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Effects of Priming by Salicylic Acid on Resistance to Pigweed Allelophatic Compounds and Their Interaction on Germination and Seedling Growth of *Cuminum cyminum*

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ABSTRACT

Allopathic interaction is one of the main decrasing factors with a complex mechanism, which influences all growth and development aspects of plants. One of the most important effects of salisilic acid return to the activity of plant hormones. Nevertheless, there are not any information in case of effects of the interaction of these two cases in germination level, so the main goal of this research is evaluating the interaction between salisilic acid and allelopatic interference. Results showed that applying the priming by salicylic acidwere influenced seed activitied directly. Not only in normal conditions increased germination and seedling growth of *Cuminum cyminum* but also under the interference of allelopatic compounds the decreasing rate were reduced. This experiment was carried out in randomized complete block design based on a factorial experiment with three replications in order to evaluate effects of priming with different times of applying salicylic acidand its interaction with Allopathic compounds in germination and seedling growth stage. Treatment were factor A (priming with salicylic acidmµ10^{-3} and priming with distilled water) and factor B (6,12 and 18 hours) and factor C (concentration of 1 to 10, or 20% pigweed extract and control). Considering the results, root length, shoot, dry weight, germination percentage and germination rate coefficient had significant difference in the 1 percent level, except the seedling lenght extract allopathic × hormone interaction coefficient and rate of germination the interaction of hormones and the effect of extracts Allopathic × trilateral showed. These attibute had significant difference in the 5 percent level.
KEYWORDS: allelophatic compounds, *Cuminum cyminum*, pigweed, priming, salicylic acid.

INTRODUCTION

Successful establishment of seedlings, the most important step in determining the competitive ability of crops and fertility, depends on power of germination and seedling growth. In addition, seed germination under field conditions often are affected by allelopathic interference. germination stop can be attributed to change the enzyme activity of those compounds on transfer of reserves during germination stage (6).
Irregularities in the respiration rate led to restrictions on metabolic energy (ATP) and reduce the germination and growth of seedlings. Also, these compounds stoped mitoses(15). Allopathic compounds not only reduce germination but also delay seedlings emergence. Plants with larger size have a better competition under low soil moisture, inconsistent or limited food with neighbors(7). Allelochemicals reduced grain growth rate. growth of seedlings in the early stages will be controlled by these compounds(1).

Some non-biological and biological stresses reduced establishment of seedlings in field conditions. One effective strategy to overcome drought stress is priming (18). Priming is simple, inexpensive and safe method for environment (11) However, previous studies have shown that seed priming success is influenced by the complex interaction of many factors such as plant species, priming factors water potential, priming duration, temperature, seed vigore, seed dehydrasion and seed storage conditions (5) Priming is used to improve germination, reduce the duration of germination and establishment and improvement of yield (1).

Priming techniques is used for accelerate emergence of seedlings, creating a stronger and resistance against stress(18). Priming causes fast and uniform emergence under field conditions for achieving

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maximum yield and quality(17).seed priming causes physiological and biochemical changes before germination (12).

There are reports showing that priming led to early transcription of DNA, RNA and protein synthesis increasing and increases embryo growth, repair seeds damaged parts and reduces metabolie leakage (8).

Priming improves seeds germination rate and uniformity and seedlings emergence, and its beneficial effects is clear under unfavorable conditions (9).On priming influence, faster seedlings emergence can lead to stronger plant production. In addition, improved emergence of seedlings can help establish plant population under different environmental conditions. But under influence of priming, some improvement in coverage related to the emergence of green plants, early and successful establishment of seedlings (8).

Priming can be done by different method, for example hydropraiming, osmopraiming, polyethylene glycol, potassium salts and hormones(17).The researchers discovered that the corn seed priming by potassium nitrate increased germination (17). Çakmak(3) reported that improving plant by potassium nutrition had high importance for survival of crops in drought stress conditions Also hydropriming increased germination and seedling growth in drought and salinity. Priming improved speed and uniformity of seedling emergence, especially under stressful conditions (18).

Plant growth regulators are organic compounds that in small amounts change physiological process in plants and rarely act single and combined effect of two or more activities necessary to produce an effect (14). Generally, plant hormones divided to six hormones like as auxin, cytokinin, gibberellin, *Brassinosteroid*, and ethylene. There are several allelophatic combination that have similar structure to plant hormones, but apparent differences are with them. some allelophatic materials activity mechanisms is like to plant hormone synthesis, also(4).

Destruction of the hormonal balance is one of the inhibitory effect of phenolic compounds(2). Allelophatic compounds severely affect on hormone activity (10,15).

MATERIALS AND METHODS

This experiment was carried out in a factorial experiment based on randomized complete block design with three replications in order to evaluate effects of priming with different times of applying salicylic acidand its interaction with allopathic compounds on germination and seedling growth stage. Treatment were factor A (priming with salicylic acid10^{-3}mμ and priming with distilled water) and factor B (6, 12 and 18 hours) and factor C (concentration of 1:10, or 1:20 pigweed extract and control).

For extract preparation, weeds have been collected and then were dried in 80°C in oven and then the powdered by mill. For preparation a 1:5 concentration extract, 20 grams of powder in 100 cc of water was used. Germination percentage, shoot and radicle length and dry weight were measured. Data analysis was done by MSTATC and plotting graphs by EXCEL.

RESULTS AND DISCUSSION

Analysis of variance showed that all studied traits had significant difference, except seedling lenght in extract×salicylic acidinteraction and germination rate in extract×salicylic acid. priming treatment (with salicylic acidor water) has been increased seeds germination percentages in compared with control. increasing the priming duration increased germination percentage (Figure1). salicylic acidpriming had more effect than priming with water on germination percent. salicylic acidpriming has reduced the negative effects of allelophatic extracts than priming with water (Figure4). Priming greatly reduced the allelophatic compounds effects (Figure 5).

By increasing concentration the difference between the duration of priming increased and in fact, higher priming concentration treatment shows more impact. According to other researchers also, some biotic and abiotic stress reduces establishment of seedlings in the field. and the fact that crops seedlings better establish play an important role in yield under stressful condition, priming improved seedling establishment by increasing germination percentage (1,8).

Salicylic acid increased directly and indirectly physiological activities in seed (13,16). Priming with salicylic acid particularly expected with allelopathy interfering. because stop in germination with allelophatic compounds can be attributed to change in enzym activity on the transfer of storage compounds during germination procedure (5). Irregularities in the respiration rate led to restrictions on metabolic energy (ATP), germination and reduced seedlings growth. these compounds stop mitosis (7).

Applying priming increased germination rate. In this context, researchers have reported that amount of nuclear DNA during priming in sugar beet increased without cell division (9). primed seed had more power for germination than control. germination rate increased by salicylic acid treatment than water priming (Figure 2). Seedling length increased by salicylic acid treatment also (Figure 3). Increasing allelophatic extract concentration decresed seedling length (Figure 6).

In allelophatic high concentration extract there was significant differences between between 10 and 20 hours priming but in concentrations of 1:15 no significant difference between these two time observed. Priming increased seedling vigor by increasing germination rate. Therefore, these factors can improve germination stability and seedling emergence and priming effect may important in unfavorable condition (8).

Table 1: Anova of Effects of priming by salicylic acid on resistance to pigweed compounds and their interaction on *Cuminum cyminum*

S o V	df	Mean squre			
		germination percentage	**seedling length**	**germination rate index**	plantlet dry weight
Salcylic acid	1	755**	2.31**	581.132 ns	0.377 **
Priming time	2	4448**	41.5**	701 ns	0.598**
time*Salcylic	2	149.40**	1.32**	2079**	0.143**
extract	2	9559**	79.8**	802.45 ns	2.3**
extract*Salcylic	2	203**	0.49*	46975**	0.038*
extract*time	4	975**	3.1**	469.270 ns	0.036*
extract*Salcylic*time	4	43**	0.65**	926**	0.022*
error	34	1.3	0.123	577	0.002
Cv%		6.63	6.23	12.76	6.7

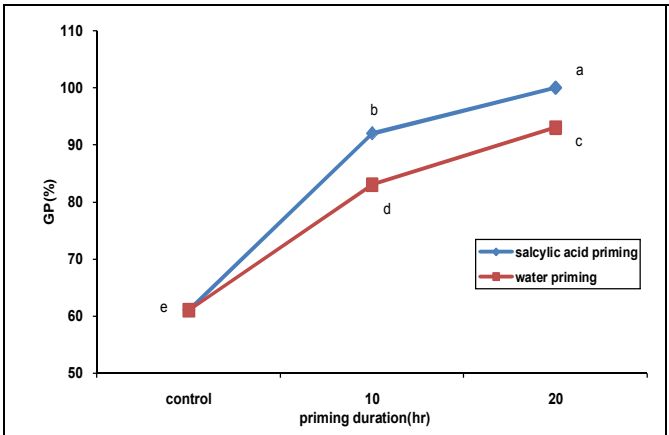


Fig 1:effect differnt priming time and salcylic acid on *Cuminum cyminum* germination percentage

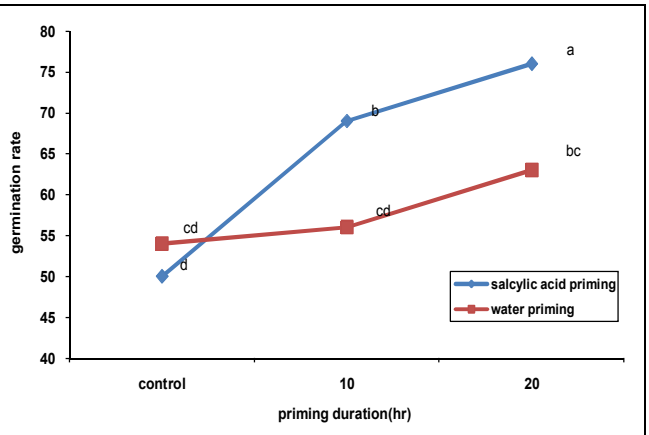
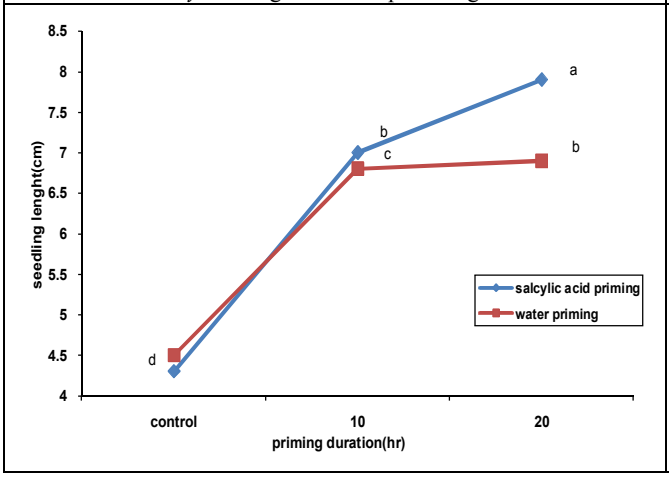


Fig 2:effect differnt priming time and salcylic acid on *Cuminum cyminum* germination rate



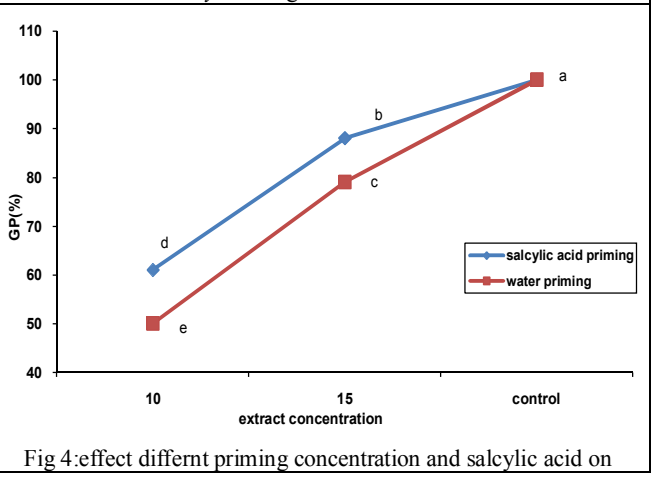


Fig 4:effect differnt priming concentration and salcylic acid on

Fig 3 :effect differnt priming time and salcylic acid on *Cuminum cyminum* seedling length

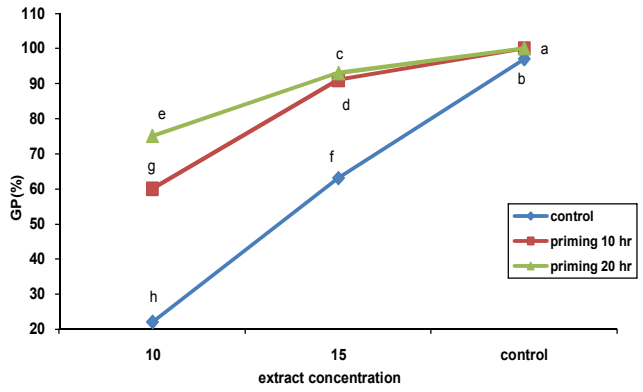


Fig 5 :effect differnt priming concentration and priming time on *Cuminum cyminum* germination percentage

Cuminum cyminum germination percentage

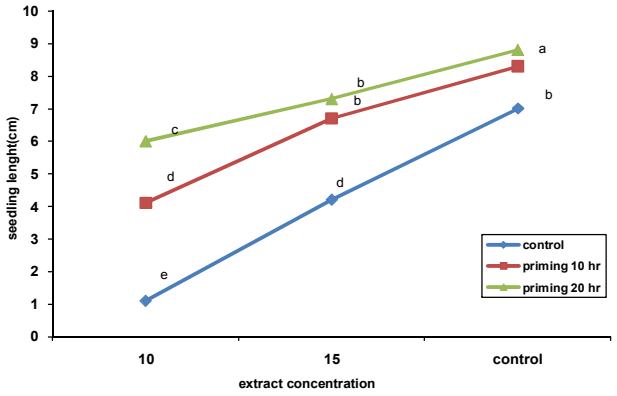


Fig 6:effect differnt priming concentration and priming time on *Cuminum cyminum* seedling length

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