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Effect of Priming of (KNO_3, $ZnSo_4$, Distilled water) on rate Germination and Seedling Establishment on Cannabis seed (*Cannabis sativa* L.)

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ABSTRACT: In order to investigate the effect of priming on cannabis seed performance a study was carried out at the Seed Research Laboratory of Azad University, Mahabad, Iran. The experiment was factorial with three factors arranged in a completely randomized design with three replications. The factor was seed priming (KNO_3, $ZnSo_4$ and distilled water), and seed cannabis. Results indicated that for both cultivars germination percentage (GP), mean germination rate (MGR), radicle length (RL), plumule length (PL) and seedling dry weight (SDW) were non-significant. Although, the cultivars showed different responses, Results showed that pre treatment with distilled water to increase the percentage of seed germination, root length, seedling dry weight and plumule length.

Keywords: Establishment seedling, KNO_3, Rate germination, Seed vigour index, $ZnSo_4$

INTRODUCTION

Cannabis sativa is belonging to the family Cannabinaceae and known by various names worldwide. It is called Marijuana in America. Bhang , Ganja and Charas in India, Kif in North Africa and Brazil, Sodom, Tampl, Gum, Guage, Stuff, Kinshashs, Swala and Whiskt in Ghana, Grifa, in Mexico. Seed priming is a pre-sowing strategy for influencing seedling development by modulating pre-germination metabolic activity prior to emergence of the radicle and generally enhances germination rate and plant performance. Seed priming is soaking of seeds in a solution of any priming agent followed by drying of seeds that initiates germination related processes without radical emergence (McDonald, 2000). There are reports that seed priming permits early DNA replication, increase RNA and protein synthesis, enhances embryo growth, repairs deteriorated seed parts and reduces leakage of metabolites. Seed priming is seen as a viable technology to enhance rapid and uniform emergence, high vigor and better yields in some field crops (Basra *et al.,* 2002; Chiu *et al.,* 2002; Harris *et al.,* 1999; Murungu *et al.,* 2004). Common priming techniques include osmopriming (soaking seeds in osmotic solutions such as polyethylene glycol), halo priming (soaking seeds in salt solutions) and hydropriming (soaking seeds in water). Previous studies on pepper (Amjad *et al.,* 2007), sugarcane (Patade *et al.,* 2009) and melon showed that halo priming improves seed germination, seedling emergence and growth under saline and drought conditions. Singh and Rao (1993) stress that potassium nitrate effectively improved germination, seedling growth and seedling vigor index of the seeds of sunflower varieties with low germination. Olouch and Welbaum (1996) suggested that priming can be a valuable process for improving germination and uniformity of heterogeneously matured seed lots. (Rao *et al.,* 1987) also reported that primed Brassica seeds may reduce the risk of poor stand establishment under unfavorable condition. Guzman and Olave (2006) reported that seed priming with nitrate solutions resulted in an improved germination rate, radicle growth and germination index. Seed priming with many organic and inorganic salts has been used for invigoration the performance of normal seeds of different crops, but very little work has been done to improve the performance of rape seeds. Thus, this research was carried out to evaluate the effects of different priming techniques on seed germination and seedling establishment of cannabis seed.

MATERIALS AND METHODS

Seed of Cannabis (*Cannabis sativa* L.) were obtained from Pakan Bazar in Esfahan. Experiments were conducted in the Mahabad Islamic Azad University. Moisture content of seed lot was determined as 10.9% by grinding the seeds and then drying at 130±2 for 4 h (ISTA, 2003).

A. Seed Priming

The sub-samples were primed by soaking the seeds in distilled water and solutions of KNO_3 (10.1mM) and $ZnSo_4$ (5.74 mM) for 18 hours. All priming treatments were performed in an incubator adjusted on 20±1 under dark conditions. After priming, samples of seeds were removed and rinsed three times in distilled water and then dried to the original moisture level.

B. Germination and Seedling

Three replicates of 25 seeds were germinated between double layered rolled germination papers. The rolled papers with seeds were put into plastic bags to avoid moisture loss. Seeds were allowed to germinate at 15±1 in the dark for 21days. Germination was considered to have occurred when the radicles were 2 mm long. Germinated seeds were recorded every 24 h for 21 days. Seed vigor index (SVI) was estimated SVI = SDW/MGT (ISTA, 2003), where MGT is mean germination time and SDW is seedling dry weight and germination rate (GR) was estimated

$$\mathbf{GR} = \frac{\mathbf{n}}{\sum \mathbf{Dn}}$$

At the end of germination test (21 days), seedling weight and then dried in an oven at 80 for 48 h. then dried seedling were weighed to the nearest g and the mean seedling dry weights, root length and plumule weights and consequently mean seedling dry weight were determined.

EXPERIMENTAL DESIGN

Laboratory tests were carried out at the seed Technology laboratory of Mahabad Branch of Islamic Azad University, Iran, using Completely Randomized Design (CRD) design with three replicates in 2015. Analysis of Variance (ANOVA) of the laboratory data and combined and using SPSS software. Means were compared by applying LSD at 5% probability.

RESULT AND DISCUSSION

The analysis of variance of the laboratory data showed significant effects of KNO_3 of rape seed, rate germination, Eestablishment seedling and seedling fresh weight (Table 1). Hydro-priming improved seed quality and seedling vigour of rape seed in the laboratory (Table 1). Positive effects of hydro-priming on seed and seedling performance were also reported in wheat (Basra *et al.*, 2003), barley (Abdulrahmani *et al.*, 2007), lentil (Ghassemi- Golezani *et al.*, 2008.

Table 1: Analysis of variation in determined characteristics.

S.V	df	Mean of squares						
		Germination percentage	Germination rate	Root length	Length plumule	Weight seedling	Seed vigor index	Dry weight
Control 1infront others	1	41.370**	5846**	5.479*	5.493*	11**	82020**	14790**
Control 2 Infront others	1	1.366$^{n.s}$	2096**	4.404*	1.068$^{n.s}$	267**	42250**	11340**
Control 3 Infront others	1	21.335**	28912**	21.20**	8.921**	31.245**	28620**	26870**
Density (D)	2	13.780**	2 n.s	1.017 n.s	2.89 n.s	9.045**	1 n.s	1 n.s
Cultivar (C)	2	46.196**	1$^{n.s}$	29.92**	16.956**	55.181**	1 n.s	40**
D× C	4	8.466**	10**	1.300$^{n.s}$	1.52$^{n.s}$	7.090**	1 n.s	1 n.s
Error	24	17.33	0.0001	33.105	129.973	0.022	0.0001	0.0001
CV(%)		0.054	0.118	0.385	0.437	0.390	4.545	0.375

n.s, *and ** indicate non-significant , significant at 5% levels of probability, S.V. = Source of variation; df = Degree of freedom

A. Germination Percantage

The analysis of variance of data showed that the germination percentage of the concentration of non-significant,and control 1 and control 3 in fronts others significant and control 2 non-significant (Table 1). Pre-treatment with distilled water was highest germination percentage (Fig. 1). Germination percentage decreased with KNO_3 and $ZnSO_4$.

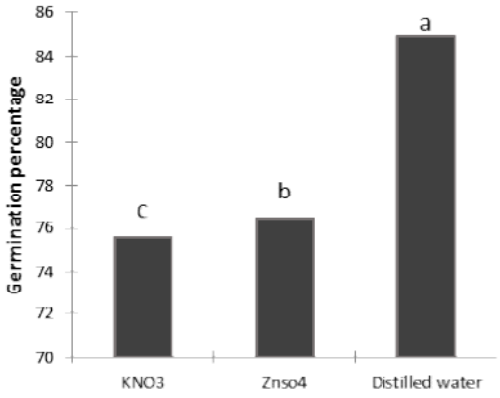

Fig. 1. Effect different pre-treatment on germination percentage.

B. Germination Rate

Germination rate of all treatments and cultivars showed non-significant differences (Table 1). The pre-treatment seeds with KNO_3 increase germination rate (Fig. 2).

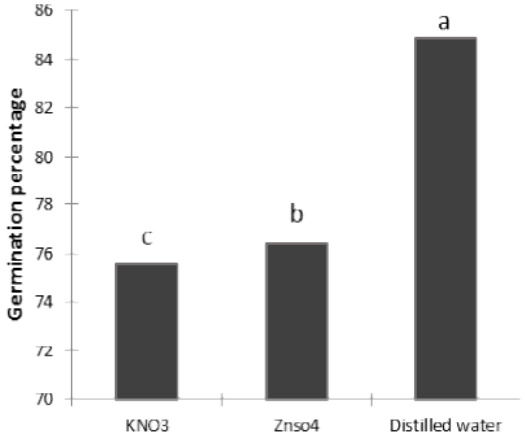

Fig. 2. Effect of different pretreatment on germination rate.

C. Root Length and Length Pulumle

The analysis of variance of the laboratory data showed that treatments the root length and plumule were not significantly (Table 1) and pre treatment with distilled water were best root length and length pulumle (Fig. 3, 4).

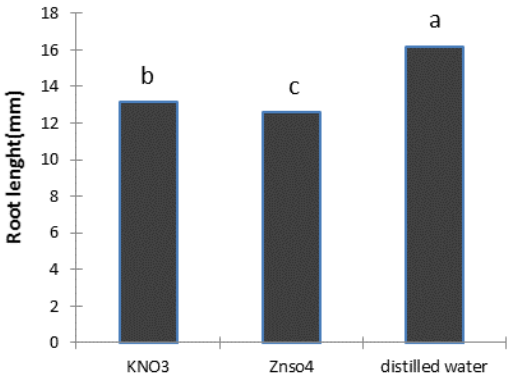

Fig. 3. Effect of different pre treatment on root length pulumle.

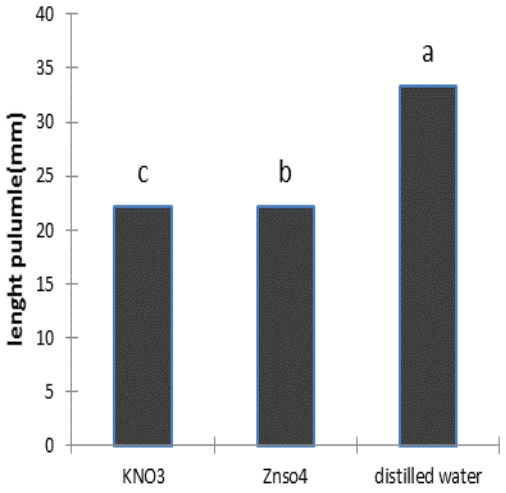

Fig. 4. Effect of different pre treatment on length pulumle.

D. Seedling Weight

All treatments of rape seeds had effect significant on seedling weight (Table 1) and seedling weight seeds pretreatment with KNO_3 increased (Fig. 5). The study Demir *et al.*, (2006) conducted on sun flower reported treated seeds with KNO_3 compared with control seeds, significant and highest seedling weight.

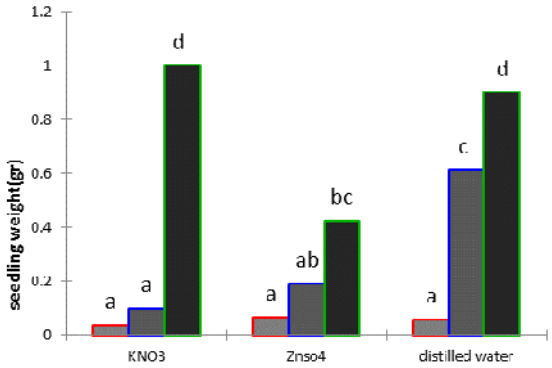

Fig. 5. Effect the interaction between seed cannabis and pretreated on the seedling weight.

E. Seedling Dry Weight

These result clearly showed that Seedling dry weight of all treatments non-significant effects (Table 1) pretreated with distilled water showed highest seedling dry weight (Fig. 6).

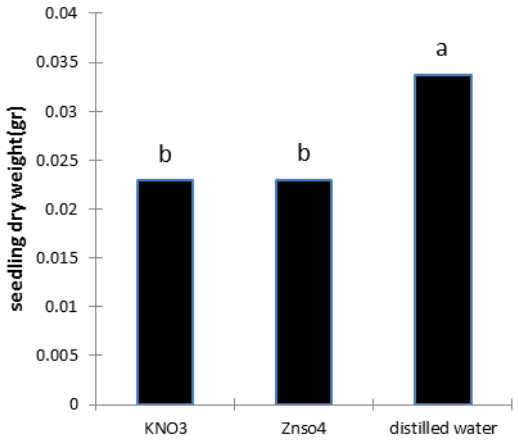

Fig. 6. Effect of different pre treatment on seedling.

F. Seed Vigour Index

Seed vigor index in all treatments showed non-significant (Table 1) comparison showed that Cannabis seed with treated KNO_3 highest seed vigor index interaction control non primid (Fig. 7).

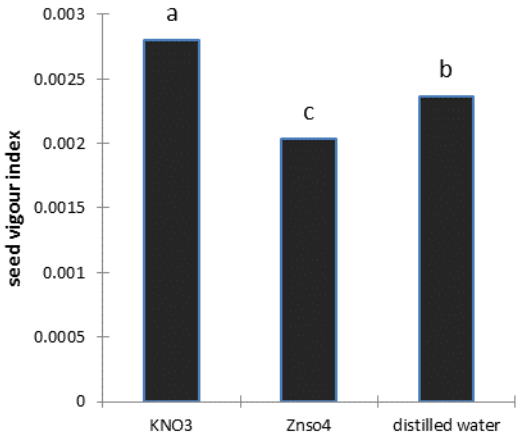

Fig. 7. Effect of different pretreated on seed vigour index.

CONCLUSIONS

Seed priming as a mechanism to increase seedling establishment, especially in adverse condition is presented, were pretreated with water in normal conditions could be more favorable despite the rapidly increases use of these acids had no significant effect was not on the germination of some traits such as germination, root length, seedling dry weight and long plumule.

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