ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

DIFFERENT PRIMING TREATMENTS ON GERMINATION AND VIABILITY OF CLUSTER BEAN SEEDS

Dileepkumar Masuthi*, Mukesh L. Chavan[1], Khaja Rubina S, Ramangouda S.H., Abdul Kareen M, Itagi Prabhakar., Mohammed Waseem, Sudheesh Kulkarni, Tejagouda Bhanuje and Haleshkumar B

*Assistant Professor of Seed Science and Technology. [1]Associate Professor of Crop Physiology. Department of Biotechnology and crop improvement KRC College of Horticulture,Arabhavi-591218, Gokak Tq, Assistant Professor. UHS Bagalkot., Karnataka, India.,

Manuscript Info

Manuscript History:

Received: 12 March 2015
Final Accepted: 25 April 2015
Published Online: May 2015

Key words:

Seed viability, Seed priming, Organic, Germination, Vigor, Quality

Corresponding Author

Dr. Dileepkumar Masuthi

Abstract

The seed germination under control ranged up to 83%, where treatments enhanced up to an average of 90.5% germination. We have observed 94.7% seed germination seeds treated with ginger extract five per cent and 93.8% seed germination with treatment of garlic extracts and extracts of turmeric showed 91% germination and shoot length (21.64 cm) and seedling vigour index (4941) was significantly superior in treatment of Ginger, followed by Garlic respectively. Compared to non-treated seeds, botanical priming with Ginger extract or garlic extracts increased early (3-day) germination percentage at 25^{o}C, and improved total germination percentage of low-germination seed lot.

INTRODUCTION

Seed priming is one of the physiological methods that improves seed performance and provides faster and synchronized germination. It is an easy, low cost and low risk technique and recently being used to overcome the problem in agricultural lands.

Seed priming involves exposing quiescent seeds to a solution or matricum of low water potential that permits partial seed hydration without seed germination (Bradford, 1986). This seed treatment can improve seed germination and seedling emergence, particularly under adverse seedbed conditions, such as low temperature, reduced water availability (Frett and Pill, 1989), or salinity (Wiebe and Muhyad- din, 1987).

During priming seeds are permitted to enter the lag stage of germination (stage with little or no fresh weight increase prior to radicle emergence), but are then desiccated back to approximately the original moisture content before the radicle emerges. Upon subsequent rehydration, seeds show improved germination characteristics which include (1) reduced time to radical emergence, (2) synchronization of germination within a seed lot, (3) greater percentage germination, and (4) improved seed vigour in deteriorated seed lots.

Recently many scientists have concluded that the post storage priming treatments reduced the chromosomal aberrations, increased the rate of root growth, and decreased the frequency of morphologically abnormal seedlings and more or less complete repair of DNA lesions which are occurring during the storage. Seed priming is not only useful for regeneration purposes but also reduces the incidence of heritable genetic damage. Significant changes in enzyme activities were noticed in primed seeds compare to un-primed seeds, desiccation and storage of seeds has been suggested to result in progressive loss of integrity of the membrane components of the seeds, which in turn contribute to seed deterioration as measured by loss of seed vigor and viability (Agrawal and Dadlani 1995).

During imbibition prior to germination the integrity of cell membranes need to be re-established. Rapid imbibitions by the seed at this time possibly reverse the damage and cell will attain maximum vigor by repair mechanism. A protein detected by the proteomic analysis, whose abundance specifically increases during hydro

priming, is a catalase isoform. Catalase is a free-radical scavenging enzyme. It is presumed that hydro priming initiates an oxidative stress, which generates reactive oxygen species, and catalase is synthesized in response to this stress to minimize cell damage. Increased levels of these free radical scavenging enzymes due to the oxidative stress during priming could also protect the cell against membrane damage due to lipid peroxidation occurring naturally (Anuradha *et al.,* 2010). Seed germination and vigour of bell pepper was improved by seed priming with non-toxic and eco-friendly organic sources like Melia azedarach leaf extract 10%, Eucalyptus leaf extract 10%, garlic clove extract 5%, cow urine 5%and cow dung extract 5% for 24 hours.

Botanical-priming process had potential advantages over simple seed coating. Seed priming often results in more rapid and uniform seedling emergence and may be useful under adverse soil conditions. And many researchers have shown the ability of different botanicals in combating adverse climatic condition and also help the seed to show its potentials. Hence the objective of these studies was to investigate the effect of different botanical primings on germination of several seed lot of cluster bean.

MATERIALS AND METHODS

The study was conducted in the seed laboratory of KRC College of Horticulture, Arabhavi. Seeds of Cluster bean (Cyamopsis tetragonoloba),obtained locally. Seeds were subjected to seed priming. Seeds were treated with the following seed-soaking media: (i) unsoaked seed (control); (ii) Garlic extract (5 per cent), (iii) Ginger extract (5 per cent), (iv) Tulsi extract (5 per cent) and (v) Turmeric extract (5 per cent). And seeds were soaked overnight to encompasses the seed germination of cluster bean. After soaking, seeds were washed with distilled water, then re-dried in the incubator at 25ºC in the dark. Germination test was conducted by placing 100 seeds from each of the treatments by between paper method. that was moistened with distilled water. Seeds were kept in germinator at 25ºC in dark condition. A completely randomized design with four replications was used. Radicle protrusion of 2 mm was scored as germination (Kaya *et al*., 2006). Germination was counted final count (14 days) until no further germination occurred. The seedlings were evaluated as described in Seedling Evaluation Handbook (AOSA, 1991). Final germination percentage (%), shoot and radicle length (cm) and seedling length (cm) was recorded after 14 days of planting on germination paper. For statistical analysis, the data of germinating percentage was transformed to arcsin $\sqrt{(100/X)}$. Experimental data was analyzed by a statistical packet. Treatments means were compared using ANOVA test at 1 per cent level of probability. The seedling vigour index was calculated according to the following formula (AbdulBaki and Anderson ;1970):

Seedling Vigour index (VI) = [seedling length (cm) × germination percentage]

RESULTS and DISCUSSION

The results of this study indicate that cluster bean seedlings which are exposed to various seed priming treatments have shown increase in root and shoot length and thus their seedling dry weight content. The seed germination under control ranged up to 83.30 per cent, where as priming treatments enhanced up to 90.50 per cent germination. In this experiment germination of 94.70 per cent was recorded with seeds treated with ginger extract five per cent and 93.30 per cent seed germination with treatment of garlic extracts and extracts of turmeric showed 91.30 per cent germination and shoot length (21.64 cm) and seedling vigour index (4941) was significantly superior in treatment of Ginger over the control, followed by Garlic (21.20 cm, 4827) respectively. But the root length of 30.6 cm was observed in the priming treatment with Garlic extract fallowed by Ginger (30.50 cm). Seedling dry weight was recorded more in ginger priming treatment fallowed by turmeric and garlic priming treatment (6.10 cm each) which are numerically superior over the control. In all our experiment the priming treatment with Tulsi has recorded lower results compared to control with respect to germination and seedling vigour index. This is an indicative to say that Tulsi priming has allopathic effect on the germination of the cluster bean seeds.

On the basis of present results, the ginger and garlic extracts, can be used for the enhancement of seed germination and its quality parameters of various crops. This priming condition stimulates many of the metabolic processes involved with the early phases of germination and it has been noted that seedlings from primed seeds emerge faster, grow more vigorously and perform better. This observation is similar to those of other workers for other plant seedlings.(Bratcher, et al, 1993; Alvarado, A.D. and K.J. Bradford, 1988; Brocklehurst, P.A. and J. Dearman. 1983; Dearman et al ., 1986; Samfield, et al,. 1991; Haigh, A.M. and E.W.R. Barlow. 1987) Overall, our results are in good agreement with observations made by other workers.

Germination percentage of low-germination seed lots can be increased by priming or chilling stratification. However, laboratory germination may not always relate well to greenhouse or field germination. Conditions during germination also may affect the response to seed presowing treatments. When seed lot viability is high but germination is low, or the conditions for germination are less than optimal, a presowing seed treatment could be

beneficial. But these botanical priming will have its additive effect on the germination of the seeds. And botanicals are a cheap source available with farmers. And botanicals will be nature friendly to use. The experimental observation on the increase in the germination of the cluster bean is indicative to the priming with botanicals have effect on the physiological processes of the seeds.

Table: 1 Effect of different botanicals on the seed quality of cluster bean

Treatment	Germination %	Shoot Length (cm)	Root Length (cm)	Seedling Dry Weight(mg)	Seedling Vigour Index
T1	83.3	19.9	29.4	5.9	4108
T2	94.7	21.7	30.5	6.2	4942
T3	91.3	20.8	29.4	6.1	4587
T4	93.3	21.2	30.6	6.1	4827
T5	80.7	21.1	29.7	6.0	4106
Total	443.3	104.7	149.6	30.3	22570
Mean	88.7	20.9	29.9	6.1	4514
SEM±	1.59	0.33	NS	NS	84
CD	5.19	1.09	1.97	0.31	275

T1	Control	T4	Garlic (*Allium sativum*) bulb extract 5 %
T2	Ginger (*Zingiber officinale)* rhizome extract 5 %	T5	Tulsi (*Ocimum tenuiflorum*) leaf extract 5 %
T3	Turmaric (*Curcuma longa*) rhizome extract 5 %		

REFERENCES

Abdul Baki, A.A., and J.D., Anderson, (1973). Vigor determination in soybean by multiple criteria Crop Sci., 13: 630-633

Agrawal PK and Dadlani M (1995). Techniques in Seed Science and Technology. Second Edition. South Asian Publishers N e w D e lh i In te rn at ion a l B o ok C ompa n y Absec on Highlands: 109–113.

Alvarado, A.D. and K.J. Bradford. (1988). Priming and storage of tomato (Lycopersicum lycopersicum) seeds. Seed Sci. Technol. 16:613–623.

Anuradha V, Alice KV and Malavika D (2010). The subcellular basis of seed priming. Current Science 99:450-456

Association of Official Seed Analysis (AOSA). (1991). Rules for testing seeds. Seed Science and Technology. 12:18-19.

Bradford, K.J. (1986). Manipulation of seed water relations via osmotic priming to improve germination under stress conditions. HortScience 21:1105–1113.

Brocklehurst, P.A. and J. Dearman. 1983. Interaction between seed priming treatment and nine seed lots of carrot, celery and onion. I. Laboratory germination. Ann. Appl. Biol. 102:577–584.

Dearman, J., P.A. Brocklehurst, and R.L.K. Drew. (1986). Effects of osmotic priming and ageing on onion seed germination. Ann. Appl. Biol.108:639–648.

Kaya, M. D., G. Okcu, M. Atak, Y. Cıkılı and O. Kolsarıcı (2006). Seed treatments to overcome salt and drought

stress during germination in sunflower (*Helianthus annuus* L.). European Journal of Agronomy. 24:291-295.

Samfield, D.M., J. Zajicek, and B.G. Cobb. (1991). Rate and uniformity of herbaceous perennial seed germination and emergence as affected by priming. J. Amer. Soc. Hort. Sci. 116:10–13.

Haigh, A.M. and E.W.R. Barlow. (1987). Germination and priming of tomato, carrot, onion, and sorghum seeds in a range of osmotica. J. Amer. Soc. Hort. Sci. 112:202-208.

Wiebe, H.I. and T. Muhyaddin. (1987). Improvement of emergence by osmotic seed treatments in soils of high salinity. Acta Hort. 198:91-100.