

ORIGINAL ARTICLES

Investigation of absinthe (*Artemisia absinthium* L.) seedling features under hydropriming technique

Davoud Karimian

Young Researchers Club, Shahr-e-Qods Branch, Islamic Azad University, Tehran, Iran

ABSTRACT

Hydropriming technique clearly improved seed germination and seedling early growth under both stress and non-stress conditions. In order to the investigation of absinthe (*Artemisia absinthium* L.) seedling features under hydropriming technique, this experiment was conducted in 2011 by a completely randomized design with four replications. The factor was including hydropriming (0, 10, 20 and 30 hours). The results showed that the effect of hydropriming was significant on germination percentage, seedling vigour, seedling length and seedling dry weight in absinthe. Mean comparison showed that the highest germination percentage, seedling vigour, seedling length and seedling dry weight were achieved under hydropriming after 20 h. The results showed that hydropriming technique increased seedling features in absinthe.

Key words: Hydropriming technique, seedling features, absinthe (*Artemisia absinthium* L.).

Introduction

A study was carried out for improving yield and biological nitrogen fixation capacity of mung bean through priming techniques. The seeds were invigorated by traditional soaking (hydropriming), osmo-conditioning (soaking of seeds in aerated, low-water-potential solutions) with potassium di-hydrogen phosphate (KH_2PO_4), mannitol ($\text{C}_6\text{H}_{14}\text{O}_6$), polyethylene glycol (PEG_{6000}), sodium molybdate dihydrate ($\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$) and salicylic acid ($\text{C}_7\text{H}_6\text{O}_3$) while untreated seeds were kept as control. The experiment was carried out at two locations under different climatic conditions during the year 2007 to 2008. All the priming treatments significantly improved the dry matter yield (4001 to 5262 kg ha^{-1}) and seed yield (713 to 948 kg ha^{-1}) compared to the control. The highest biological nitrogen fixation (46.39 kg ha^{-1}) was observed in phosphorous primed plants compared to the control. In conclusion, overall, priming of mung bean seed with phosphorous (P at 0.6%) was found very effective for improved germination and vigour of mung bean seeds under field conditions. It is easy and cost effective technology for resource poor farmers of the region (Umair *et al.*, 2011). Poor crop establishment is a major problem in wheat production due to low soil moisture. Two experiments were undertaken to determine the effects of seed priming on seed germination and seedling emergence of wheat varieties. The first experiment determined the effects of water potentials (0, -0.01, -0.1, -0.2, -0.5 and -1.5 MPa), seed hydro-priming treatments including non-primed, primed (without seed drying), primed and 12 h drying on seed germination of wheat varieties. The second experiment determined the optimum seed soaking duration in wheat for maximum emergence. The factors used were seed treatment (soaking for 0, 1, 2, 4, 8, 12, 16, 20 and 24 h and 12 h soaking and 12 h drying) and variety. In the first experiment, there was a significant interaction between seed treatment and water potentials. Seed germination percent for all the treatments decreased as water potentials decreased. The non-primed seeds had the greatest decrease in germination percent as water potential was lowered. At low water potentials (-0.2 and -0.5 MPa), priming improved the germination of all the varieties. In the second experiment, there was a significant ($P < 0.05$) seed treatment effect on wheat emergence. Priming resulted in an increased final percent emergence and lower time to 50% emergence when compared with the non-soaked seed. It was concluded that priming wheat seed up to 12 h may be recommended where soil water potential is low enough to limit emergence. Delay of planting after soaking for 12 h did not affect the final emergence (Murungu, 2011). Effects of seed priming treatments with 0.5% KH_2PO_4 (w/v) solution and water were determined on germination and seedling characters of hexaploid triticale (*Triticosecale* Witm., cv. Presto) in different osmotic potential of NaCl and PEG solutions. Drought and salt osmotic stress conditions were separately created by using PEG 6000 and NaCl, respectively, at different osmotic potentials (-0.45, -0.77, -1.03 and -1.44 MPa and control). At the equivalent osmotic potential, the effects of PEG 6000 were more harmful than NaCl on germination and seedling stage. Germination percentage and seedling growth and also relative water content (RWC, %) decreased with the decrease in osmotic potential of PEG 6000 and NaCl. But root-to-

shoot length ratios increased with the effects of osmotic stress of PEG 6000 and NaCl. Despite the negative effects of two stress conditions, the two priming treatments were effective in improving germination percentage and seedling growth in Presto. But seed primed treatment was effective at the lowest osmotic potentials; therefore, seedling growth survived at the highest concentrations. Consequently, the effect of hydropriming is very pronounced particularly in improving germination and seedling growth in low stress (Yağmur and Kaydan, 2008). Therefore, the objective of this study was to evaluate the investigation of absinthine (*Artemisia absinthium* L.) seedling features under hydropriming technique.

Materials and Methods

In order to the investigation of absinthine (*Artemisia absinthium* L.) seedling features under hydropriming technique, this experiment was conducted in 2011 by a completely randomized design with four replications. The factor was including hydropriming (0, 10, 20 and 30 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 15 days at 21 to 22°C. After 15 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 absinthine 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 absinthine. Mean comparison showed that the highest germination percentage, seedling vigour, seedling length and seedling dry weight were achieved under hydropriming after 20 h.



Fig. 1: Germination percentage in absinthine under hydropriming.

The results showed that hydropriming technique increased seedling features in absinthine. Seeds of two alfalfa (*Medicago sativa* L.) varieties, cv. Hamedani and Yazdi, were used to investigate the effects of osmo- and hydro-priming on seed germination, growth parameters, biochemical changes and antioxidant enzymes activities under high-level salt concentration (150 mM NaCl) stress. Seeds were primed with water and mannitol (4%) for 12 h at $25 \pm 1^\circ\text{C}$. Ten-day-old seedlings obtained from seeds primed with mannitol (4%) and water showed more growth with respect to root and shoot length in comparison with seedlings obtained from non-primed seeds. The results showed that germination percentage was significantly higher than that of the unprimed seeds after priming. The priming treatment significantly enhanced the activities of catalase (CAT), peroxidase (POD), superoxide dismutase (SOD) and proline content and reduced the malondialdehyde (MDA) accumulation and electrolyte leakage under the salt stress condition. The results suggested that osmo- and hydro-priming were effective methods to enhance the ability of salt tolerance and to improve seed germination and seedling growth of alfalfa under high salt concentration stress condition. It seems that, these priming methods could be applied in alfalfa production in high saline soils in the future (Amooghaie, 2011). An investigation was carried out to

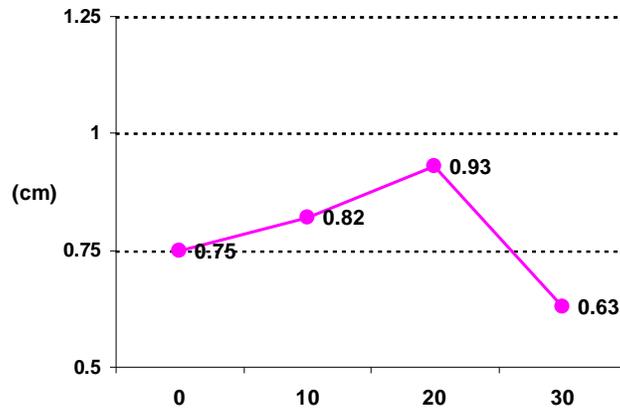


Fig. 2: Seedling length in absinth under hydropriming.

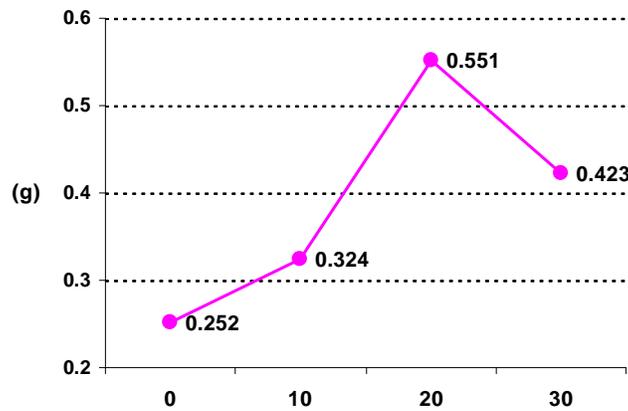


Fig. 3: Seedling weight in absinth under hydropriming.

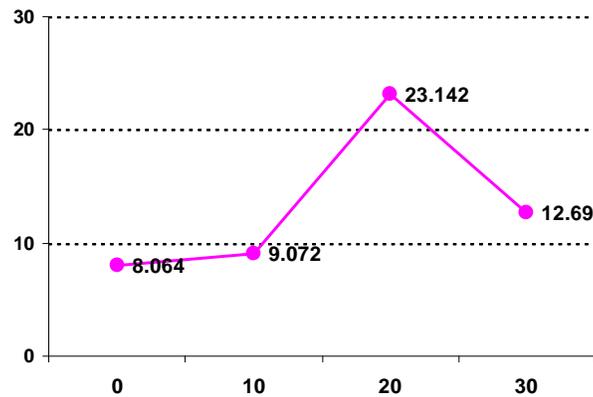


Fig. 4: Seedling vigour in absinth under hydropriming.

study the effect of different gamma irradiation doses and water soaking on okra [*Abelmoschus esculentus* (L.) Moench- Malvaceae] seeds of two varieties (Sabahia and Balady). Both varieties showed similar trends in response to different treatments. Gamma irradiation at 400 Gy was superior for both varieties in growth criteria enhancement, photosynthetic pigment contents, seed yield and seed quality. The results also showed that 300 Gy had positive effects with respect to all studied growth parameters. Seeds irradiated with either 500 Gy or soaked in water (hydropriming) for 12 h before planting showed lower effects than other treatments but still greater than the control (direct dry seed sowing). Soaking in water or application of gamma irradiation induced changes in the number of protein bands in the two varieties, but high doses of gamma irradiation (400 and 500 Gy) caused highest changes. The variation in DNA profile in responses to gamma irradiation treatments was detected by

RAPD-PCR technique. In variety Sabahia, the percentage of polymorphism was 47.37%, but in variety Balady it was 50%. The relatively high doses of gamma irradiation (400 and 500 Gy) induced more changes in genomic DNA pattern than the low dose (300 Gy) (Hegazi and Hamideldin, 2010). A factorial experiment (using RCB design) with 3 replications was conducted in 2008, in order to evaluate the effects of hydro-priming duration (P1, P2, P3 and P4: 0, 7, 14 and 21 h, respectively) on field performance of three pinto bean (*Phaseolus vulgaris* L.) cultivars (Talash, COS16 and Khomain). The highest seedling establishment, ground cover, plant biomass and grain yield per unit area were recorded for P2 followed by P3. Mean chlorophyll content index of Talash was significantly higher than that of COS16 and Khomain. Ground cover, plant biomass, pods per plant, grains per plant and grain yield per unit area of COS16 and Talash were significantly higher than those of Khomain, but 1000 grain weight of Khomain was higher than that of other cultivars. Ground cover positively correlated with plant biomass, pods per plant, grains per pod, grains per plant, harvest index and grain yield per unit area. Thus, it can be used as a reliable index to estimate the yield potential of pinto bean cultivars. No significant interaction of priming duration \times cultivar indicated that optimal time of hydro-priming for all pinto bean cultivars is 7 h (Ghassemi-Golezani *et al.*, 2010).

References

- Amooaghaie, R., 2011. The effect of hydro and osmopriming on alfalfa seed germination and antioxidant defenses under salt stress. *African Journal of Biotechnology*, 10(33): 6269-6275.
- Hegazi, A.Z., N. Hamideldin, 2010. The effect of gamma irradiation on enhancement of growth and seed yield of okra [*Abelmoschus esculentus* (L.) Monech] and associated molecular changes. *Journal of Horticulture and Forestry*, 2(3): 038-051.
- Ghassemi-Golezani, K., A. Chadordooz-Jeddi, S. Nasrullahzadeh, M. Moghaddam, 2010. Influence of hydro-priming duration on field performance of pinto bean (*Phaseolus vulgaris* L.) cultivars. *African Journal of Agricultural Research*, 5(9): 893-897.
- Murungu, F.S., 2011. Effects of seed priming and water potential on seed germination and emergence of wheat (*Triticum aestivum* L.) varieties in laboratory assays and in the field. *African Journal of Biotechnology*, 10(21): 4365-4371.
- Umair, A., S. Ali, R. Hayat, M. Ansar, M.J. Tareen, 2011. Evaluation of seed priming in mung bean (*Vigna radiata*) for yield, nodulation and biological nitrogen fixation under rainfed conditions. *African Journal of Biotechnology*, 10(79): 18122-18129.
- Yağmur, M., D. Kaydan, 2008. Alleviation of osmotic stress of water and salt in germination and seedling growth of triticale with seed priming treatments. *African Journal of Biotechnology*, 7(13): 2156-2162.