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Influence of different priming materials on germination vegetative characteristics and seedling establishment of cannabis *(Cannabis sativa)* 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 cannabis (*Cannabis sativa)* 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 then seeds dried and number of 50 seeds was on filter paper 30 x 30 towel method. The results indicated in the pre-treatments, most positive effect on the germination coefficient of cannabis plant was potassium phosphate, in other words, the seeds in less time, had the highest percentage of germination. Potassium phosphate and sodium chloride treatments in cannabis have a positive effect on root length and shoot length. The coefficient correlation plant cannabis showed that the number of normal seedling with root length (r=0/683**) and shoot length (r=0/643**) was significant positive correlation, and significant negative correlation with the number of abnormal seedlings, and not significant correlation have with other traits. According to results, the pre-treatment for 72 h with potassium phosphate 1% Seeds Cannabis recommended.

Introduction

Cannabis (*Cannabis sativa)* is a dioecious plant and belongs to the Canabinaceae family. *Cannabis* plants produce a unique family of terpeno-phenolic compounds called cannabinoids. The two cannabinoids usually produced in greatest abundance are cannabidiol (CBD) and or Δ^9-tetrahydrocannabinol (THC), but only THC is psychoactive. Today, medicinal plants have economic importance which are used raw form or processed in traditional and industry modern. 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. It was concluded that inhibition of germination due to water stress should be overcome by using primed lentil seeds (Saglam et al., 2010). During priming, the embryo expands and compresses the endosperm (Liptay and Zariffa 1993). Argerich and Bradford (1986) found that the occurrence of space inside primed tomato seeds may accelerate the rate of germination by facilitating water uptake. 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). Seed priming improves seed performance under environmental conditions (Tavili et al., 2010) and can reverse some of the aging-induced deteriorative events (Chiu et al., 2002). 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). 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 eeds in water). Singh et al (1999) reported that osmotic priming of muskmelon with PEG result in higher amylase and dehydrogenase activity and germination rate in saline condition increased. Bradford (1986) has shown that the degree of seed hydration is correlated with the osmotic potential of the priming solution. 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). 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).

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%) were and distilled water was considered as control. Seeds submerged in treatment for 72 hours with aeration, then seeds dried and the number of 50 seeds were 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 germination. numerical value MGT is smaller indicating fast

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

n = number of seeds germinated during d day

d = number of days from the beginning of germination

ΣN = total number of germinated seeds

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

Source of variation	Degree of freedom	Shoot length (cm)	root length (cm)	shoot fresh (mg) weight	Root fresh weight (mg)	shoot dry weight (mg)	Root dry weight (mg)	mean germination time	Germination coefficient
Treatment	3	1.531**	14.486**	405.968**	38.635**	0.128^{ns}	1.767**	0.227 ^{ns}	199.508 ^{ns}
Error	12	0.132	0.274	66.388	1.537	0.595	0.131	0.071	62.438

**significant at p≤0.01,* significant at p≤0.05, ns non significant

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

priming	Shoot length (cm)	Root length (cm)	shoot fresh weight (mg)	Root fresh weight (mg)	shoot dry weight (mg)	Root dry weight (mg)	Number of normal seedling	Number of abnormal seedling
control	7.22^{a}	7.73^{a}	57.54^{a}	7.86^{a}	5.17^{a}	1.80^{a}	36.00^{a}	6.00^{b}
potassium phosphat	8.24^{b}	11.66^{b}	74.09^{b}	15.11^{c}	5.50^{a}	2.92^{b}	46.00^{b}	1.75^{b}
sodium chloride	8.01^{b}	10.90^{b}	81.12^{b}	13.36^{c}	5.55^{a}	1.52^{a}	41.00^{ab}	4.50^{ab}
potassium nitrate	6.95^{a}	8.39^{a}	68.82^{a}	11.43^{b}	5.29^{a}	1.53^{a}	36.75^{a}	7.50^{b}

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

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

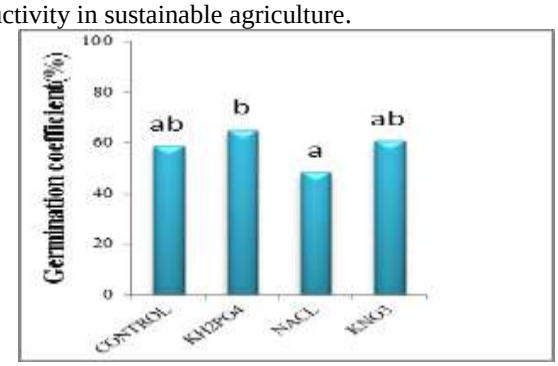
Analysis of variance showed that the effect of priming on shoot length and root length cannabis (P≤0.01) was significant (Table 1). Mean comparisons root length and shoot length in Cannabis showed that between potassium phosphate with control and potassium nitrate was significantly there was not significant difference between potassium phosphate with sodium chloride (Table 2).

Fresh weight and dry weight of shoot and root Analysis of variance showed that the effect of priming on root and shoot fresh weight and root dry weight were significant (P≤0.01) but indicated not significant difference in shoot dry weight (Table 1). Mean comparisons dry weight and fresh weight of shoot and root showed that between pretreatment potassium phosphate with sodium chloride was observed not significant differences but indicated statistically significant difference between pre-treatment potassium phosphate and sodium chloride with potassium nitrate and control (Table 2). mean germination time (MGT) and germination coefficient (GC)

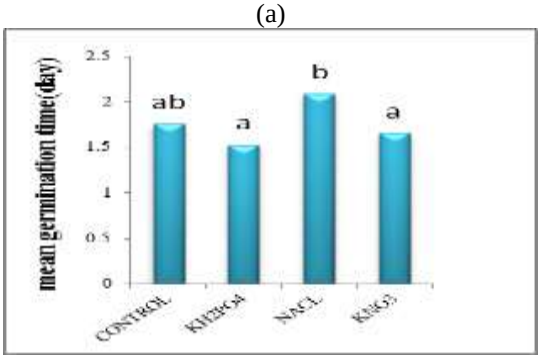
Analysis of variance showed that the effect of priming on mean germination time and germination coefficient was not significant (Table1). Mean comparisons showed that between pre-treatment potassium phosphate, potassium nitrate and control was not significant difference but potassium phosphate has minimum time necessary for germination while sodium chloride has maximum time necessary for germination (fig 1). 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.

Conclusion

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



(a)



(b)

Fig. 1: The effect of priming treatments on Germination coefficient (a) mean germination time (b) of cannabis (Duncan range test).

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