Research Journal of Fisheries and Hydrobiology, 6(4): 499-502, 2011
ISSN 1816-9112
This is a refereed journal and all articles are professionally screened and reviewed

ORIGINAL ARTICLES

Seedling vigour variations in Hyssop (*Hyssopus officinalis* L.) by hydropriming method

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ABSTRACT

In order to the seedling vigour variations in Hyssop (*Hyssopus officinalis* L.) by hydropriming method, this experiment was conducted in 2011 by a completely randomized design with four replications. The factor was including hydropriming (0, 4, 8 and 12 hours). The results showed that the effect of hydropriming was significant on germination percentage, seedling vigour, seedling length and seedling dry weight in Hyssop. Mean comparison showed that the highest germination percentage, seedling vigour, seedling length and seedling dry weight were achieved under hydropriming after 12 h. The results showed that priming could be defined as controlling the hydration level within seeds so that the metabolic activity necessary for germination can occur but radicle emergence is prevented.

Key words: Hydropriming, seedling vigour variations, Hyssop (*Hyssopus officinalis* L.).

Introduction

Insufficient seedling stand establishment is one of the major obstacles to achievement of winter wheat (*Triticum aestivum*) potential yield. In the present study, seeds of eleven wheat cultivars differing in drought resistance were subjected to hydropriming with distilled water and osmopriming with PEG 6000 for 12 h. Speed of emergence, vigor index and seedling dry weight were studied under two temperature conditions at 11 and 18 degrees C in plant growth incubators. Water stress started 15 Days After Sowing (DAS). As compared with osmopriming, hydropriming clearly improved speed of emergence, vigor index and seedling dry weight. The results were more evident at 11 degrees C indicating that hydropriming is more efficient for cold rather than temperate area. At both temperatures, PEG treatment severely diminished above mentioned traits. At 11 degrees C, drought resistant cultivars i.e., Sardari, Agosta-Sefid, Azar 2 and Sabalan had higher seedlings dry weight as compared with susceptible ones. Therefore, it is proposed that measurement of seedling dry weight may be a proper approach for early screening of wheat drought resistant genotypes (Ahmadi *et al*., 2007). The influence of seed priming using different priming agents (distilled water, NaCl, salicylic acid, acetyl salicylic acid, ascorbic acid, PEG-8000 and KNO3) on seed vigour of hot pepper cv. Hot Queen was examined. Primed seeds of each treatment were cultured in Petri dishes, kept at 25+2 ºC and 16 hours photoperiod, to evaluate the effect of different priming agents on seed vigour. All priming treatments significantly improved seed performance over the control. KNO3 primed seeds excelled over all other treatments; decreased time taken to 50% germination, increased root and shoot length, seedling fresh weight and vigour over all other priming agents. Water and NaCl, being cheapest and easily affordable by the farmers were used for further studies on salt tolerance. Seeds were primed in water (hydropriming) and NaCl (1% solution) (halopriming) and sown in pots at different salinity levels [1.17 (control), 3, 5 and 7 dS m-1], along with unprimed seeds. Emergence rate (ER), final emergence percentage (FEP), reduction percentage of emergence (RPE), shoots length, number of secondary roots, seedling fresh weight and vigour were significantly improved by both priming treatments over the control; halopriming was more effective than hydropriming. Number of secondary roots was maximum in haloprimed and unprimed seeds. Seed priming treatment did not significantly affect root length, fresh and dry weight of seedlings. Results indicated that seed priming can be used for improving performance of pepper seeds and seedlings grown under saline conditions (Amjad *et al*., 2007).In seed priming, seeds are partially hydrated to a point where germination processes commence but radical emergence does not occur. A lab experiment was conducted for assessment of antioxidant enzymes activity as affected by different seed priming treatments. The seeds were invigorated by traditional soaking (hydropriming), osmo-conditioning (soaking of seeds in aerated, low-water-potential solutions) using, potassium di-hydrogen phosphate, Mannitol, Polyethylene glycol, sodium molybdate dihydrate and hormonal priming by using salicylic acid. The ranges of osmotic potential for all the priming treatments were -0.5 to -1.2 M Pa. All the invigoration treatments significantly affected the activities of anti-oxidants i.e., Superoxide Dismutase (SOD), Peroxidase (POD), Polyphenoloxidase (PPO) and Catalase (CAT) activity. Osmopriming using P @ 0.60% applied in the form of KH2PO4 significantly improved the

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SOD and CAT activity while T10 showed improvement in PPO. All the seed priming treatments also enhanced the seedlings vigour in terms of germination and vigour index (Umair *et al*., 2012). 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). Therefore, the objective of this study was to evaluate the seedling vigour variations in Hyssop (*Hyssopus officinalis* L.) by hydropriming method.

Materials and Methods

In order to the seedling vigour variations in Hyssop (*Hyssopus officinalis* L.) by hydropriming method, this experiment was conducted in 2011 by a completely randomized design with four replications. The factor was including hydropriming (0, 4, 8 and 12 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 18 days at 19 to 21ºC. After 18 days, 10 seedlings were selected and was determined seedling length and then placed on electrical Owen for 48h at 75ºC and determined seedling weight by electrical scale. Finally, germination percentage determined for Hyssop by following formula:

(Number of Seeds Germinated / 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 Hyssop. Mean comparison showed that the highest germination percentage, seedling vigour, seedling length and seedling dry weight were achieved under hydropriming after 12 h.

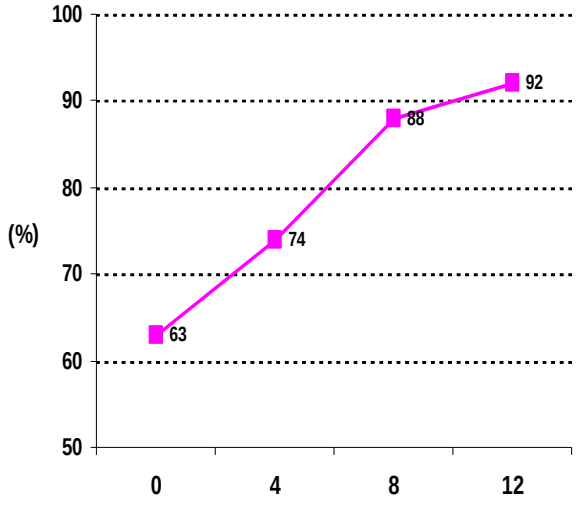

Fig. 1: Germination percentage in Hyssop under hydropriming.

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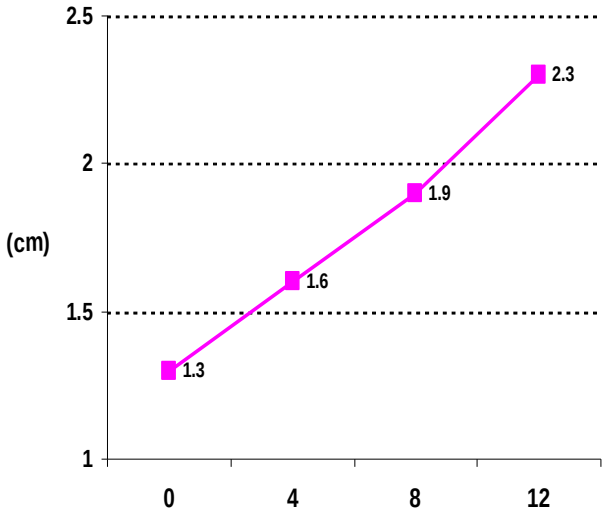

Fig. 2: Seedling length in Hyssop under hydropriming.

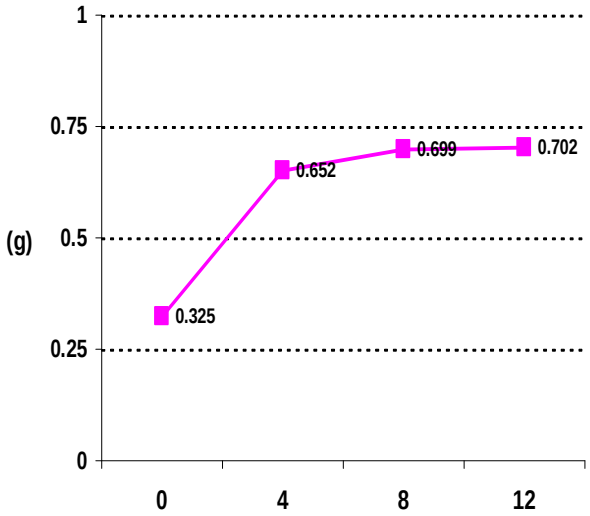

Fig. 3: Seedling weight in Hyssop under hydropriming.

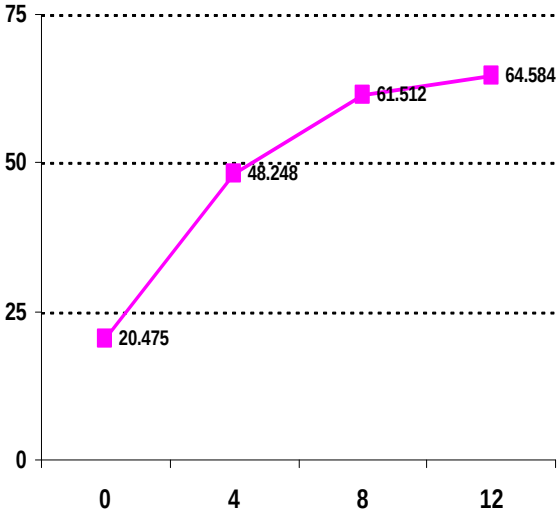

Fig. 4: Seedling vigour in Hyssop under hydropriming.

The results showed that priming could be defined as controlling the hydration level within seeds so that the metabolic activity necessary for germination can occur but radicle emergence is prevented. A smoke-derived butenolide, 3-methyl-2*H*-furo[2,3-*c*]pyran-2-one, has previously been shown to improve seedling vigour. The aim of this study is to examine the effect of hydropriming and butenolide priming treatments on seedling emergence and growth under different sowing depths at 20 and 25°C in two melon (*Cucumis melo* L.) seed lots of high and low quality. Seeds are subjected to hydropriming (21 h at 25°C) and butenolide priming (10^{-7} M, 21 h at 25°C) and sown at a depth of 4 or 8 cm in peat moss (field capacity, 64% water by mass). In general, seedlings from butenolide-primed and hydroprimed seeds are superior to those of the control. At 20°C, the effect of butenolide priming is more pronounced than that of hydropriming and the control, particularly for the seeds sown at a depth of 8 cm. Butenolide priming has a 'repair-inducing' effect and enhances the low-quality seeds more than those of the high-quality seed lot, an effect which is more obvious at 20°C than 25°C. It can be concluded that butenolide priming may be a useful tool to enhance melon seedling performance under low temperature sowing conditions (Mavi *et al*., 2010). Seed storability depends on factors such as variety, seed history, harvesting, drying and storage conditions, etc. Moreover, seed priming has been reported to both increase and decrease seed storability in many crops. Seed priming is a technique to hydrate seed in different ways to a moisture level sufficient to initiate the early germination process but not sufficient to permit radicle protrusion. Methods of seed priming can be divided into two groups depending on whether water uptake is uncontrolled (hydro-priming) or controlled (osmotic-priming and solid matrix priming). The benefits of seed priming are not only to extend seed storability but also to improve seed germination, seed vigor, uniform field emergence, and yield. However, the success of seed priming may vary due to variety, seed quality, seed lot, chemicals used, priming duration and temperature, and storage conditions. This experiment aimed to investigate the effect of delayed seed drying, duration of seed hydro-priming, and their interaction on rice seed storability at three different seed ages (Thavong and Jamradkran, 2010).

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