



## ORIGINAL ARTICLES

### The effect of hydropriming on seedling growth in dill (*Anethum graveolens* L.) at laboratory conditions

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#### ABSTRACT

Dill seed is used as a spice, with a flavor somewhat similar to caraway but also resembling that of fresh or dried dill weed. Dill seeds were traditionally used to soothe the stomach after meals. In order to the effect of hydropriming on seedling growth in dill (*Anethum graveolens* L.) at laboratory conditions, this experiment was conducted in 2011 by a completely randomized design with four replications. The factor was including hydropriming (0, 9, 18 and 27 hours). The results showed that the effect of hydropriming was significant on germination percentage, seedling vigour, seedling length and seedling dry weight in dill. Mean comparison showed that the highest germination percentage, seedling vigour and seedling dry weight were achieved under hydropriming after 27 h and seedling length was achieved under hydropriming after 18 h. The results showed that the seedling vigour decreased by increasing in hydropriming in dill under hydropriming after 27 h.

**Key words:** Hydropriming, seedling growth, dill (*Anethum graveolens* L.).

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#### Introduction

A simple technique of hydro-priming (involving 15 h of soaking the seeds in water followed by drying in room temperature for three days) was effectively utilised to break seed dormancy. Initially seeds of sunflower genotypes obtained from different growing regions were primed for 15 h and then stored for further germination tests. Then both the primed and the control seeds were put in germination in three different dates upto 65 days after priming. It was observed that there was large variability in germination among the cultivars and between localities. In all the tests, germination percentage was higher than that in the control indicating that the primed seeds did not lose viability even after 65 days after priming. This technique may be easily utilised by the farmers and seed producers in the commercial production of sunflower (Maiti *et al.*, 2006a). Poor emergence and poor seedling vigour is a great problem in cotton indicating that there is the necessity to develop technique to improve cotton seedling vigour. Hydropriming (soaking the seeds in water followed by drying in room temperature) is found effective in improving seedling vigour. It is observed that at 20 h priming period (followed by drying for three days) has improved greatly the seedling vigour in all the cotton hybrids, although there was genetic variability. Among the hybrids, CHECK-1 (77%), VCH-103 (65%), VCH-105 (60%), CHECK-4 (60%), VCH-104 (58%) and VCH-106 (58%) have shown high seed vigour with respect to the number of seedling, 2-3 times greater than that in the control and also higher seedling fresh and dry weight (Maiti *et al.*, 2006b). The effects of onion seed osmo- and hydropriming combined with the use of fungicides or a biological preparation Promot, containing spores of *Trichoderma koningii* and *T. harzianum*, on seed germination and the incidence of seed-borne fungi were studied. Both methods of priming improved germination rate. Osmopriming resulted in a considerable increase in seed infestation, mainly with *Penicillium* spp. The influence of hydropriming on seed health was differentiated. Fungicides alone and in combination with osmo- and hydropriming controlled occurring fungi to a larger extent than Promot (Dorna *et al.*, 2005). The Chickpea (*Cicer arietinum* L.) is a particularly important crop in semi-arid and arid regions of world and is highly sensitive to salinity stress. Recently, priming of seed has been reported to be a simple technique for enhancing seedling establishment and crop production under stressed conditions. In this study, the changes in percentage and speed of germination and growth parameters in osmo (mannitol 4%) and hydro (water) primed chickpea seedlings under salt treatment (0, 25, 50 and 75 mM) were investigated. Results showed that compared to controls, salinity caused the reduction of speed and percentage germination of seeds, length, fresh and dry weights of shoots and roots of plants. In general, a salt dose- dependent decrease was observed in nodule number seedlings. Data on the effect of water and mannitol (4%) priming of chickpea seeds (12h at 25°C) showed higher number of nodules in osmopriming seed compared to hydro priming and control seeds. Seedlings obtained from primed seeds with mannitol (osmopriming) and water (hydropriming) showed more growth with

respect to fresh and dry weights root and shoot in comparison with seedling obtained from non-primed seeds under salinity stress conditions (Khodabakhsh *et al.*, 2011). An experiment was conducted to study the germination, emergence and seedling establishment of wheat (*Triticum aestivum* L.) cv. Auqab-2000. Wheat seeds were subjected to hydropriming for 24h or hardening for 12h (one cycle) or matricconditioning with pressmud for 24h or halopriming with 100 mol m<sup>-3</sup> CaCl<sub>2</sub>, 50 mol m<sup>-3</sup> NaCl, 25 mol m<sup>-3</sup> Ca(NO<sub>3</sub>)<sub>2</sub> for 24h. Both primed and unprimed seeds were subjected to germination, emergence and electrical conductivity test. In germination test hydropriming, hardening and matricconditioning were found better as expressed by all the invigoration parameters. But no significant effect of Ca(NO<sub>3</sub>)<sub>2</sub> and NaCl treatments was noted in final germination percentage, T50 and mean germination time. In case of seedling evaluation in emergence test, hydropriming and hardening treatment were the most effective treatments as expressed by final emergence percentage, root and shoot dry weight, root and shoot length and root / shoot ratio. While seed priming with NaCl resulted in minimum final emergence percentage, seedling dry weight and minimum fresh weight of seedling, root and shoot length, root / shoot ratio and shoot fresh weight except control. All the treatments showed maximum seed invigoration than the control. Higher electrical conductivity of seeds treated with CaCl<sub>2</sub> non-primed seeds and Ca(NO<sub>3</sub>)<sub>2</sub> were recorded as compared to seeds treated with NaCl, matricconditioning, hydropriming, and hardening treatments. These results support the hypothesis that wheat seed vigor can be enhanced when treated with distilled water for 24 h or hardening for 12h (one cycle) (Basra *et al.*, 2005). Therefore, the objective of this study was to evaluate the effect of hydropriming on seedling growth in dill (*Anethum graveolens* L.) at laboratory conditions.

### Materials and Methods

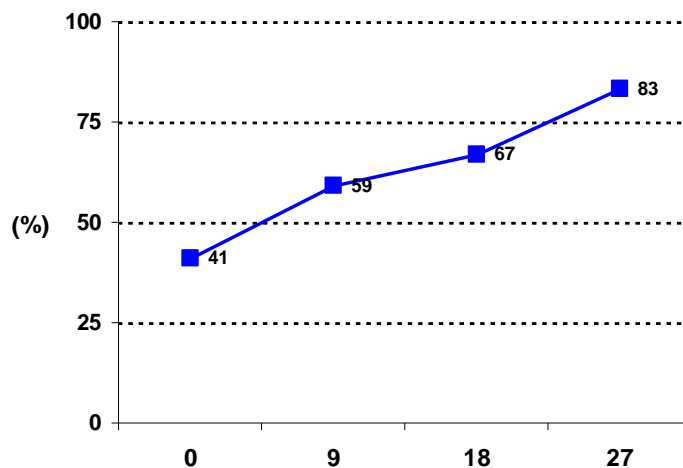
In order to the effect of hydropriming on seedling growth in dill (*Anethum graveolens* L.) at laboratory conditions, this experiment was conducted in 2011 by a completely randomized design with four replications. The factor was including hydropriming (0, 9, 18 and 27 hours) and then in the laboratory at each Petri dish 100 seeds were placed between two layers of paper culture and Petri dishes were placed in Germinator for 7 days at 18 to 20°C. After 7 days, 10 seedlings were selected and was determined seedling length and then placed on electrical Owen for 48h at 75°C and determined seedling weight by electrical scale. Finally, germination percentage determined for dill by following formula:

$$(\text{Number of Seeds Germinated} / \text{Total Number of Seeds on Petri Dish}) * 100$$

Data were subjected to analysis of variance (ANOVA) using Statistical Analysis System [SAS, 1988] and followed by Duncan's multiple range tests. Terms were considered significant at  $P < 0.05$ .

### Results and Discussion

The results showed that the effect of hydropriming was significant on germination percentage, seedling vigour, seedling length and seedling dry weight in dill. Mean comparison showed that the highest germination percentage, seedling vigour and seedling dry weight were achieved under hydropriming after 27 h and seedling length was achieved under hydropriming after 18 h.



**Fig. 1:** Germination percentage in dill under hydropriming.

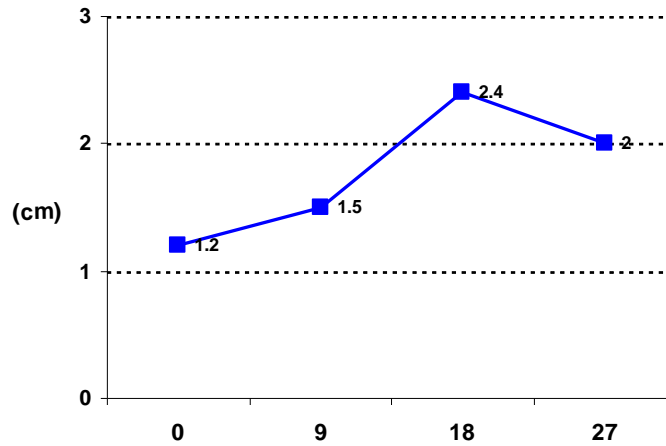


Fig. 2: Seedling length in dill under hydropriming.

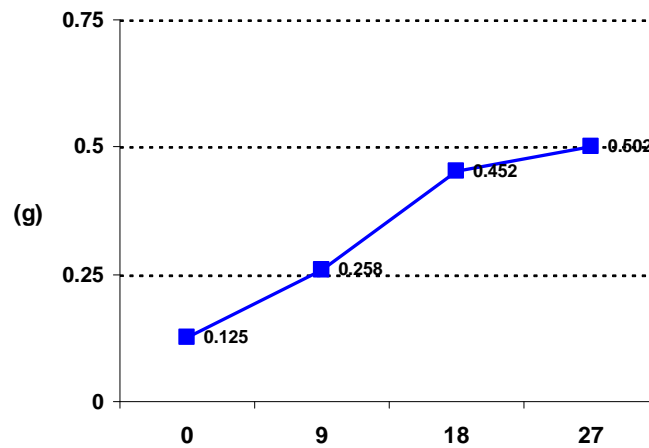


Fig. 3: Seedling weight in dill under hydropriming.

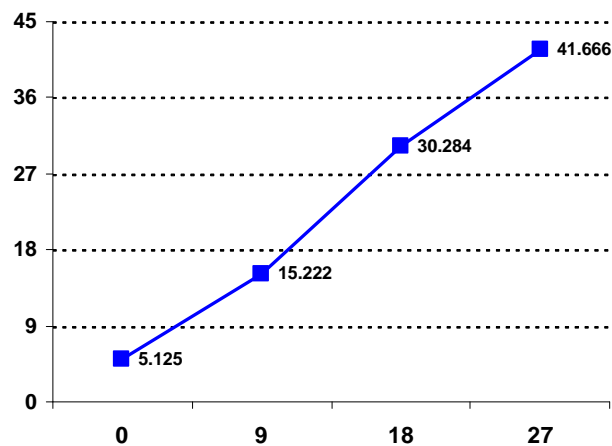


Fig. 4: Seedling vigour in dill under hydropriming.

The results showed that the seedling vigour decreased by increasing in hydropriming in dill under hydropriming after 27 h. Sainfoin is a legume crop that use for dry forage and grazing in irrigation and dryland conditions. Morphological structure and inhibitor substrates of pod and variety of seed (pod) size are effective on sainfoin germination. Farmers use high seed (pod) rate in sowing time in some regions of Iran. In order to

determine hydro and osmopriming effects on seed germination of sainfoin in two seed (pod) size categories, priming agents (PEG 6000, KNO<sub>3</sub> and CaCl<sub>2</sub>) were examined in different osmotic potentials -0.45 to 0 Mpa ranges for 12 to 24 hours. Results showed that the most germination of treated pods was obtained in the hydroprimed seeds (0 Mpa = hydropriming), but germination trend in the osmoprimed treatments reduced in -0.15 Mpa toward -0.45 Mpa. Otherwise, the least germination among different osmopriming agents obtained in -0.45 Mpa. Maximum and minimum germination in priming agents belonged to PEG6000 and KNO<sub>3</sub> respectively. Germination in primed pods at 24 h were more than other priming periods. Seed germination in the large seed was higher in compared with small size, but performance of priming were greater in small seed. Increasing of vigor and reducing of pod effects caused germination improvement for some of primed treatments particularly in hydroprimed for 24 h. Therefore hydropriming for 24 h can be employ to improve germination sainfoin in compare to other treatments (Noorbakhshian *et al.*, 2011). Three cucumber seed lots: 'Bingo I', 'Bingo II' and 'HB128' were subjected to hydropriming and electric field treatments. The optimum conditions of these two treatments were seed lot dependent. Seed germination and the membrane permeability (electrical conductivity of seed leachates) were tested after the treatments. Hydropriming increased the germination speed of all three seed lots, as well as the germination percentage of 'HB128'. Electric field treatment enhanced the germination percentage in, both 'Bingo II' (the low germination seed lot) and 'HB128', but had no effect on 'Bingo I' (the high germination seed lot). The electrical conductivity of 'Bingo I' and 'Bingo II' was significantly reduced by both hydropriming and electric field treatments. However, a slight increase in the electrical conductivity of 'HB128' was also observed (Huang *et al.*, 2006). Oilseeds are more susceptible to deterioration due to membrane disruption, high free fatty acid level in seeds and free radical production. These factors are tended to less vigorous seed. Priming treatments have been used to accelerate the germination and seedling growth in most of the crops under normal and stress conditions. For susceptible and low vigor soybean seed, this technique would be a promising method. At first, in separate experiment, effects of hydropriming for (12, 24, 36 and 48 h) with control (none prime) were evaluated on germination traits of soybean seed lots cv. 'Sari' (include 2 drying method and 3 harvest moisture). Then, next experiment was conducted to determination the best combination of osmopriming in soybean seed lots, hence 3 osmotic potential level (-8, -10 and -12 bar) at 4 time (12, 24, 36 and 48 h) were compared. Analysis of variance showed that, except for seedling dry weight, the other traits include standard germination, germination rate, seedling length and vigor index were influenced by osmopriming. Hydropriming had no effect on these traits and decreased rate of germination. Finally the best combination of osmopriming were osmotic potential -12 bar at 12 hours for time, that submitted acceptable result in all conditions and recommended for soybean seed lots cv. 'Sari' (Rouhi *et al.*, 2011).

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