RESPONSE OF MUNGBEAN TO DIFFERENT HYDRO-PRIMING PERIODS AND TEMPERATURE REGIMES

Ghulam Mustafa Laghari[1*], Mustafa Raza Laghari[1], Aijaz Ahmed Soomro[1], Shah Jahan Leghari[1], Majeeduddin solangi[2], Ashifa Soomro[3]

[1]Department of Agronomy, Sindh Agriculture University Tandojam, 70060-Pakistan
[2]Department of Horticulture, Sindh Agriculture University Tandojam, 70060-Pakistan
[3]Department of Land and Water Management, Sindh Agriculture University Tandojam, 70060-Pakistan
*Corresponding author's email: leghari222@gmail.com

ABSTRACT**:** *Laboratory experiment was laid out in Replicated Complete Design under laboratory condition during 2013-14 at Seed Testing Laboratory, Department of Agronomy, Sindh Agriculture University Tandojam. The results for mangbean varieties showed that maximum germination (86.78%), shoot length (10.71cm), root length (5.32cm), shoot fresh weight (1693mg), root fresh weight (658.0 mg), shoot dry weight (54.74mg), root dry weight (7.89mg), were observed in 4 hours priming. Whereas, the 2 hours priming ranked second with germination (84.78%), shoot length (10. 40cm), root length (5.19 cm), shoot fresh weight (1664mg), root fresh weight (642.6mg), shoot dry weight (52.81mg), root dry weight (7.71 mg). However, No priming (check) had minimum germination (68.88%), shoot length (7.53cm), root length (3.09cm), shoot fresh weight (1103 mg), root fresh weight (431.9mg), shoot dry weight (38.56mg), root dry weight (5.49mg).. The data further indicated that the maximum germination (86.52%), shoot length (11.12cm), root length (5.60cm), shoot fresh weight (1839mg), root fresh weight (664.7 mg) shoot dry weight (57.88mg), root dry weight (8.20mg), were recorded in 35^oC temperature regimes as compared to 25^oC temperature regimes which was produced germination (81.71%), shoot length (9.51cm), root length (4.48 cm), shoot fresh weight (1553mg), root fresh weight (591.8mg), shoot dry weight (49.09mg), root dry weight (6.89 mg). Whereas, the lowest germination (72.21%), shoot length (8.01cm), root length (3.51cm), shoot fresh weight (1068 mg), root fresh weight (476.0mg), shoot dry weight (49.14mg), root dry weight (6.00mg) were observed in 15^oC temperature regimes. These results are statistically significant ($P<0.05$) probability levels. It is concluded that seed priming period 4 hours proved better for seed germination and early growth traits of mungbean. At 35^oC temperature regime early growth and yield of mungbean was determined.*

Key words: Hydropriming, Mungbean, Germination, Growth, Temperature

INTRODUCTION

Green mung bean is very important annually leguminous crop. Its seed contains about 22 to 25% of protein and thus it becomes a good source in term of vegetable protein for peoples [1]. This crop is cultivated in many areas of Pakistan, but maximum crop yield cannot be obtained in the country. It is due to weak crop growth and establishment which is a big problem in mung bean cultivation [2; 3]. And high yield is associated with early vigorous growth and development [4]. Unfavorable conditions of environment are the major cause of poor stand of crop that is responsible for low crop yield in one of many ways. Good germination insures better establishment of crop and it is a big sign for maximum crop yield. For that seed treatment are necessary before sowing. in the field conditions, primed seeds resulted earlier germination [5]. It has potential to enhance crop by increasing yield and its quality [6]. Seed priming restored deteriorated seeder parts and quickened germination because of speedier developing life [7]. Seed priming is a controlled hydration method in which seeds are soaked in water or low osmotic potential solution for a point where germination related metabolic exercises start in the seeds, however radical development does not happen [8]. Diverse priming treatments joined with various substances, for example, San & KNO3 enhanced seeds by the incitement of germination and impervious to stress [9]. During seed priming, it was found effective for legumes that is, yields of legume harvest were increased impressively by priming seeds before sowing [10; 11; 6]. Moreover to better establishment, primed crops were grown extra vigorously, earlier flowered and provided maximum growth constituents [8; 15]. Levels of preparing media are not suitable for seedling development and foundation in mung bean. Further studies are required for option treatments, advancements of temperatures and substrates, etc and/or consolidating of distinctive seed priming methods [12] In view of above facts the study was started to study impact of priming periods on mungbean seedling growth and evaluate the response of mungbean seedling growth to temperatures regimes.

MATERIAL AND METHOD

Laboratory experiment was laid out in Replicated Complete Design under Laboratory condition during 2013-14 at Seed Testing Laboratory Department of Agronomy, Sindh Agriculture University Tandojam,. mungbean variety C-23 healthy seeds was used in the experiment. Mungbean variety was C-23, twenty (20) seeds were soaked in distilled water and canal water for 2 and 4hours and was kept in Petri dishes, than kept these seed into incubator under different temperature regimes. In this study factor A mentioned as three hydro-priming periods viz. control (no priming), 2 hours seed soaked in distilled water and 4 hours soaked in canal water and factor B showed three temperature regimes as 15 ^{0}C, 25 ^{0}C and 35 ^{0}C. Observations recorded viz. Seed germination%, Soot length (cm), Root length (cm), Shoot fresh weight (g), Root fresh weight (g), Shoot dry weight (g) and Root dry weight (g). Data analysis data were statistically analyzed through MSTAT-C computer software. The LSD value for mean comparison was calculated only if the general treatment F test was significant at a probability of ≤ 0.05 [13].

RESULT AND DISCUSSION

The results showed that maximum mean seed germination% (86.78) was recorded at Hydro-priming period 4 hours, whereas the lower seed germination % (68.88) no priming. In case of temperatures the higher seed germination% (86.52) was found at 35 ^{0}C and the lower seed germination % (72.21) was observed at lower temperature regime 15 ^{0}C,

respectively. The interaction results showed that the higher seed germination % (93.73) was recorded at 4 hours Hydro-priming period x 35 ^{0}C temperature regime where as the lower interaction value (60.45) was observed at no priming or check x 15 ^{0}C, respectively. The primed seeds revealed earlier germination in conditions of field [5].The results showed that maximum mean shoot length cm (10.71) was recorded at Hydro-priming period 4 hours, whereas, the lower (7.536) found at no priming or check. In case of temperatures the higher shoot length cm (11.12) was recorded at 35 ^{0}C and the lower shoot length cm (8.012) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results for shoot length (cm) showed non- significant response to hydro-priming periods x temperature regimes. During seed priming found effective for legumes that is, yields of legume crops were increased considerably by priming seeds before sowing [10; 11; 6].

The maximum mean root length cm (5.324) was recorded at Hydro-priming period 4 hours where as, the lower (3.093) found at no priming or check. In case of temperatures the maximum root length cm (5.602) was recorded at 35 ^{0}C and the lower shoot length cm (3.518) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results for root length (cm) showed non- significant response to hydro-priming periods x temperature regimes. Results revealed that maximum means shoot fresh weight mg (1693) was recorded at Hydro-priming period 4 hours where as, the lower shoot fresh weight mg (1103) was found at no priming or check. In case of temperatures the higher shoot fresh weight mg (1839) was found at 35 ^{0}C and the lower shoot fresh weight mg (1068) was observed at lower temperature regime 15 ^{0}C. The interaction results showed that the higher shoot fresh weight mg (2057) was recorded at 4 hours Hydro-priming period x 35 ^{0}C temperature regime where as the lower interaction value (752.0) was observed at no priming or check x 15 ^{0}C, respectively.

Results revealed that maximum mean root fresh weight mg (658.0) was recorded at Hydro-priming period 4 hours, where as, the lower root fresh weight mg (431.9) was found at no priming or check. In case of temperatures the higher root fresh weight mg (664.7) was recorded at 35 ^{0}C and the lower shoot fresh weight mg (476.0) was observed at lower temperature regime 15 ^{0}C. The interaction results for root fresh weight (mg) showed non- significant response to hydro-priming periods x temperature regimes. The results showed that maximum mean shoot dry weight mg (54.74) was recorded at Hydro-priming period 4 hours, whereas the lower shoot dry weight mg (38.56) found at no priming or check. In case of temperatures the higher shoot dry weight mg (57.88) was found at 35 ^{0}C and the lower shoot dry weight mg (39.14) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results showed that higher shoot dry weight mg (63.63) was recorded at 4 hours Hydro-priming period x 35 ^{0}C temperature regime where as the lower interaction value (30.27) was observed at no priming or check x 15 ^{0}C temperature regime, respectively. Priming can increase the germination and growth of seedling under stressed conditions in oilseeds such as soyban seeds [14]. On the other hand the results displayed that maximum mean root dry weight mg (7.898) was observed at Hydro-priming period 4 hours, where as the lower root dry weight mg (5.496) found at no priming or check. In case of temperatures the higher root dry weight mg (8.203) was found at 35 ^{0}C and the lower root dry weight mg (6.007) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results showed that higher root dry weight mg (8.940) was recorded at 4 hours Hydro- priming period x 35 ^{0}C temperature regime where as the lower interaction value (3.677) was observed at no priming or check x 15 ^{0}C temperature regime, respectively. Higher levels of priming media are not suitable for seedling growth and establishment in mung bean. Further studies are required for alternative treatments, optimizations of temperatures, substrates, etc., and/or combining of different seed priming techniques [12].

Seed germination (%)

The result for germination % has affected by temperature regimes, Hydro-priming periods showed highly significant whereas their interaction was significant for germination % (Table-1). The maximum mean seed germination% (86.78) was recorded at Hydro-priming period 4 hours, whereas the lower seed germination % (68.88) no priming. In case of temperatures the higher seed germination% (86.52) was found at 35 ^{0}C and the lower seed germination % (72.21) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results showed that the higher seed germination % (93.73) was recorded at 4 hours Hydro-priming period x 35 ^{0}C temperature regime where as the lower interaction value (60.45) was observed at no priming or check x 15 ^{0}C, respectively.

Table 1: Effect of temperature regimes and priming periods on seed germination % of mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	60.45 g	69.70 f	76.48 e	68.88 C
2 hours priming	77.68 de	87.32 c	89.34 b	84.78 B
4 hours priming	78.49 d	88.11 bc	93.73 a	86.78 A
Mean for temperature regimes	72.21 C	81.71 B	86.52 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	0.3302	0.3302	0.5718
LSD 5%	0.9809	0.9809	1.699

Shoot length (cm)

Shoot length (cm) has affected by temperature regimes, Hydro-priming periods showed highly significant, whereas their interaction was significant for shoot length (cm) (table-2). The maximum mean shoot length cm (10.71) was recorded at Hydro-priming period 4 hours whereas the lower (7.536) found at no priming or check. In case of temperatures the higher shoot length cm (11.12) was recorded at 35 ^{0}C and the lower shoot length cm (8.012) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results for shoot length (cm) showed non- significant response to hydro-priming periods x temperature regimes.

Table 2: Effect of temperature regimes and priming periods on shoot length (cm) of mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	6.117	7.847	8.643	7.536 B
2 hours priming	8.887	10.29	12.02	10.40 A
4 hours priming	9.033	10.41	12.69	10.71 A
Mean for temperature regimes	8.012 C	9.513 B	11.12 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	0.2817	0.2817	0.5718
LSD 5%	0.8369	0.8369	----

Root length (cm)

Root length (cm) has affected by temperature regimes, Hydro-priming periods showed highly significant, where as their interaction was significant for root length (cm) (Table-3). The maximum mean root length cm (5.324) was recorded at Hydro-priming period 4 hours where as the lower (3.093) found at no priming or check. In case of temperatures the maximum root length cm (5.602) was recorded at 35 ^{0}C and the lower shoot length cm (3.518) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results for root length (cm) showed non- significant response to hydro-priming periods x temperature regimes.

Table 3: Effect of temperature regimes and priming periods on of root length (cm) mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	2.060	3.033	4.187	3.093 C
2 hours priming	4.200	5.120	6.250	5.190 B
4 hours priming	4.293	5.310	6.370	5.324 A
Mean for temperature regimes	3.518 C	4.488 B	5.602 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	0.02108	0.02108	0.03651
LSD 5%	0.06264	0.06264	----

Shoot fresh weight (mg)

Shoot fresh weight (mg) has affected by temperature regimes, Hydro-priming periods showed highly significant, whereas their interaction was significant for shoot fresh weight (mg) (Table-4). Results revealed that maximum mean shoot fresh weight mg (1693) was recorded at Hydro-priming period 4 hours, whereas the lower shoot fresh weight mg (1103) was found at no priming or check. In case of temperatures the higher shoot fresh weight mg (1839) was found at 35 ^{0}C and the lower shoot fresh weight mg (1068) was observed at lower temperature regime 15 ^{0}C. The interaction results showed that the higher shoot fresh weight mg (2057) was recorded at 4 hours Hydro- priming period x 35 ^{0}C temperature regime where as the lower interaction value (752.0) was observed at no priming or check x 15 ^{0}C, respectively.

Table 4: Effect of temperature regimes and priming periods on shoot fresh weight (mg) of mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	752.0 e	1116 d	1441 c	1103 B
2 hours priming	1218 d	1756 b	2018 a	1664 A
4 hours priming	1233 d	1787 b	2057 a	1693 A
Mean for temperature regimes	1068 C	1553 B	1839 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	30.27	30.27	52.44
LSD 5%	89.95	89.95	155.8

Root fresh weight (mg)

The result for root fresh weight (mg) has affected by temperature regimes, Hydro-priming periods showed highly significant where as their interaction was non-significant for root fresh weight (mg) presented in (Table-5). Results displayed that maximum mean root fresh weight mg (658.0) was recorded at Hydro-priming period 4 hours where as the lower root fresh weight mg (431.9) was found at no priming or check. In case of temperatures the higher root fresh weight mg (664.7) was recorded at 35 ^{0}C and the lower shoot fresh weight mg (476.0) was observed at lower temperature regime 15 ^{0}C. The interaction results for root fresh weight (mg) showed non- significant response to hydro-priming periods x temperature regimes.

Table 5: Effect of temperature regimes and priming periods on root fresh weight (mg) of mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	323.1	446.3	526.4	431.9 B
2 hours priming	545.4	657.7	724.9	642.6 A
4 hours priming	559.6	671.6	742.8	658.0 A
Mean for temperature regimes	476.0 C	591.8 B	664.7 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	7.190	7.190	12.45
LSD 5%	21.36	21.36	-----

Shoot dry weight (mg)

Shoot dry weight (mg) has affected by temperature regimes, Hydro-priming periods showed highly significant where as their interaction was significant for shoot dry weight (mg) (Table-6). The maximum mean shoot dry weight mg (54.74) was recorded at Hydro-priming period 4 hours where as the lower shoot dry weight mg (38.56) found at no priming or check. In case of temperatures the higher shoot dry weight mg (57.88) was found at 35 ^{0}C and the lower shoot dry weight mg (39.14) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results showed that higher shoot dry weight mg (63.63) was recorded at 4 hours Hydro- priming period x 35 ^{0}C temperature regime where as the lower interaction value (30.27) was observed at no priming or check x 15 ^{0}C temperature regime, respectively.

Table 6: Effect of temperature regimes and priming periods on shoot dry weight (mg) of mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	30.27 f	37.43 e	47.97 c	38.56 C
2 hours priming	41.81 d	54.60 b	62.03 a	52.81 B
4 hours priming	45.35 c	55.24 b	63.63 a	54.74 A
Mean for temperature regimes	39.14 C	49.09 B	57.88 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	0.5945	0.5945	1.030
LSD 5%	1.766	1.766	3.059

Root dry weight (mg)

Root dry weight (mg) has affected by temperature regimes, Hydro-priming periods showed highly significant where as their interaction was significant for root dry weight (mg) (Table-7). The maximum mean root dry weight mg (7.898) was observed at Hydro-priming period 4 hours where as the lower root dry weight mg (5.496) found at no priming or check. In case of temperatures the higher root dry weight mg (8.203) was found at 35 ^{0}C and the lower root dry weight mg (6.007) was observed at lower temperature regime 15 ^{0}C, respectively. The interaction results showed that higher root dry weight mg (8.940) was recorded at 4 hours Hydro-

priming period x 35 ^{0}C temperature regime where as the lower interaction value (3.677) was observed at no priming or check x 15 ^{0}C temperature regime, respectively.

Table 7: Effect of temperature regimes and priming periods on root dry weight (mg) of mungbean

Hydro-priming periods	Temperature regimes			Mean for hydro-priming
	15 ^{0}C	25 ^{0}C	35 ^{0}C	
No priming (check)	3.677 g	5.863 f	6.947 e	5.496 C
2 hours priming	7.077 e	7.347 d	8.723 b	7.716 B
4 hours priming	7.267 d	7.487 c	8.940 a	7.898 A
Mean for temperature regimes	6.007 C	6.899 B	8.203 A	

	Temperature Regimes	Priming periods	Priming periods x temperature regimes
SE	0.02582	0.02582	0.04472
LSD 5%	0.07671	0.07671	0.1329

CONCLUSION

It is concluded that seed priming period 4 hours proved better for seed germination and early growth traits of mungbean. At 35^{o}C temperature regime early growth and yield of munbean was recorded. The results for mungbean varieties showed that maximum germination (86.78%), shoot length (10.71cm), root length (5.32cm), shoot freshy weight (1693mg), root fresh weight (658.0 mg), shoot dry weight (54.74mg), root dry weight (7.89mg), were observed in 4 hours priming compare to 2 hours priming and no priming (check) had produced minimum values in term of germination, shoot length , root length, shoot fresh weight , root fresh weight , shoot dry weight and root dry weight . The results are statistically significant. . The data further indicated that the maximum germination (86.52%), shoot length (11.12cm), root length (5.60cm), shoot fresh weight (1839mg), root fresh weight (664.7 mg) shoot dry weight (57.88mg), root dry weight (8.20mg), were recorded at 35^{o}C temperature regimes as compared to 25^{o}C temperature regimes

REFERENCES

Khalil, A., ‘’Nutritional improvement of Egyptian breed of mungbean by probiotic Lactobacilli,’’ *Afr. J. Biotech*, **5**: 206-212(2006).

[1]. Naseem, S. B., Khan, A. H., Islam, M., Mollah, U. and Ali, M. A., ‘’Effect of seeding methods and varying surface soil moisture on the stand establishment of mung bean (*Vigna radiata L.*),’’ *Bang. J. Sci. Indus. Res*, **32**: 295-301(1997).

[2]. Rahmianna, A. A., Adisarwanto, T. and Kirchhof, G., ‘’Crop establishment of legumes in rainfed lowland rice-based cropping systems,’’ *Soil Till. Res*, **56**(1/2): 67-82(2000).

[3]. Kumar, R., Tyagi, C. S. and Ram, C., ‘’ Association of laboratory seed parameters with field performance in mung bean,’’ *Seeds and Farms*, **15**: 33-36(2002).

[4]. Ashraf, M. and Foolad, M. R., ‘’Pre-sowing seed treatment- A shotgun approach to improve germination, plant growth, and crop yield under saline and non-saline conditions,’’ *Advan. Agron*, **88**: 223-276(2005).

[5]. Harris, D., Joshi, A., Khan, P. A., Gothkar, P. and Sodhi, P. S., ‘’On-farm seed priming in semi-arid agriculture: development and evaluation in maize, rice and chickpea in India using participatory methods,’’ *Exp. agric*., **35**: 15-29(2004).

[6]. Shad, K.. K.., John, G. M., Abdur, R., Amir, Z., Said, W., Muhammad, Z., Khalil, I. H. and Fida, M., ‘’Soybean mother plant exposure to temperature stress and its effect on germination under osmotic stress,’’ *Pak. J. Bot*, **42**(1): 213-225(2010).

[7]. Farooq, M., Aziz, T., Basra, S. M. A., Cheema, M. A. and Rehman, H., ‘’Chilling Tolerance in Hybrid Maize Induced by Seed Priming with Salicylic Acid,’’ *J. Agro.Crop Sci*, 161-168(2008).

[8]. Mohammad, E., Zfarzad, S., Sajjad, Z., Mohammad and, F., Ashtaki, A. D. M., ‘’Effect of seed priming on mung been (*vigna radiata*) cultivars with salicylic acid and potassium nitrate under salinity stress,’’ *International J. Agri. Res. and Rev*., **2** (S): 926-932(2012).

[9]. Musa, A. M., Harris, D., Johansen, C. and Kumar, J., ‘’Short duration chickpea to replace fellow after Aman rice: The role of on-farm seed priming in the high barind tract of Bangladesh,’’ *Expl Agric*., **37**: 509-521(2001).

[10]. Rashid, A., D. Harris, P., Hollington, S., Ali, ‘’On-farm seed priming reduces yield losses of mung bean (*Vigna indiata*) associated with mung bean yellow mosaic virus in NWFP of Pakistan,’’ *Crop Protect*, **23**: 1119-1124(2004).

[11]. Adnan, U., Safdar, A., Rifat, H., Muhammad, A. and Muhammad, J. T., ‘’Evaluation of seed priming in mung bean *(Vigna radiata*) for yield, nodulation and biological nitrogen fixation under rainfed conditions,’’ *Afric. J. Biotech*, **10**(79): 18122-18129(2011).

[12]. Gomez, K.. A. and Gomez, A. A., ‘’Statistical procedures for agricultural research,’’ *John Wiley and* Sons, *New York. USA*, (1984).

[13]. Kaya, M. D., Okçu, G., Atak, M., Çıkılı, Y. and Kolsarıcı, Ö., ‘’Seed treatments to overcome salt and drought stress during germination in sunflower (Helianthus annuus L.),’’ *European Journal of Agronomy*, **24**(4): 291-295(2006).

[14]. Afzal, I., Basra, S. A. and Iqbal, A., ‘’The effects of seed soaking with plant growth regulators on seedling vigor of wheat under salinity stress,’’ *Journal of Stress Physiology and Biochemistry*, **1**(1): 6-14(2005).