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ORIGINAL ARTICLE

Increasing Of Germination Percentage By Hydropriming Method In Soybean (*Glycine Max* L.)

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ABSTRACT

An experiment was carried out using a completely randomized design with three replications on germination in soybean (*Glycine max* L.) seed's at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran in 2011. The factor of study included different time hydropriming (control, 12 and 24 h). The characters measured were: germination percentage, seedling dry weight and seedling vigour. The results showed that effect of hydropriming significant on germination percentage, seedling dry weight, and seedling vigour in $P \leq 0.05$. Mean comparison showed that the highest germination percentage (78 %), seedling dry weight (1.32 g) and seedling vigour (102.96) were achieved by 24 h hydropriming.

Key words: Hydropriming, Germination, Germination percentage and Soybean.

Introduction

Soybean, (*Glycine max* L.) is a species of legume native to East Asia and classed as an oilseed rather than a pulse. It is an annual plant that has been used in China for 5,000 years to primarily add nitrogen into the soil as part of crop rotation. Fat-free (defatted) soybean meal is a primary, relatively low-cost, source of protein for animal feeds or rations; soy vegetable oil is another valuable product of processing the soybean. Soybean products such as TVP (textured vegetable protein), for example, are important ingredients in many meat and dairy analogues. Traditional non fermented food uses of soybeans include soymilk, and from the latter tofu and tofu skin or yuba. Fermented foods include shoyu or soy sauce, miso, natto, tempeh, Ketjap among others. The oil is used in many industrial applications. The main producers of soy are the United States (32%), Brazil (28%), Argentina (21%), China (7%) and India (4%).

The beans contain significant amounts of phytic acid, alpha-Linolenic acid, and the isoflavones genistein and daidzein. Among the legumes, the soybean, also classed as an oilseed, is pre-eminent for its high (38-45%) protein content as well as its high (20%) oil content. Soy protein which is essentially identical to that of other legume seeds can produce products that are good substitutes for animal products. In the United States, the bulk of the crop is solvent-extracted with hexane, and the "toasted" defatted soymeal (50% protein) can be used as animal feed. Global oilseed production for 2009/10 is projected at 428.60 million tons, up 8.42% as compared to 395.30 million tonnes in 2008-09. Soybean can be processed for its edible oil, and high (~40% on a dry weight base) protein content. There is a high demand for organic soybeans by the tofu industry, and also used as a livestock feed protein supplement. As for weed control, soybeans are useful to break the weed cycle in grain crops and they are especially a good choice if wild oats mean a problem. In soybeans, weeds emerging at the same time, and in case they are let to grow for 2-4 weeks, they will have a negative effect on yields. Different varieties of soybeans possess different weed suppressing ability: the longer their growing season lasts, the better this ability is. These varieties develop bigger green mass and their good weed suppressing ability is maintained by the later period of the growing season. Rapid-growing annual with branching habit, stems being mostly primary tissue. Leaves are alternate, pinately trifoliate with pulvini, stipels and stipules. The plants are tap-rooted, up to 2 m in depth, with numerous lateral roots. On each plant, inflorescence comprises one or two self-fertile flowers that are borne in the axils of the leaves. Flower colour differs according to cultivar with white and purple represented. Flowers also have pubescence that is either tawny or grey in appearance. Pods typically contain two or three

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seeds. Seeds are flattened when young but becoming roundish later with two cotyledons and little endosperm. Seeds normally yellow with either a dull or a shiny seed coat and a hilum colour ranging from yellow to black, with black being most common. Soybeans are suitable for ensiling, which is the main use for pure-sown forage stands. To avoid soil contamination when cutting, the stubble height has to be 10 cm above ground level and the cut swath left unturned. In North America, intercropping maize and soybeans has been found to improve total forage yield and forage quality marginally [1,2]. There was an increase of 11 to 51% in the CP concentration for maize-soybean intercrops relative to pure sowings of maize [2]. Martin *et al.,* [1], concluded that this increase in the CP concentration of the intercrop significantly reduced the need for concentration supplementation of the ration. Soybeans also improved the land equivalent ratios (LER) relative to corn monocrops [1]. In Italy, there was an 89% higher yield for the mixture relative to pure crops of soybeans, but only a 4% higher yield when compared to pure crops of maize [3]. The spatial distribution of the maize and soybeans is important, as the maize can out-compete the soybean mitigating the improvement in forage quality that adding soybeans was intended. Anil *et al.,* [4] concluded that mixing maize and soybeans could result in a potentially valuable option for farming systems that can grow both crops Coffey *et al*. [5] found that silages produced from forages harvested at the R6 growth stage (Table 1, Full Seed) had the highest lactic acid and lowest ammonia concentrations and in one of the years also produced the lowest total volatile fatty acids. Coffey *et al*. [5] concluded that, based on the changes in quality and yield, farmers should wait until R6 to harvest and ensile soybeans. This experiment was conducted to increasing of germination percentage by hydro priming method in soybean (*Glycine max* L.).

Materials and Methods

This experiment was carried out using a completely randomized design with three replications on germination in soybean (*Glycine max* L.) seed's at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran in 2011. The factor of study included different time hydropriming (control, 12 and 24 h) through the placing seeds was exposed to water. After disinfecting, seeds were put in disinfected Petri dish. Each Petri dish contained 100 seeds. Three replicates of 100 seeds were put between double layered rolled. The rolled paper with seeds was put into sealed plastic bags to avoid moisture loss. All of the Petri dish irrigated by distilled water. Seeds were allowed to germinate at 25 ± 3$^{\circ C}$ for 9 days. Germination percentage was recorded after the 9sth day. Germination percentage was calculated with the following formula:

Germination percentage = Number of germinated seeds / Number of total seeds × 100

Also, Seedling vigor index was calculated by the following formula:

Seedling vigor index = Germination percentage × Seedling dry weight

Statistics analysis:

Data were subjected to analysis of variance (ANOVA) using Statistical Analysis System (Spss) computer software at $P < 0.05$.

Results and Discasion

Germination Percentage:

The results showed that the effect of hydro priming was significant on germination percentage in $P \leq 0.05$. The highest germination percentage (78 %) was achieved by 24 h hydro priming and lowest germination percentage (65 %) was achieved by control treatment (Table 1, Fig 1).

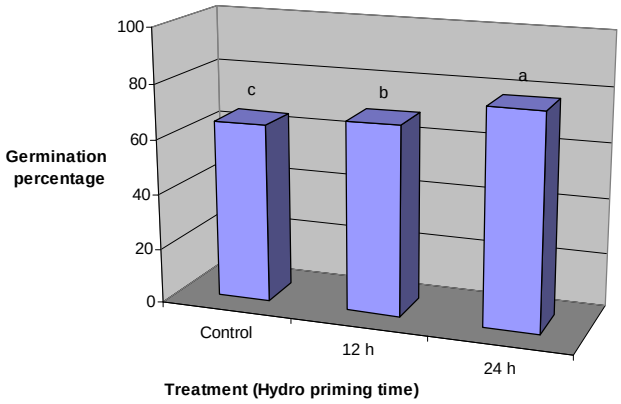

Fig. 1: Effect of hydro priming on germination percentage in soybean.

Adv. Environ. Biol., 5(7): 1663-1668, 2011

Seedling Dry Weight:

The results showed that the effect of hydro priming was significant on seedling dry weight in $P \leq 0.05$. The highest number of grain (1.32 g) was achieved by 24 h hydro priming and lowest seedling dry weight (1.08 g) was achieved by control treatment (Table 1, Fig 2).

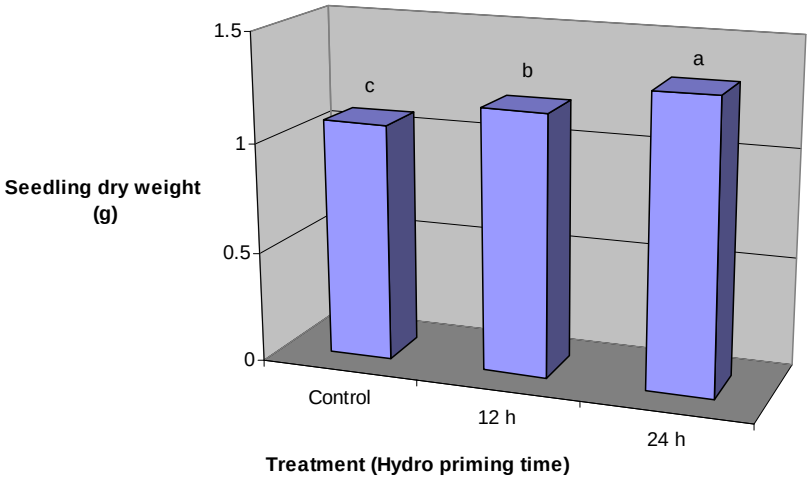

Fig. 2: Effect of hydro priming on seedling dry weight in soybean.

Seedling Vigour:

The results showed that the effect of hydro priming was significant on seedling vigour in $P \leq 0.05$. The highest seedling vigour (102.96) was achieved by 24 h hydro priming and lowest seedling vigour (70.20) was achieved by control treatment (Table 1, Fig 3).

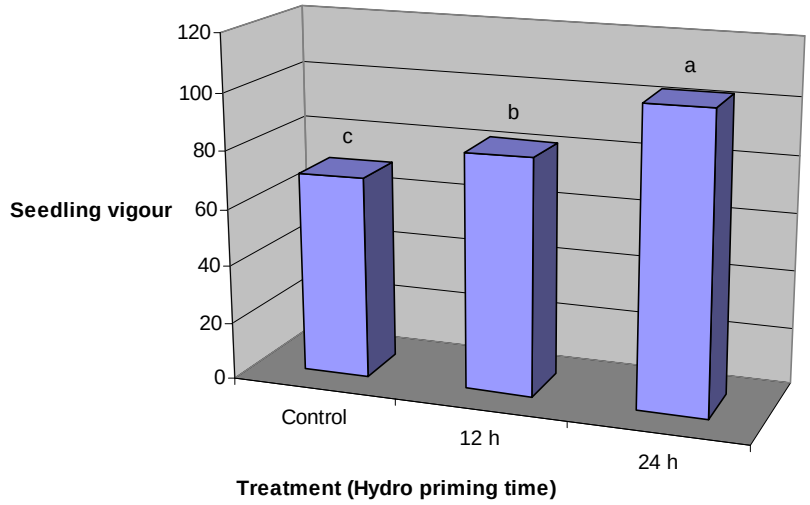

Fig. 3: Effect of hydro priming on seedling vigour in soybean.

Table1: Means Comparison

Treatment (Hydro priming time)	Germination percentage	Seedling dry weight (g)	Seedling vigour
Control	65 [c]	1.08 [c]	70.20 [c]
12 h	69 [b]	1.19 [b]	82.11 [b]
24 h	78 [a]	1.32 [a]	102.96 [a]

Means within the same column and factors, followed by the same letter are not significantly difference.

Seed priming is a technique of seed enhancements that improves germination or seedling growth. Seed priming enhances seed performance by rapid and uniform germination, normal and vigourous seedlings, which resulted in faster and better germination in different crops [6]. It permits seedling development in a wide range of agro-climatic conditions and decreases sensitivity to external factors [7,8]. Seeds performance of various crops can be improved by inclusion of plant growth regulators and hormones during priming and other pre-sowing treatments [10]. Priming is responsible to repair the age related cellular and sub cellular damage of low vigour seeds that may accumulate during seed development [9]. Priming enhanced germination, better establishment and increased yields in a range of crops in many diverse environments [12].The priming technique due to its simplicity might be acceptable to the farmer of area as accepted to farmer in other semi arid region and promoted to a wide range of crops, for example maize [13], wheat [14], mung bean [11], Chick pea [16], upland rice in India [17] and millet in India. It has been long known that one of the main merits of priming treatments is to increase germination and emergence rate [15]. However, the question arises whether rapid radicle protrusion is always reflected in rapid seedling emergence.

References

1. Martin, R.C., H.D. Voldeng, D.L. Smith, 1990. Intercropping corn and soybean for silage in cool temperate region: yield, protein and economic effects. Field Crop Research, 23: 295-310.
2. Putman, D.H., S.J. Herbert, A. Vargas, 1985. Intercropped corn-soybean density study. I. Yield complementarity. Experimental Agriculture., 21: 41-51.
3. Marchiol, L., F. Miceli, M. Pinsona, G. Zerbi, 1992. Intercropping of soybean and maize for silage in northern Italy: Effect of nitrogen level and plant density on growth, yield and protein content. European Journal of Agronomy, 1: 207-211.
4. Anil, L., J. Park, R.H. Phipps, F.A. Miller, 1998. Temperate intercropping of cereals for forage: a review of the potential for growth and utilisation with particular reference to the UK. Grass and Forage Science, 53: 301-317.
5. Coffey, K.P., G.V. Granade, J.L. Moyer 1995. Nutrient content of silages made from whole-plant soybeans. The Professional Animal Scientist., 11: 74-80.
6. Cantliffe, D.J., 2003. Seed Enhancements. *Acta Horticulturae.,* 607: 53-59.
7. Ashraf, M. and M.R. Foolad, 2005. Pre-sowing seed treatment – A shotgun approach to improve germination, growth and crop yield under saline and non-saline conditions. *Advances in Agronomy*, 88: 223-271.
8. Welbaum, G.E., Z. Shen, M.O. Oluoch, L.W. Jett, 1998. The evolution and effects of priming vegetable seeds. *Seed Technology,* 20: 209-235.
9. Bray, C.M., 1995. Biochemical processes during osmopriming of seeds. *In*: Kigel, J. and G. Galili (eds.), *Seed Development and Germination*, pp: 767–789. New York, Basel, Hong Kong, Maceldekker.
10. Lee, S.S., J.H. Kim, S.B. Hong, S.H. Yuu, E.H. Park, 1998. Priming effect of rice seeds on seedling establishment under adverse soil conditions. Korean Journal of Crop Science, 43: 194198.
11. Rashid, A., D. Harris, P.A. Hollington, M. Raffiq, 2004. Improving the yield of mung bean (*Vigna radiata*) in the North West frontier province of Pakistan using on-farm seed priming. *J. Expt. Agric.,* 40: 233-244.
12. Rashid, A., P.A. Hollington, D. Harris, P. Khan, 2006. On-farm seed priming for barley on normal, saline and saline-sodic soils in North West frontier province of Pakistan using on-farm seed priming. *Europ. J. Agron.,* 24: 276-281.
13. Harris, D., A. Rashid, G. Miraj, M. Arif, H. Shah, 2007. On-farm seed priming with zinc sulphate solution-A cost-effective way to increase the maize yields of resourcepoor farmers. *Field Crops Res.*, 102: 119-127.
14. Harris, D., A.K. Pathan, P. Gothkar, A. Joshi, W. Chivasa, P. Nyamudeza, 2001. On-farm seed priming: using participatory methods to review and refine a key technology. *Agric. Syst.,* 69: 151-164.
15. Heydecker, W., P. Coolbear, 1977. Seed treatments for improved performance survey and

attempted prognosis, Seed Sci. Technol., 5: 353-375.

16. Musa, A.M., D. Harris, C. Johansen, J. Kumar, 2001. Short duration chickpea to replace fallow after aman rice: the role of on-farm seed priming in the High Barind Tract of Bangladesh. *Exp. Agric.*, 37: 509-521.
17. Harris, D., R.S. Tripathi, A. Joshi, 2002. On-farm seed priming to improve crop establishment and yield in dry direct-seeded rice, in *IRRI: International Workshop on Dry-seeded Rice Technolgoy;* held in Bangkok, 25-28 January 2008. The International Rice Research Institute, Manila, the Philippines, pp: 164.