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EFFECT OF ON-FARM SEED PRIMING ON YIELD AND SEED QUALITY OF BEAN (*Phaseolus vulgaris* L.)

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ABSTRACT

Two field experiments were carried out during the two summer growing seasons of 2006 and 2007, at El-Baramoon Farm, Mansoura Horticultural Research Station, Dakahlia Governorate, Egypt, to investigate the effect of on-farm seed priming for different periods in water or in molybdenum (Mo) solution on growth, yield and pod characters as well as seed yield and its quality of snap bean (*Phaseolus vulgaris* L.) cv. Bronco. Nine treatments were arranged in complete randomized block design with 3 replicates.

Results indicated that priming bean seeds in Mo solution or water significantly increased the capability of the plants to produce vigorous vegetative growth expressed as plant height, number of branches and number of leaves per plant, plant fresh and dry weight as well as chlorophyll content.

All priming treatments enhanced the total green plant yield, especially priming for 9 hours in Mo solution or water. These treatments gave the highest values for yield. Seed yield and its quality were also improved as a result of using seed priming treatments.

Generally, On-farm seed priming seems to be a widely applicable technology and can be used to add to the benefits achieved by using improved modern varieties or by adoption of other improved technologies such as fertilizer or better crop protection. This low-cost, low-risk technology is good insurance for farmers by providing low-cost more options and improvements to their livelihoods.

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) is frequently consumed as both dry beans and immature green pods, called snap beans. Dry bean is an important food staple worldwide and provides a significant source of protein, calories, vitamins, minerals and fiber. Seeds of beans are the most important protein and mineral food sources overall the world, especially the developing countries including Egypt.

Poor germination and low seed viability are among the most serious problems in the production of bean. The use of high-quality seed with appropriate seed rate is essential to establish a suitable plant population in the field for best returns. Vigorous seeds germinate rapidly and uniformly, and are able to better withstand environmental adversity after sowing (Ajouri et al., 2004; Marwat & Nafziger, 1990).

Good crop-stand establishment is vital in the production of annual crops from seed, because patchy stands result in low yields. Having good stands is particularly important for resource-poor farmers in developing countries because, even if sparse crops can be re-sown, it is expensive and can lead poor farmers into crippling debt. Good crop establishment is especially difficult in marginal environments under which many poor farmers live. Several factors, *e.g.,* poor soils, low-quality seed, and limited availability of labor or draft power contribute to such a situation.

Speed of germination and emergence is an important limiting factor of successful crop stand establishment (Harris, 1996). Harris *et al.* 1999 demonstrated that on farm seed priming – soaking seeds for a certain period in water, surface-drying them and then sowing in normal fashion markedly improved the stand establishment and early vigor of chickpea. They added that rapid establishment and greater vigor also resulted in greater and faster plant development, earlier flowering and maturity, and higher yields. Moreover, these effects resulting from such simple, low-cost, low-risk intervention also had positive impacts on the wider farming system and farmers' livelihoods, and the technology has proven to be highly popular with farmers (Harris *et al.* 1999).

This simple technology, as expected, promoted rapid germination and emergence but was also found, in many cases, to increase seedling vigor, advanced crop development, and increased yield. Other benefits of on-farm seed priming have been observed. Musa *et al.* (2001) reported that priming chickpea seed for 8 h significantly reduced the damage caused by collar rot (*Sclerotium rolfsii*) in Bangladesh. Recent work in Pakistan has demonstrated that mungbean (*Vigna radiata*) grown from seed primed in water for 8 h before sowing showed significantly fewer serious symptoms of infection by Mungbean Yellow Mosaic Virus (MYMV) than a crop established without priming (Rashid *et al.* 2004 a). The large differences in virus-related damage were associated with significant increases in pod weight (3-fold) and grain weight (5-fold) due to priming.

Seed priming has been particularly effective in legumes. For example, yields of chickpea (*Cicer arietinum*) and mungbean (*Vigna radiata*) were increased substantially by priming seeds for 8 h before sowing (Harris *et al.* 1999; Musa et al. 2001; Rashid *et al.* 2004b). Yield benefits were due to a combination of better crop stands and better individual plant performance. For chickpea, Musa *et al.* (2001) in Bangladesh also noted that plants grown from primed seeds had significantly more N-fixing nodules than plants grown from non-primed seeds. This effect has also been reported in cowpea (*Vigna unguiculata*) in Senegal by Braconnier and Bourou (2004).

In many parts of the world, legumes do not grow well because they cannot take up enough Molybdenum (Mo). It is possible, if rather expensive, to add salts such as sodium molybdate to the soil but it is also quite difficult to spread it uniformly across large areas due to the small quantities involved. Substantial yield benefits (20-90%) can result from the addition of tiny amounts of Mo to the priming water.

Molybdenum, a micronutrient element essential for nearly all organisms, deserves special attention as a major requirement for plant growth. Mo is a constituent of nitrogenase and nitrate reductase, required for the assimilation of soil nitrates. Therefore, the function of Mo is closely related to plant nitrogen metabolism, and Mo deficiency is manifested as deficiency of plant N (Mendel and Hansch, 2002; Pollock *et al.*, 2002). If symbiosis is being established, unusual proliferation of nodules is often observed when legumes are deficient in Mo, presumably due to the N deficiency (Marschner, 1995). However, lesser Mo content is required for nitrate reduction than for N_2-fixation support (Parker and Harris, 1977). Therefore, Mo is efficiently concentrated in the nodules of Mo-deficient plants (Brodrick and Giller, 1991).

The research results available show that a low level of molybdenum in bean seeds being sown (< 1.41 mg˜kg-1) results in plants of a lower weight of root nodules, yielding lower, accumulating less nitrogen, and producing seeds with 50% lower germination (Brodrick *et al.* 1992).

Rondon *et al.* (2007) indicated that bio-char enhanced biological nitrogen fixation (BNF) by common beans (*Phaseolus vulgaris* L.) and the primary reason for the higher BNF with bio-char additions was the greater B and Mo availability. They added that bean yield was increased by 46% and biomass production by 39% over the control at 90 and 60 g kg-1 bio-char, respectively.

The aim of this work was to study the efficiency of using on-farm seed priming for different periods in water or in molybdenum (Mo) solution on enhancing growth, yield and pod characters, as well as seed yield and its quality, of snap bean plants cv. Bronco.

MATERIALS AND METHODS

Two field experiments were carried out during the two growing summer seasons of 2006 and 2007, at El Baramoon Farm of Mansoura Horticultural Research Station, Dakahlia Governorate, Egypt, to investigate the effect of on-farm seed priming for different periods and using molybdenum solutions on growth, yield and pods characters as well as seed yield and quality of snap bean plants cv. Bronco. The soil of the experimental field was clayey in texture. Data of chemical and mechanical properties as described by Chapman and Pratt (1961) and Jakson (1965) are shown in Table (1).

Table (1): Mechanical and chemical analysis of the soil during 2006 season.

Sand %	Silt %	Clay %	Tex. class	O.M. %	$CaCo_3$ %
16.72	24.65	56.35	clayey	1.95	3.13
Avail. N ppm	Avail P ppm	Avail K ppm	Fe ppm	EC. ds/m	pH
69	4.72	297	18.2	0.93	8.2

Seeds of Bronco cv. of snap bean were divided into 9 groups; the first group did not have any treatment served as control while the remaining 8 groups were treated with different seed priming periods and molybdenum. Each experiment included 9 treatments as follows:

1- Control treatment.

2- Seed priming in water for 3 hours.

3- Seed priming in water for 6 hours.
4- Seed priming in water for 9 hours.
5- Seed priming in water for 12 hours.
6- Seed priming in 50 ppm Mo solution for 3 hours.
7- Seed priming in 50 ppm Mo solution for 6 hours.
8- Seed priming in 50 ppm Mo solution for 9 hours.
9- Seed priming in 50 ppm Mo solution for 12 hours.

After the priming treatment, the seeds were spread for surface drying, and then were sown on March 15 and 18 of 2006 and 2007 seasons, respectively. A complete randomized block design with 3 replicates was followed. The plot area was 17.5 m^2 , which consisted of 5 rows, each row 5 m in length and 70 cm width. Three seeds were sown per hill at 15 cm apart, and the growing seedlings were thinned to one plant after 20 days from sowing. Surface irrigation was applied and other agricultural practices used in accordance with the recommendations of the Ministry of Agriculture.

Recorded data was from samples, each of 5 plants, from each plot taken at 50 days after sowing (flowering stage) to determine the following data:

- Plant height (cm), number of branches per plant, number of leaves per plant, leaf area (measured by Li-300 leaf area meter produced by Li-Cor, Pinclivania), total fresh and dry weight of vegetative part of plant (leaves + stem).
- Total chlorophyll of the third leaf from top measured by using chlorophyll meter (SPAD).
- Total pod yield. During harvest, the green pods produced were collected and the total pods yield was calculated at the end of the harvesting season.
- Pod characters: A random sample of 20 pods was taken and average pod length, diameter and weight were measured.
- At second harvest, random samples of green pods were taken from each plot and oven-dried at 70 C° until constant, and the dry matter was then finely ground and analyzed to determine nitrogen, phosphorus and potassium concentrations by the methods described by Watanabe and Olsen (1965), and Jackson (1967) respectively; and total protein was determined in dry pods using the method of A.O.A.C. (1975).
- At seed maturity stage; plants were harvested, dry seeds were manually extracted and total dry seed yield (kg/fed.) was calculated, seed index and germination percentage (GP) were measured according to the ISTA rules (ISTA, 1999). Mean time to germination in days (MGT) was calculated according to the formula $MGT=\Sigma nd/N$ where n is the number of germinated seed on each day; d the number of days from the beginning of the test, and N the total number of germinated seeds (Edwards and Sundstrom, 1987).

The obtained data were subjected to statistical analysis of variance according to Gomez and Gomez (1984) and the treatment means were compared using the Duncan Multiple Range test as published by Duncan (1965).

RESULTS AND DISCUSSION

1- Vegetative Growth

Data presented in Tables 2 and 3 demonstrate that seed priming significantly stimulated the vegetative growth characters of plants, when compared with the untreated plants (control) in both the two seasons. Moreover, priming with molybdenum was superior to water priming.

Regardless of the priming solution, priming for 9 hours proved to be a more effective treatment in enhancing the vegetative growth parameters of bean plants.

Table (2): Effect of seed priming on plant height, number of branches and leaves per plant as well as leaf area of bean plants during 2006 and 2007 seasons.

Seasons	2006				2007			
Characters / Treatments	Plant Height (cm)	No. of Branches / plant	No. of Leaves / plant	Leaf Area / plant (cm^2)	Plant Height (cm)	No. of Branches / plant	No. of Leaves / plant	Leaf Area / plant (cm^2)
Control	30.3 e	3.87 e	10.3 b	156 a	29.6 e	3.77 e	9.7 d	147 e
Priming in water for 3 h.	31.7 de	4.30 d	11.3 ab	160 a	31.1 de	4.03 e	11.0 bc	163 d
Priming in water for 6 h.	32.9 cd	4.93 c	11.0 ab	166 a	32.4 cd	4.80 d	10.7 c	167 cd
Priming in water for 9 h.	35.5 ab	5.43 b	12.3 a	167 a	34.6 ab	5.27 bc	12.0 a	182 a
Priming in water for 12h.	35.0 ab	5.37 b	11.0 ab	170 a	34.9 ab	5.10 cd	10.7 c	182 a
Priming in 50 ppm Mo solution for 3 h.	34.1 bc	5.27 bc	11.3 ab	172 a	33.6 bc	5.07 cd	11.0 bc	170 bc
Priming in 50 ppm Mo solution for 6 h.	35.9 a	5.43 b	11.7 ab	175 a	36.1 a	5.47 ab	11.7 ab	172 b
Priming in 50 ppm Mo solution for 9 h.	36.0 a	6.00 a	12.3 a	181 a	35.9 a	5.77 a	11.3 ab	184 a
Priming in 50 ppm Mo solution for 12h.	35.0 ab	5.47 b	11.7 ab	182 a	35.1 ab	5.5 ab	10.7 c	184 a

Values within the same column followed by the same letters are not significantly different, using Duncan's Multiple Range Test at 5% level.

The highest values of plant height, number of branches and leaves per plant, plant fresh weight, plant dry weight, leaf area and the total chlorophyll content were produced by priming bean seeds for 9 hours in 50 ppm of Mo solution.

Table (3): Plant fresh and dry weight as well as total chlorophyll of bean plants in relation seed priming treatments during 2006 and 2007 seasons.

Seasons	2006			2007		
Characters / Treatments	Plant Fresh Weight (g)	Plant Dry weight (g)	Total Chlorophyll (SPAD)	Plant Fresh Weight (g)	Plant Dry weight (g)	Total Chlorophyll (SPAD)
Control	37.0 e	4.04 b	37.2 d	36.3 e	3.96 h	37.7 d
Priming in water for 3 h.	40.3 d	4.45 b	39.8 c	39.7 d	4.28 g	39.5 c
Priming in water for 6 h.	42.7 c	6.00 a	39.8 c	42.0 c	5.15 e	39.7 c
Priming in water for 9 h.	45.0 ab	5.95 a	40.3 c	43.9 b	5.65 cd	40.1 c
Priming in water for 12h.	44.5 bc	5.90 a	40.8 c	43.5 bc	5.56 d	40.3 c
Priming in 50 ppm Mo solution for 3 h.	43.0 c	5.51 a	42.1 b	41.7 c	5.03 f	42.6 b
Priming in 50 ppm Mo solution for 6 h.	43.8 bc	5.66 a	43.6 b	42.3 bc	5.70 c	43.2 b
Priming in 50 ppm Mo solution for 9 h.	46.8 a	6.30 a	46.3 a	45.9 a	6.03 a	46.0 a
Priming in 50 ppm Mo solution for 12h.	15.1 ab	6.05 a	46.0 a	44.1 b	5.87 b	45.9 a

Values within the same column followed by the same letters are not significantly different, using Duncan's Multiple Range Test at 5% level.

On the other hand, some reports concluded that seed priming promoted the vegetative growth of different crops for instance; Harris *et al.* (1999) found that hydropriming enhanced seedling establishment and early vigor of chickpea. Arif and Tariqjan (2008) found that priming enhanced the different vegetative growth characters of soybean.

Results reported by numerous authors also show favorable effects of using molybdenum on the vegetative growth of bean for example, Padma *et al.* (1989) and Deka and Shadeque (1991) recorded an increase in plant height, leaf area and number of leaves per plant.

2- Total Yield and Pod Characters

Significant increases were detected in the total green pod yield and pod characters expressed as average pod length, and fresh weight, from plants which received priming treatments, as compared to the control, as presented in Table 4, but at the same time there were no significant differences in the pod diameter in both seasons. Data also show that priming in 50 ppm Mo was significantly superior to other treatments, *i.e,* water priming or control. The superior results of molybdenum as a priming tool may be attributed to producing plants with the highest branch numbers, widest leaf area and higher total chlorophyll content in leaves as presented in Tables 2 and 3. These plants apparently possessed higher capability of photosynthesis. This would in turn build higher yield of carbohydrates which gave rise to more cell division and enlargement, inducing more vegetative vigorous plants, and finally lead to produce more total yield.

Priming for 9 or 12 hours either in water or molybdenum proved to be the best treatments in increasing yield of bean. There is a great deal of evidence that on-farm seed priming is an effective method for resource-poor farmers to increase yields. Although there is some evidence that the initial germination response to priming is greater in crops and situations where germination is slower (which is often correlated with seed size (Harris and Mottram, 2005), priming seems to be appropriate across a wide range of legumes. The yield gains result from earlier, faster germination and emergence, more vigorous early growth, earlier flowering, and hastened maturity (*e.g.*, Harris 1996, 2003; Harris *et al.* 1999, 2001a; Musa *et al.* 2001).

Table (4): Total yield and pod characters of bean plants as affected by seed priming during 2006 and 2007 seasons.

Seasons	2006				2007			
Characters / Treatments	Total Yield (ton/fed)	Average Pod Length (cm)	Average Pod Diameter (cm)	Average Pod Weight (g)	Total Yield (ton/fed)	Average Pod Length (cm)	Average Pod Diameter (cm)	Average Pod Weight (g)
Control	3.58 e	9.70 d	0.75 a	3.95 d	3.52 h	9.5 d	0.75 a	4.00 d
Priming in water for 3 h.	4.80 d	10.6 c	0.79 a	4.25 c	4.73 g	10.6 c	0.77 a	4.25 c
Priming in water for 6 h.	5.13 c	11.0 bc	0.80 a	4.30 c	5.05 f	10.6 c	0.79 a	4.28 c
Priming in water for 9 h.	5.78 a	11.5 ab	0.77 a	4.75 a	5.62 c	11.5 a	0.80 a	4.78 a
Priming in water for 12h.	5.73 a	11.2 ab	0.79 a	4.72 a	5.67 b	11.1 b	0.79 a	4.68 a
Priming in 50 ppm Mo solution for 3 h.	5.40 b	11.0 bc	0.77 a	4.47 b	5.31 e	10.8 c	0.78 a	4.45 b
Priming in 50 ppm Mo solution for 6 h.	5.44 b	11.2 ab	0.79 a	4.50 b	5.38 d	11.1 b	0.80 a	4.45 b
Priming in 50 ppm Mo solution for 9 h.	5.84 a	11.6 a	0.78 a	4.77 a	5.79 a	11.6 a	0.82 a	4.80 a
Priming in 50 ppm Mo solution for 12h.	5.83 a	11.4 ab	0.80 a	4.72 a	5.79 a	11.2 b	0.79 a	4.70 a

Values within the same column followed by the same letters are not significantly different, using Duncan's Multiple Range Test at 5% level.

However, there are benefits beyond those due to enhanced general vigor or changes in phenology. Musa *et al.* (2001) and Rashid *et al.* (2004) reported that crops from primed seeds showed fewer symptoms of disease and that disease-related yield losses were smaller in primed crops. It was not possible in either case to rule out the possibility that disease resistance was the result of 'escape' or avoidance of infection due to earliness, in the case of mungbean and MYMV disease.

3- Seed Yield and Quality

Data presented in Table 5 show the effect of seed priming on seed yield and quality expressed as, seed index, germination percentage, and mean time to germination (germination rate) of snap bean plants.

Regarding the effect of the treatments on seed yield, it is obvious that priming treatments had highly promotional effects on seed yield. Priming in Mo solution for 9 hours gave the best results in this regard, followed by priming for 12 hours in Mo solution, in both seasons.

There is a slight difference between treatment effects on seed index of bean plants. However, all treatments were superior to control treatment and priming for 9 hours either in water or in 50 ppm Mo solution was the best treatment in both seasons.

Germination percentage as a seed quality indicator responded significantly to the priming treatments in water or Mo solution, for the different periods .Priming bean seeds in 50 ppm Mo solution for 12 hours gave the best result in this regard in 2006 season, while priming in water for 6 hours shared the same rank for the 2007 season.

Data presented in Table 5 show that primed bean seeds in different treatments were characterized by a progressive reduction in mean germination time (MGT) as compared to non-primed seeds. Priming treatments shortened MGT by more than one day in some treatments.

Results reported by numerous authors show a favorable effect of molybdenum on seed yield and structural yield components in bean. The highest increases in seed yield were recorded following the application of 76-90 g Mo˙ha-1. Compared to the control, Vieira *et al.* 1996 recorded a 40% seed yield increase. Reports by Correa *et al.* 1990 showed that molybdenum itself increases the number of pods and seeds per plant, and number of seeds per pod .Deka and Shadeque (1991) recorded an increase in pods yield per plant.

The improved seed yield and quality of primed seed from treated plots may be due to early and improved emergence of the primed plots that ultimately resulted in higher yield. Similar arguments were made by Sharma *et al.* (1993), who attributed higher yield to early floral initiation, more flowers and pods per plant in salicylic acid-primed seed. The resulting improved stand establishment due to priming can reportedly increase drought tolerance, reduce pest damage and increase crop yield (Harris *et al.*, 1999; Musa *et al.*, 1999; Harris *et al.*, 2000). The increase in yield of primed seed plots may be due to the fact that primed seed emerge faster and more uniformly and seedlings grow more vigorously, leading to a wide range of phenological and yield-related benefits (Harris *et al.*, 2000).

4- Chemical Content of Green Pods

Data in Table 6 indicate that total nitrogen, phosphorus and total protein content were higher in pods produced from plants primed with water or Mo solution than those of pods produced from untreated plants in the two seasons. There were no significant effects on the potassium content in pods of plants treated or untreated.

Table (5): The effects of seed priming on bean seed yield and its quality during 2006 and 2007 seasons.

Seasons	2006				2007			
Characters / Treatments	Seed Yield (kg/fed)	Seed Index (g)	Germination Percentage (%)	Mean Germination Time (days)	Seed Yield (kg/fed)	Seed Index (g)	Germination Percentage (%)	Mean Germination Time (days)
Control	716 i	26.0 b	85.0 f	3.25 a	680 f	25.9 d	87.0 e	3.30 a
Priming in water for 3 h.	1010 h	30.0 a	88.0 e	3.00 b	946 e	29.9 c	88.0 d	2.95 b
Priming in water for 6 h.	1077 g	31.1 a	90.0 c	2.44 c	1010 d	31.3 b	92.0 a	2.50 d
Priming in water for 9 h.	1213 c	32.1 a	88.0 e	2.50 c	1124 c	32.1 a	87.0 e	2.45 de
Priming in water for 12h.	1146 d	31.9 a	89.0 d	2.04 d	1133 c	23.1 a	88.0 d	2.10 g
Priming in 50 ppm Mo solution for 3 h.	1080 f	31.2 a	90.0 c	2.23 d	1169 b	31.2 b	90.0 c	2.30 f
Priming in 50 ppm Mo solution for 6 h.	1196 d	32.0 a	91.0 b	2.50 c	1129 c	32.1 a	90.0 c	2.73 c
Priming in 50 ppm Mo solution for 9 h.	1285 a	32.1 a	90.0 c	2.12 d	1216 a	32.1 a	91.0 b	2.34 ef
Priming in 50 ppm Mo solution for 12h.	1282 b	31.9 a	92.0 a	2.20 d	1214 a	32.0 a	92.0 a	2.12 g

Values within the same column followed by the same letters are not significantly different, using Duncan's Multiple Range Test at 5% level.

Dry bean is an important food staple worldwide and provides a significant source of protein, calories, vitamins, minerals, and fiber (Akcin, 1988). In this connection, it should be mentioned that all priming treatments either in water or Mo solution and for different periods of 3, 6, 9 or 12 hours increased protein content of beans significantly over the control treatment which recorded 21.8 and 21.1% protein for the first and second seasons respectively, while priming in Mo solution for 9 hours recorded 24.1 and 24% protein for the first and second seasons, respectively.

Table 6: Effect of seed priming treatments on chemical content of green pod of bean plants during 2006 and 2007 seasons.

Seasons	2006				2007			
Characters / Treatments	Macronutrients (g/100 g dry weigh)			Total Protein (%)	Macronutrients (g/100 g dry weigh)			Total Protein (%)
	N	P	K		N	P	K	
Control	2.86 f	0.559 i	3.67 a	21.8 f	2.71 f	0.578 i	3.79 a	21.1 h
Priming in water for 3 h.	3.13 e	0.582 g	3.76 a	22.2 e	3.42 c	0.591 h	3.81 a	21.9 g
Priming in water for 6 h.	3.15 e	0.605 e	3.80 a	22.8 d	3.43 c	0.601 f	3.82 a	22.6 f
Priming in water for 9 h.	3.25 d	0.591 f	3.77 a	23.3 c	3.12 e	0.609 e	3.83 a	23.1 e
Priming in water for 12h.	3.30 c	0.612 c	3.77 a	23.3 c	3.17 e	0.637 b	3.82 a	23.2 e
Priming in 50 ppm Mo solution for 3 h.	3.22 d	0.615 b	3.78 a	23.7 b	3.12 e	0.628 c	3.81 a	23.5 d
Priming in 50 ppm Mo solution for 6 h.	3.40 b	0.571 h	3.77 a	23.8 b	3.33 d	0.597 g	3.82 a	23.7 c
Priming in 50 ppm Mo solution for 9 h.	3.52 a	0.623 a	3.79 a	24.1 a	3.90 a	0.639 a	3.81 a	24.0 a
Priming in 50 ppm Mo solution for 12h.	3.50 a	0.609 d	3.75 a	24.0 a	3.80 b	0.619 d	3.81 a	23.9 b

VALUES WITHIN THE SAME COLUMN FOLLOWED BY THE SAME LETTERS ARE NOT SIGNIFICANTLY DIFFERENT, USING DUNCAN'S MULTIPLE RANGE TEST AT 5% LEVEL.

CONCLUSION

In many areas, germination and subsequent seedling growth can be inhibited by adverse conditions in the field. Priming is helpful in reducing the risk of poor stand establishment under a wide range of environmental conditions. Priming is a simple and useful technique for enhancing seedling emergence rate and percentage of germination of bean. These effects can improve seedling establishment and field performance of this important food legume.

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تأثير مهيئات الإنبات على المحصول و جودة البذورفى الفاصوليا

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أجريت تجربتين حقليتين خلال الموسم الصيفى لعامى ٢٠٠٦و٢٠٠٧ بمزرعة البرامون (بالقرب من مدينة المنصورة)- محطة بحوث البساتين بالمنصورة - معهد بحوث البساتين - مركز البحوث الزراعية لدراسة تأثير مهيئات الإنبات لفترات مختلفة ٣و٦ و٩ ساعات فى الماء أو محلول ٥٠ جزء فى المليون من المولبيدنيم لنفس الفترات على النمو الخضرى و المحصول و صفات القرون وكذلك المحصول البذرى وجودته فى نبات الفاصوليا صنف برنكو. وإشتملت التجربة على ٩ معاملات وزعت فى قطاعات كاملة العشوائية فى ٣ مكررات

أوضحت النتائج أن تهيئة بذور الفاصوليا للإنبات سواء فى الماء أو محلول المولبيدنيم زاد معنويا قدرة النباتات لاعطاء نمو خضرى قوى متمثلا فى ارتفاع النبات و عدد الأوراق و الأفرع على النبات و الوزن الغض والجاف للنبات و كذلك المحتوى الكلوروفيللى للأوراق. كل معاملات مهيئات الإنبات زادت من المحصول الأخضر و خاصة معاملة التهيئة لمدة ٩ ساعات سواء فى الماء أو محلول المولبيدنيم اللذان أعطا أعلى محصول طازج للفدان و كذلك ازداد المحصول البذرى و تحسنت جودته معنويا نتيجة استخدام معاملات تهيئة البذور للإنبات.

و بصفة عامة فان معاملات تهيئة البذور للإنبات تبدو أنها واعدة و ذات كفاءة عالية و سوف تستخدم على نطاق واسع و يمكن أن تستخدم لاضافة قيمة لمدخلات الانتاج الأخرى مثل الأصناف الحديثة أو استخدام التكنولوجيات الحديثة من أسمدة و ميكنة و خلافه. و هذه التقنية (تهيئة البذور للإنبات) قليلة التكاليف و قليلة المخاطر علاوة على أنها ذات فائدة عظيمة للمزارع حيث أنها تحسن الانتاج ومن ثم الدخل.