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The Effect of different primings on germination and seedling growth of Ajowan(*Trachyspermum ammi)* medicinal plant

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ABSTRACT

This experiment was conducted in a controlled environment, to evaluate the effects of Pre-treatment salts different on the characteristics of seeds Ajowan (*Trachyspermum ammi)* implemented. Experiment was carried out as completely randomized design with 4 replications. Pre-treatment included: potassium nitrate (1%), potassium phosphate (1%), sodium chloride (1%) and distilled water which was the control experiment. Seeds were submerged for 72 hours with aeration in treatments and then seeds dried and number of 50 seeds were on filter paper 30 x 30 towel method. The results indicated that in the pre-treatment, most positive effect on the germination coefficient of Ajowan plant was potassium nitrate, in other words,the seeds in less time, had the highest percentage of germination. Means comparison showed that the highest and lowest positive effect on the average time required for germination in plant Ajowan were potassium nitrate (6.9 days) and sodium chloride (9.3 days). According to results, the pre-treatment for 72 h with potassium nitrate 1% Seeds Ajowan recommended.

Introduction

Ajowan (*Trachyspermum ammi)* is an annual plant and of belongs to the Apiaceae family. Since times immemorial , this plant has many medicinal properties such as anti-spasm, relieve stomach and liver diseases and ailments of the throat, cough and rheumatism. Effective ingredient and active Ajowan plant is thymol. Today, medicinal plants of economic importance which raw form or processed in traditional and industry modern are used and productivity. Seed priming is one of the physiological methods used to enhance the rate and the uniformity of germination (Heydecker and Gibbins 1978, Sivritepe and Dourado 1995). Mohseni et al (2010) showed that the most germination time in corn seeds was observed for treatments with 10% PEG and 2% KCL, and the least time is observed for treatment with 2% KNO3. Seed priming is the imbibition of seeds in water sufficient for pre-germinative metabolic activity to occur while preventing radical emergence (Basra et al. 2003). It was concluded that inhibition of germination due to water stress should be overcome by using primed lentil seeds (Saglam et al., 2010). Techniques priming includes osmopriming (soaking seeds in osmotic solutions such as polyethylene glycol), halopriming (soaking seeds in a solution of salt) hormopriming (soaking seeds in a solution of hormonal) and hydropriming (soaking seeds in water). Seed priming improves seed performance under environmental conditions (Tavili et al., 2010). it can reverse some of the aging-induced deteriorative events (Chiu et al., 2002). NaCl priming increased germination percentage compared with non-primed seeds Also, best germination percentage was obtained by applying NaCl at 4 g L^{-1} for 12 h (Benfredj et al. 2013). In addition to seed priming by GA decreased the uptake of sodium, because GA application exceeded the growth and development of the meristimatic tissue (Naeem and Muhammad, 2006). The compression force of the embryo and hydrolytic activities on the endosperm cell walls may deform the tissues that have lost their flexibility upon dehydration (Lin et al.1993), producing free space and facilitating root protrusion after rehydration.

Material and methods

Laboratory tests were conducted in Seed Technology Laboratory of Tabriz University. experimental treatments consisted of three pre-treatment (priming) germination, which included potassium nitrate (1%), potassium phosphate (1%), sodium chloride (1%) and distilled water was considered as control. Seeds were submerged in treatment for 72 hours with aeration then seeds dried and the number of 50 seeds was on filter paper 30 x 30 towel method. Daily counting germinated seeds, mean germination time (MGT) and germination coefficient (GC) was calculated according to the formula following. Whatever the numerical value MGT is smaller indicating fast germination.

$$MGT=\frac{\sum dn}{\sum N}$$

$$GC=(\frac{1}{MGT})\times 100$$

n = number of seeds germinated during d day

d = number of days from the beginning of germination

ΣN = total number of germinated seeds

Statistical analysis

The expriment was arranged in randomized complete block (RCBD) design with four replication. Statistical was made using analysis of variance (ANOVA) in the spss software and means were compared using Duncan multiple range test at 5% level.

Results and discussion

Shoot length and root length

Analysis of variance showed that the effect of priming on shoot length and root length Ajowan was significant ($P\leq 0.05$) (Table1). The mean comparisons showed that shoot length between potassium phosphate with distilled water (control) and sodium chloride was significant difference but between potassium nitrate with potassium phosphate there was no

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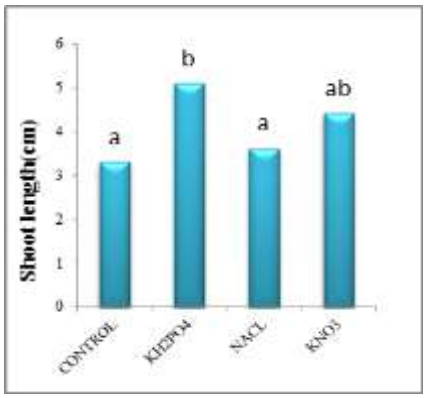
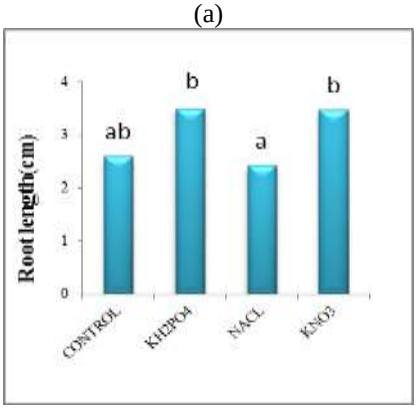
significant difference, also in attribute root length between potassium phosphate with sodium chloride was observed significant difference, but indicated not significantly different between potassium phosphate, potassium nitrate and control (Table 2).



(a)



(b)

Fig. 1: The effect of priming treatments on Shoot length (a) Root length (b) of Ajowan (Duncan range test).

Fresh weight and dry weight of shoot and root

Analysis of variance showed that the effect of priming on root fresh weight has significant difference ($P \leq 0.05$) but shoot fresh weight was not significantly different (Table 1). Mean comparisons showed not significant difference between pre-treatment in shoot fresh weight but in root fresh weight indicated significant difference between potassium phosphate and others pre-treatment (Table 2). A significant positive correlation was observed between root and shoot fresh weight in 1% level respectively (r=0.641**).

Mean germination time (MGT) and germination coefficient (GC)

Analysis of variance showed the effect of priming on mean germination time and germination coefficient was significant in 1% level ($P \leq 0.01$) (Table 1). Mean comparisons indicated that no significant difference between pre-treatment potassium phosphate and potassium nitrate While the pre-treatment potassium nitrate has minimum time for germination (Table 2). Argerich and Bradford (1986) found that the occurrence of space inside primed tomato seeds may accelerate the rate of germination by facilitating water uptake.

Conclusion

These treatments can affective in producing seedlings and giving them a higher competitive ability. According reducing chances of their mortality rate throughout year. This study showed that for improvement germination and enhance seedling establishment of Ajowan pre-treatment salt potassium nitrate (1%) for 72 h is benefit for increment productivity in sustainable agriculture.

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Table 1: Analysis of variance for seed priming effects on Ajowan seed germination

Source of variation	Degree of freedom	Shoot length (cm)	root length (cm)	shoot fresh (mg) weight	Root fresh (mg) weight	mean germination time	Germination coefficient
Treatment	3	2.617*	1.288*	4.899^{ns}	0.706*	3.964**	9.156**
Error	12	0.569	0.351	2.843	0.199	0.526	1.177

**significant at $p \leq 0.01$, * significant at $p \leq 0.05$, ns not significant

Table 2: Mean comparisons for seed priming effects on Ajowan seed germination

priming	Shoot length (cm)	Root length (cm)	Number of normal seedling	Number of abnormal seedling	mean germination time	Germination coefficient
control	3.30^{a}	2.60^{ab}	27.00^{b}	3.25^{a}	8.14^{b}	12.36^{ab}
Potassium phosphat	5.10^{b}	3.50^{b}	26.35^{ab}	2.75^{a}	7.60^{ab}	13.25^{bc}
sodium chloride	3.62^{a}	2.42^{a}	17.75^{a}	3.75^{a}	9.30^{c}	10.82^{a}
potassium nitrate	4.42^{ab}	3.47^{b}	23.75^{ab}	2.25^{a}	6.95^{a}	14.41^{c}

. Means sharing the same letters do not differ significantly according to Duncan's multiple range tests at $P \leq 0.05$

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