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Allelopathic Effect of Different Concentration of Water Extract of Prosopsis *Juliflora* Leaf on Seed Germination and Radicle Length of Wheat (*Triticum aestivum* Var-Lok-1)

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Abstract: Mesquite (*Prosposis julifl*ora) aqueous leaf extract, prepared by 25 gm and 50 gm powder of dry leaf dissolved in 500 ml of double distilled water, were tested for their allelopathic effects on seed germination and radicle length of *Triticum aestivum* var-Lok. Allelopathic effect of leaf extract of different concentrations (25 gm/500 ml (C_1) and 50 grm/500ml (C_2) of *Prosopsis juliflora* and its possible allelopathic effect tested in a laboratory experiment (Bundelkhand University, Jhansi. The experiment was conducted in sterilizes Petri dish with a 24 h, 48 h, 72 h, 96 h and 120 h time interval for seed germination and 24 h, 48 h and 72 h for radicle length on an average of 25° C. The effects of different concentrations of aqueous extract were compared to distilled water (Control C_0). Aqueous effect caused pronounced inhibitory effect on seed germination and root length of receptor plant. Seed germination and root length results indicated that the inhibitory effect was proportion to the concentration of the extract. Inhibitory effect was much pronounced radicle length rather than germination. Hence, it could be concluded that the mesquite leaf aqueous extract contain water-soluble allelochemicals. Which could inhibit the seed germination and reduce radicle length of wheat. It is suggested that wheat should not be planted close to *Prosopsis juliflora* due to adverse effects on its growth.

Key words: Allelopathic effect, *Prosopsis juliflora,* Seed germination, Root length, *Triticum aestivum var*-Lok

INTRODUCTION

Wheat (*Triticum aestivum,* family poaceae) was one of the first domesticated food crops and the basic staple food of the majority of the population in many regions of the world. Today, wheat is grown on more land area than any other commercial crop and continues to be the most important food grain source for humans. The population pressure in wheat-consuming countries required that more attention be directed towards new approaches to sustainable wheat production. Improvement of both crop quality and yield is an urgent task. Optimally, yield improvement must be sought through agronomic approaches that are environmentally safe [1].

Prosopsis juliflora a leguminous species (Mimosoideae), a well adopted shrub to harsh environment conditions of many arid zones. The ground vegetation under its canopy indicates that it has some allelopathic potential which might have been caused either by fallen leaves (through decomposition of leaves) or plant leachates or root exudates. Consequently, the release of allelochemicals (organic substances) into the soil inhibits seed germination and establishment of agricultural crops and vegetation [2]. Allelopathy can simply be understood as the ability of plants to inhibit or stimulate growth of other plants in the environment by exuding chemicals. The concept of allelopathy was first introduced by Hans Molisch to describe both the beneficial and the detrimental chemical interactions of plants and microorganisms [3]. Since then, the term 'allelopathy' has undergone several changes and it has been defined as any direct or indirect harmful or beneficial effects of one plant on another through the production of chemical compounds that it releases into the environment [4].

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So the purpose of the present study was to elucidate the allelopathic potential of different concentration of leaf extract *Prosopsis juliflora* on *Triticum aestivum* var-Lok-1. Such information should be beneficial when planning for sowing wheat near or beneth of mesquite trees. Hence this study was conducted to investigate the alleopathic potential of mesquite leaf on seed germination and redicle length.

MATERIALS AND METHODS

Preparation of Aqueous Extracts from Leaves of Donor Plant: Fresh samples of leaves of mesquite (*Prosopsis juliflora)* were collected from the different arable zones of Bundelkhand region especially Jhansi and considered as a donor plant. The aqueous extract was prepared from fresh leaf of the donor plants. The leaves were shed dried and then ground using leaf particulator to pass through 2 mm mesh sieve. 25 gm and 50 gm of *Prosopsis juliflora* dissolve into 500ml of double distilled water and kept in water both of 45-55° 24 h. The resulting brownish and dark extract were filtered through cotton and after that with Whatman no.1 filtered paper stored in fridge in dark place in conical flasks until rerequired.

Collection and Sterilization of Test Plant: Healthy uniform grains of wheat (*Triticum aestivum)* were obtained from the Agriculture Seed Store (Govt of Uttar Pradesh), Jhansi. Before germination test the grains were surface sterilized with 1% sodium hypochloride for 20 mins, then rinsed with the distilled water for several times to remove excess of chemical.

Seed Germination and Seedling Growth: Germination test were performed for the aqueous extract of donor plant. Healthy and uniform size seed were selected and presoaked in distilled water for 2 h and then soaked in different concentration in 25 g/500ml and 50g/500 ml of aqueous extract for 3 hrs and control were treated as double distilled water. The sterilized seeds were evenly placed on two layers of filter paper in sterilized Petidish (12 cm). The Petri dishes were placed in growth chamber (25°C and 70% humidity and continuously dark. Treatments were arranged in a completely randomized design with three replications. Seeds were considered germinated upon radicle emergence. Germination was determined by counting the number of germinated seeds at 24-h intervals over a 5-day period and radicle was counted continuously three days. At every 24 h interval the radicle length of the germinated seed were measured using a millimeter ruler.

Statistical Analysis: Statistical analysis was performed employing one way ANOVA test using GPIS software 1.13 (GRAPHPAD, California, USA). To detect the significance of differences of variables. All values are expressed as mean± SEs.

RESULTS AND DISCUSSION

The allelopathic effect of *Prosopsis julifloras* on the germination of wheat is shown in Figure 1. It is obvious that the aqueous leaf extract of *Prosopsis juliflora* inhibited the germination of wheat. The maximum seed percentage was shown in the control where no extract was used which was 52.86% at 24 h, 71.78% at 48 h, 89.77% at 72 h, 95.77% at 96 h and 98.88% at 120 h. The highest inhibitory effect was found in *Triticum aestivum* at C_2(50gm/500ml) treatment which was 10.75% at 24 h, 15.86 % at 48 h, 26.86% at 72 h, 30.76% at 96h and 40.75% at 120hrs. While the percentage seed germination decreased with increasing concentration of aqueous leaf extract of *Prosopsis juliflora.*

The study of Table 1 revealed that the *Prosopsis juliflora* decreased the *Triticum aestivum* length as compared to control. The smallest root length was registered in the extract C_2 treated seeds, which was 0.7±0.01 at 24 h, 1.20±0.08 at 48 h and 1.30±0.08 at 72 h time interval, which significantly differed from the other extract in *Triticum* root length. The highest root length

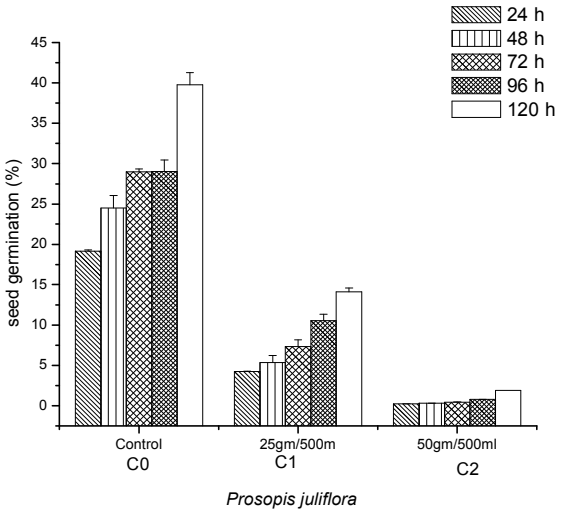

Fig. 1: Effect of aqueous extract of *Prosopsis juliflora* on seed germination of *Triticum aestivum* var-Lok-1

Table 1: Effect of aqueous extract of *Prosopsis juliflora* on radicle length of *Triticum aestivum* var- Lok-1

	Radicle length (cm)		
Concentration of *Prosopsis Juliflora*	24h Mean ± S.E	48h Mean ± S.E	72h Mean ± S.E
Control (C_0)	1.19±0.03	1.79±0.08	3.12±0.43
25gm/500ml (C_1)	1.05± 0.05	1.35±0.90	1.75± 0.12
50gm/500ml (C_2)	0.7± 0.01	1.20 ± 0.08	1.30±0.08

was obtained in control group in all time intervals. The highest reduction in *Triticum* root length exhibited in the C_2 (50gm/500ml) in all time intervals revealed that the allelochemicals in the aqueous extract, which caused the maximum in reduction in root length.

The present findings corroborate the earlier report by Bora *et al.* [5] who found that, the inhibitory effect of leaf extracts of *Acacia auriculiformis* on germination of some agricultural crops was proportional to the concentration of the extract. Also, as noted by Jadhar and Gayanar [6] the percentage of germination, plumule and radicle length of rice and cowpea, were decreased with increasing concentration of *Acacia auriculiformis* leaf leachates.

In the present study, responses indices revealed that the inhibition of growth parameters of seedlings was more pronounced than that of seed germination. The inhibitory effect of the tested species on seed germination and radicle length of wheat may be related to the presence of allelochemicals including tannins, wax, flavonoides and phenolic acids. Furthermore, the toxicity might be due to synergistic effect rather than single one [7] Phenolic acids have been shown to be toxic to germination and plant growth processes [8]. Rajangam and Arumgam [9] found that, the use of z-aqueous extracts of *Excoecaria agallocha* leavesinhibited seed germination and plumule and radicle elongation of rice. Sundaramoorthy *et al*. [10] concluded that the *P. juliflora* significantly inhibited the seed germination in pearl millet. *P. juliflora* reduced the germination percentage of gram and sorghum reported by [11]. Several reports address the importance of allelopathic effect of various trees *E. camaldulensis*, *Prosopis julifera* and *Acacia nilotica* significantly affected seed germination and seed seedling growth of several crops and weed species [12]. Lisanework and Michelson [13][1] who discovered that the leaf extract of *E. camaldulmensis* decreased root growth of the majority of the crops in there studies. Similar findings were also reported by [14-19]. in leaf extract of different agroforestry trees in common agricultural crops. They found inhibitory effect in seed germination and radicle length and other initial parameters.

The present study provides the evidence of *Prosopsis juliflora* has allelopathic potential. It is also suggested that wheat should not be planted close to *Prosopsis juliflora* due to adverse effects on its growth.

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