

# Allelopathic Effect of Water Extract of Liquorice (*Glycyrrhiza glabra*) on Germination and Chlorophyll Content of Maize

H. Najafi Navaey<sup>1\*</sup>, H. Gholami Tilebeni<sup>1</sup>, M. Ghaderi far<sup>2</sup> and M. Sanei<sup>2</sup>

1- Young Researchers Club, Gorgan Branch, Islamic Azad University, Gorgan, Iran.

2- M.Sc. student, Dept. of Agronomy of Islamic Azad University, Amol Branch

**Corresponding author:** H. Najafi Navaey

**ABSTRACT:** Liquorice (*Glycyrrhiza glabra*) aqueous leaf extract, were tested for their allelopathic effects on seed germination and radicle length of Maize. Allelopathic effect of leaf extract of different concentrations (0, 25%, 50%, 75% and 100%) of *Glycyrrhiza glabra* and Experiment was CRBD design with 3 replicate in Bahonar University, Kerman, Iran in 2012 year. The experiment was conducted in Petri dishes and plastic pot. for seed germination, radical length, shoot length, plant height, Dry weight and chlorophyll. The results showed that the Seed germination and plant growth delayed at the higher concentrations, and the final germination percentage was decreased by increasing leaf extract concentration. Hence, it could be concluded that the mesquite leaf aqueous extract contain water-soluble allelochemicals.

**Keywords:** Allelopathic, *Glycyrrhiza glabra*, germination, Maize.

## INTRODUCTION

Liquorice or licorice is the root of *Glycyrrhiza glabra* from which a somewhat sweet flavour can be extracted. The liquorice plant is a legume (related to beans and peas) that is native to southern Europe and parts of Asia. It is not related to anise, star anise, or fennel, which are the sources of similar-tasting flavouring compounds ( Omidbaigi, 2005).

Liquorice affects the body's endocrine system as it contains isoflavones (phytoestrogens). It might lower the amount of serum testosterone slightly, but whether it affects the amount of free testosterone is unclear. Consuming liquorice may prevent the development of hyperkalemia in persons on hemodialysis (Krausse et al., 2004). Large doses of glycyrrhizinic acid and glycyrrhetic acid in liquorice extract can lead to hypokalemia and serious increases in blood pressure, a syndrome known as apparent mineralocorticoid excess.

Allelopathy is a phenomenon observed in many plants that release chemicals into the near environment either from their aerial or underground parts in the form of root exudation, leaching by dews and rains, and volatilization or decaying plant tissue (Rice, 2000). The released chemical compounds into the environment act on other organisms, such as weeds, plants, animals and microorganisms, by inhibitory or excitatory ways. These chemicals accumulate and persist for a considerable time, thereby imparting significant interference on the growth and development of neighboring weeds and plants (Putnam and Duke, 2002).

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 (Molisch, 1937).

So the purpose of the present study was to elucidate the allelopathic potential of different concentration of leaf extract *Glycyrrhiza glabra* on Maize. Such information should be beneficial when planning for sowing Maize near or beneath of mesquite trees. Hence this study was conducted to investigate the allelopathic potential of mesquite leaf on seed germination and plant growth.

## MATERIALS AND METHODS

The leaves extract of *Glycyrrhiza glabra* plants was prepared by soaking the dry leaves in distilled water (1:10 weight to volume) for 24 hours at room temperature (25°C), and then filtered through Whatman filter paper No.1 (Oudhia and Tripathi, 2001). The extract was diluted to obtain the concentrations of 0, 25, 50, 75, 100% while the distilled water was used as the control treatment.

The experiment was conducted at Medicinal plant research center in Bahonar University of Kerman, Iran in 2012 year. Experiment was CRBD design with 3 replicate in Petri dishes and plastic pot.

Seeds of the Maize were obtained from the agricultural shop, in Kerman, Iran. Germination test were performed for the aqueous extract of donor plant. The Petri dishes were placed in growth chamber 25°C and 70% humidity and continuously dark. 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.

Three replicates of each treatment with 10 seeds to each replicate were planted in plastic pot. Emergence was measured by counting all individual seedlings from 10 day after planting. Whole pot were harvested with laborer by using hand. Finally plant height, Dry weight and chlorophyll were measured.

Experimental data were analyzed using SAS (statistical software, SAS institute, 2002) and treatment means were compared using Duncan's multiple range tests at 5% level of probability.

## RESULTS AND DISCUSSION

The results showed that the effect of the water extract of the dried leaves of *Glycyrrhiza glabra* was inversely proportional to the percentages of daily germination. The allelopathic effect of *Glycyrrhiza glabra* on the germination of wheat is shown in Figure 1. It is obvious that the aqueous leaf extract of *Glycyrrhiza glabra* inhibited the germination of Maize. The maximum seed germination percentage was shown in the control where no extract was used which was 100%. The minimum seed germination percentage was found in *Maize* at 100% Concentration of Water Extract treatment (30%). While the percentage seed germination decreased with increasing concentration of aqueous leaf extract of *Glycyrrhiza glabra*.

The highest root and shoot length was recorded in the control treatment and then decreased by increasing leaf extract concentration. The study of Figure 2 and 3 revealed that the *Glycyrrhiza glabra* decreased the maize seed root and shoot length as compared to control. The maximum and minimum root length was attained in control and 100% Concentration treatment, respectively (48 and 5/3 mm). The smallest Shoot length was in 100% Concentration treatment (25mm). The highest shoot length was obtained in control group in all time intervals (48/2 mm).

Plant height, Dry weight and chlorophyll decreased progressively with Water Extract of Liquorice (*Glycyrrhiza glabra*). The highest plant height (54/12 mm), Dry weight (12/34 g) and chlorophyll content (24/12 mg g<sup>-1</sup> FW) was attained from control treatment. Also lowest plant height (27/33 mm), Dry weight (5/27 g) and chlorophyll (17 mg g<sup>-1</sup> FW) was attained from 100% Concentration treatment. (Figure 4, 5 and 6).

### Discussion

The present findings corroborate the earlier report by (Bora *et al.*, 2007) 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, 2003) 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 (Fag and Stewart, 2005) Phenolic acids have been shown to be toxic to germination and plant growth processes (Einhelling, 2008). (Rajangam and Arumgam, 1999) found that, the use of z-aqueous extracts of *Excoecaria agallocha* leaves inhibited seed germination and plumule and radicle elongation of rice. (Sundaramoorthy *et al.*, 1995) concluded that the *P. juliflora* significantly inhibited theseed germination in pearl millet. *P. juliflora* reduced the germination percentage of gram and sorghum reported by (Chellamuthu *et al.*, 2009). 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 (Khan *et al.*, 2004). (Lisanetwork and Michelson, 1993) who discovered that the leaf extract of *E. camaldulensis*

decreased root growth of the majority of the crops in these studies. Similar findings were also reported by (Rafique Hoque et al., 2003; Siddiqui et al., 2009). in leaf extract of different agroforestry trees in common agricultural crops. They found inhibitory effect in seed germination and radical length and other initial parameters. The present study provides the evidence of *Glycyrrhiza glabra* has allelopathic potential. It is also suggested that maize should not be planted close to *Glycyrrhiza glabra* due to adverse effects on its growth.

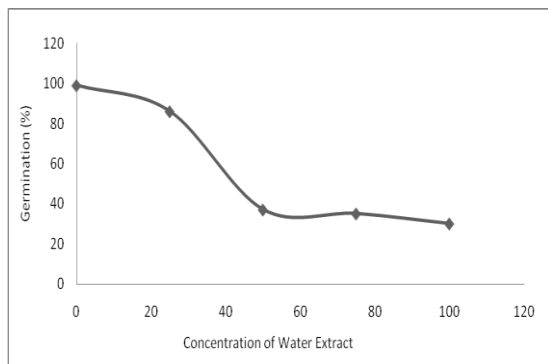


Figure 1. Effect of water extract of Liquorice on germination of maize

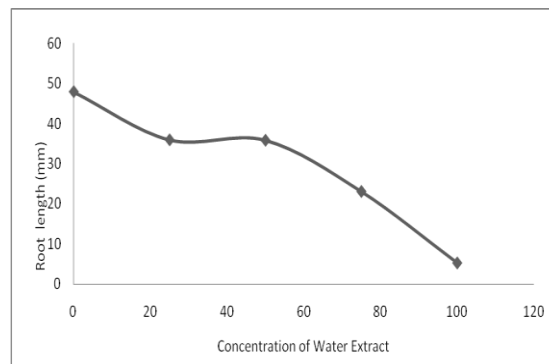


Figure 2. Effect of water extract of Liquorice on Root length of maize



Figure 3. Effect of water extract of Liquorice on Shoot length of maize

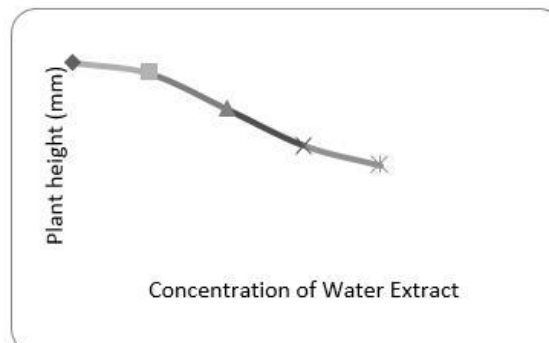


Figure 4. Effect of water extract of Liquorice on Plant height of maize

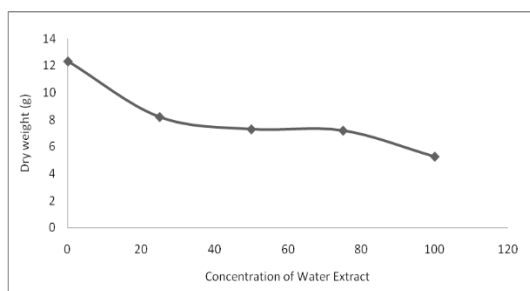


Figure 5. Effect of water extract of Liquorice on Dry weight of maize

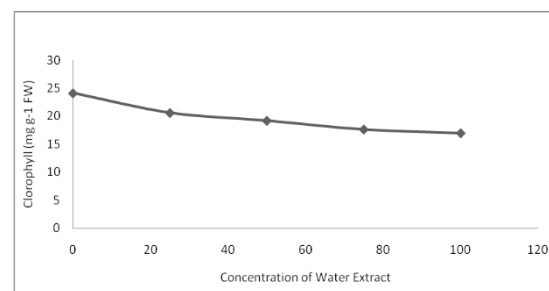


Figure 6. Effect of water extract of Liquorice on Chlorophyll of maize.

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