun Islampur in Sangli district, shade dried in laboratory. The dried parts of stem, leaves and flowers were separated, ground it, and filtered through 2mm sieves that powdered source independently stored in plastic bottles. Each of 10g of powdered poured into 100ml of distilled water overnight, filtered well and considered as pure extract stock solution from which prepared 5,10,15 and 20% concentrations treatment extract while distilled water serves as control for bioassay experiment arranged in triplicate sets. Healthy, cleaned and surface sterilized seeds of wheat and groundnut were selected from seed slot that procured from registered seed shop. Fifteen seeds of wheat and ten seeds of groundnut were treated with 10 ml of respected aqueous extract and distilled water for comparison at 0% concentration. They were moistened when required under laboratory condition. After the completion of 5^{th} days of seed soaking, seedlings were used for testing the biochemical parameters.

Estimation of Photosynthetic pigments:

The chlorophyll a, b, total chlorophyll and carotenoides content were estimated followed by Arnon method (1949). 0.5 grams of wheat and groundnut seedlings of plant material was ground in mortal and pestle with 10ml of 80% Acetone that centrifuged at 800rpm for 15 min and supernant was read at 645nm and 663nm using UV-spectrophotometer. Pigments were estimated by Allen and Krik method (1961) and values were expressed in mg g^{-1} fresh weight.

Result and Discussion

Present results vividly clear that the photosynthetic pigments; chlorophyll a, b, total chlorophyll and carotenoids content was gradually minimized in all treated concentration of stem, leaves and flower of *Pascalia glauca* Ortega as compared to control. The foremost paramount output of experiment was the leaves are the main source of allelopathic potentiality which may discharge some allelochemicals that contaminating rhizosphere soil environments and influence on the wheat and groundnut crop. Photosynthetic pigments were reduced in *Pascalia glauca* Ortega in replication to the allelochemicals present in it. The degree of reduction in pigments were in the series of leaves > stem > flower and was done as that of increase in concentration of aqueous extract. The highest reduction (0.040 mg and 0.293 mg g-1 fresh weight.) chlorophyll a content in the wheat and groundnut respectively at 20% aqueous leaves extract. The flower extracts has minimum inhibitory outcomes in all pigments in comparison of stem and leaves. Consequently leaves aqueous extract was proved to be most potent allelopathic potentiality than the stem and flower. The gradual and impeccable impairment of all studied photosynthetic pigments repressed in wheat (*Triticum aestivum* L) from lower to higher concentration of aqueous extract of stem, leaves and flower as compared to control. All pigments were ill disrupted as concentration incremented from 10 to 20% aqueous extracts and it expressed proximately double reduction to previous. Carotinoides has been gradually reduced from lower to higher concentration in both test crops. The highlighted activity has been a quick look in groundnut (Arachis *hypogea* L.) where chlorophyll a, b and total chlorophyll remarkably hick in lower concentration (5%) in aqueous extract of stem and leaves furthermore, aqueous extract of flower expressed more stimulatory response to step up the values of total chlorophyll at 5% (1.918) and 10% (1.925) comparable to control (1.905) otherwise, gradually repression perpetuated from lower to higher caliber of concentrations. The detail results depicted in table 1 and 2.

Chlorophyll pigments in higher concentration (20%) of stem, leaves and flower aqueous extracts have been reduced in wheat and groundnut that conquered hurriedly from 5% to 20%. In wheat, aqueous extract of leaves mostly influenced than the stem and flower. The highest repression has been made in chlorophyll-b (8.81 fold) followed by total chlorophyll (8.05 fold), chlorophyll-a (6.67 fold) and carotinoids (3.79 fold) in comparison to control. In groundnut, carotnoides has been highly quelled (7.43 fold) at 20% concentration trailed by Chlorophyll a (2.81 fold), total

chlorophyll (2.62 fold) and chlorophyll b (2.62 fold). The most important outcome in groundnut was the pigments at lower concentration of stem extract (5%) chlorophyll a pigment promoted (0.95 fold) and chlorophyll b was identical to that of control while in flower extract it was stimulated by 0.99 fold in 5% and 0.88 fold in 10% concentration. Additionally, the formidable results were comes in hand from present investigation was the aqueous extract of *Pascalia glauca* stem, leaves and flower has been highly influenced on wheat than the groundnut.

Physiological repute of the plant relies upon on the chlorophyll a and b total chlorophyll and carotenoids concentrations that correlated to the photosynthetic doable of a plant (Young and Britton, 1990). Chlorophylls are essential molecules which act as core component of pigment complexes surrounded the photosynthetic membrane and play an imperative role in photosynthesis metabolism (Siddiqui and Zaman, 2005). Oyerinde *et al.*, (2009) who put the document on the desk that the minimize in chlorophyll a, b, total chlorophyll accumulation in young plants of maize after being treated with fresh shoot aqueous extract plant regarded to possess allelopathic characteristics. Many researchers have pronounced that chlorophyll content and other physiological parameters were reduced drastically through allelochemicals (Alsaadawi *et al*., 1986; Salgude *et al*., 2015). Ibrahim *et al*. (2013) cited that allelopathic effect of leaves of GM and non GM extract considerably suppressed the amount of chlorophyll content. The growth, development and chlorophyll contents of wheat seedlings had been decreased by *Coronopus didymus* L (Khaliq *et al*. (2013). Peng et al. (2004) mentioned that allelochemicals have an effect on the photosynthetic activity in plant by means of destroying chlorophyll pigments. Allelochemicals responsible for breaking of the chlorophyll molecules by way of activation of pyrrolica ring and phytol chain thru which inhibit the synthesis of chlorophyll, routinely reduction in chlorophyll content in the plant (Blum *et al*., 1993), our consequences supports this view. Gulzar and Siddiqui (2014) reported chlorophyll, protein and carbohydrates contents had been reduced in some weeds after the treatment of *Eclipta alba* extract while Leela *et al*. (2014) validated the aqueous leaf extract of *Casurina equisetifolia* L. two against rice which confirmed significant reduction in the chlorophyll content. Leaves are more potent source of allelochemicals that corroborated the results of Patil and Khade (2018) who worked effect of *Celosia argentea* extract on gaur. Present outcomes has been emphasizing on the allelopathic plausible of *Pascalia glauca* Ortega that decrease the chlorophyll a, b, total chlophyll and carotenoides content would possibly be attributed with the aid of a number of allelochemicals existing in *Pascalia glauca* Ortega.

Conclusion

It can be concluded that aqueous leaf extract of *Pascalia glauca* Ortega showed more allelopathic effects than the stem and flower aqueous extract on photosynthetic pigments of *Triticum aestivum* L. and *Arachis hypogea* L.

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Table 1. Allelopathic effect of *Pascalia glauca* Ortega aqueous extract on photosynthesis pigments of **wheat seedlings** (mg/g^{-1} fresh weight.)

Sr.No.	**Parameters Pigments**	**Aqueous extract**	Treatments Control %	5%	10%	15%	20%
1.	**Chlorophyll** a	Stem	0.267	0.210	0.162	0.090	0.043
		Leaves		0.212	0.158	0.082	0.040
		Flower		0.217	0.198	0.108	0.070
2.	**Chlorophyll** b	Stem	0.635	0.503	0.412	0.260	0.098
		Leaves		0.478	0.311	0.235	0.072
		Flower		0.512	0.445	0.332	0.160
3.	**Total Chlorophyll**	Stem	0.902	0.713	0.574	0.350	0.141
		Leaves		0.690	0.469	0.317	0.112
		Flower		0.729	0.643	0.440	0.232
4.	**Carotenoides**	Stem	0.262	0.192	0.126	0.106	0.082
		Leaves		0.170	0.162	0.104	0.069
		Flower		0.211	0.185	0.152	0.102

* Values are means of three readings.

Table.2. Allelopathic effect of *Pascalia glauca* Ortega aqueous extract on photosynthesis pigments of **groundnut seedlings** (mg/g^{-1} fresh weight.)

Sr.No.	**Parameters Pigments**	**Aqueous extract**	Treatments Control %	5%	10%	15%	20%
1.	**Chlorophyll** a	Stem	0.825	0.860	0.692	0.405	0.315
		Leaves		0.745	0.668	0.474	0.293
		Flower		0.820	0.705	0.510	0.388
2.	**Chlorophyll** b	Stem	1.080	1.080	0.728	0.682	0.584
		Leaves		1.052	0.712	0.518	0.432
		Flower		1.098	1.220	0.592	0.465
3.	**Total Chlorophyll**	Stem	1.905	1.940	1.420	1.087	0.799
		Leaves		1.797	1.380	0.992	0.725
		Flower		1.918	1.925	1.102	0.853
4.	**Carotenoides**	Stem	277.10	210.27	160.11	92.44	58.72
		Leaves		204	152.10	88.30	37.25
		Flower		219	187	110.15	62.12

* Values are means of three readings.