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# Effect of different seed priming treatments and its duration on seedling characters of Bitter gourd (*Momordica charantia* L.)

**Rishabh Saini, Prashant Kumar Rai, Bineeta M Bara, Purooshottam Sahu, Taqui Anjer and Rupesh Kumar**

**Abstract**
The experiment was conducted in Post Graduate Laboratory Department of Genetics and Plant Breeding SHUATS, Allahabad, U.P during 2015-2017, in order to standardize the suitable methods of priming of along with control Bitter guard seeds. Seeds of Bitter gourd primed with hydro-priming, halo-priming, osmo-priming were evaluated by screening a range of durations and concentration viz, $T_0$ - Unprimed Control, $T_{1-2}$ - Distilled water hydration (for 6 and 12 hrs), $T_{3-4}$ NaCl (for 6 and 12 hrs) and $T_{5-6}$ PEG (for 6 and 12 hrs). Observation shows that the Osmo-priming 12 hrs of Bitter Guard displayed significant high percent of seed germination, seedling length, fresh weight, dry weight, speed of germination and vigour as compared to other treatment and unprimed. Less priming time performance decreased germination and vigour of seeds. It is also found that osmo-priming 12 hrs could to be increase the seedling parameters. The present study helps to improve the seedling parameters with the help of seed priming treatments which are cost effective and economic, non toxic, eco friendly sources.

**Keywords:** *Momordica charantia* seeds, PEG 5000, NaCl, $H_2O$, Seed Quality Parameters.

## 1. Introduction
Bitter gourd is *Memordica charantia L.* commonly known as Karela (hindi) also known as Bitter melon on other part of the world. Bitter gourd is one of the most popular vegetable in India. It is grown extensively throughout India; the bitter gourd has good medicinal value as well. Bitter gourd belongs to the family cucurbitaceae. Fruits are considered as a rich source of vitamins and minerals and 88 mg vitamin C per 100g. Bitter gourd fruits have medicinal value and are used for curing diabetes, asthma, blood diseases and rheumatism. Drinking fresh bitter gourd juice is recommended by naturopaths. Roots and stem of wild bitter gourd are used in many ayurvedic medicines. Due to increasing demand of bitter gourd in medicinal uses and as vegetables, there is urgent need to increase the productivity of bitter gourd in adopted different advances in seed technology. Seed priming is one of the most important aspects to enhance yield and quality in bitter gourd.

Halo-priming- soaking the seeds in salt solutions. Hydro priming technique can help to increase effectiveness of on farm priming. This is the simple technique, in which seeds are soaked in water before sowing and results in average yield increase upto 30% in many crops. This method has been adopted by thousands of resource poor farmers form any crops in many countries, in both Asia and Africa. Osmo-Priming (Osmo-conditioning) is the standard priming technique. Seeds are incubated in well aerated solutions with a low water potential, and later washed and dried. The low water potential of the solutions can be achieved by adding osmotic like mannitol, polyethylene glycol (PEG) or salts like potassium chloride.

Germination of bitter gourd seed is adversely hampered at when temperature goes below 18$^{o}$C (Fonseka and Fonseka, 2011) [2]. In addition to this thick seed coat enclosing embryo, affect germination by imposing mechanical restriction on embryo growth. This problem of poor or slow seed germination can be solved through many techniques and one of them is seed priming. Hence, seed priming is of great importance in areas where low temperature affects seed emergence and uniformity. It reduces the germination time, increases germination percentage, seedling emergence, and increase uniformity under adverse environmental conditions. The present study was conducted to understand the the effect of seed priming on germination and seedling characters of bitter gourd and to identify the suitable treatment and its duration of priming treatment seeds.

## 2. Materials and Method

The cleaned and graded seeds of bitter gourd (Arka Harit), a series of laboratory experiments were conducted in the Post Graduate Laboratory Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Science, Allahabad, Uttar Pradesh, India during 2016-2017, were primed in Distilled water, NaCl (2%) and PolyEthylene Glycol 6000 (PEG 6000) (5%) solution for various durations of 6 and 12 days. After priming the seeds were washed and sown before and after shade drying. The water soaked seeds and the dry seeds served as control. The following observations were recorded in the laboratory:-

### 1. Germination Test

Four replications of 50 seeds for each treatment, for each cultivar, were placed in butter paper rolls, made up of three layers moist with distilled water, with the amount of water equivalent to 2.5 times the weight of dry paper. Next, rolls containing the seeds were transferred to a germination chamber at 25°C, where they remained for 14 days. Evaluations were made at 4 and 14 days after sowing according to the criteria of the ISTA (1924).

Germination percentage was computed using the following formula:

$$\text{Germination (\%)} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds taken for germination}} \times 100$$

### 3. Mean seedling length (cm)

Ten seedlings taken at randomly from each treatment and replication were separated carefully from the paper towel of laboratory germination test and total length of seedlings after removing the cotyledons was measured using metric scale on the germination table. The mean length of ten seedlings in each treatment and replication was calculated and expressed in centimetres.

### 4. Fresh Weight of Seedling (g)

For recording seedling fresh weight, ten seedlings from each sample were taken randomly. The fresh weight of seedling was weighed with the help of electronic balance in gram.

### 5. Seedling dry weight (g)

The weight of seedling excluding the cotyledon was taken on 14$^{th}$ day after over drying at 85ºC for 24 hrs, in bitter gourd. The lot exhibiting the maximum seedling dry weight is considered as vigorous.

### 6. Vigour Index I and II

Ten normal seedlings selected at random from each replication and those seedlings used for growth measurement was placed in a paper cover and dried in shade for 24 hrs. and then they were kept in an oven maintained at 80ºC for 24 hrs. The dried seedling was recorded by the use of an electronic weighing balance and expressed in mg. Vigour index was calculated on the basis of mean seedling length and mean seedling dry weight by adopting the formula.

Seedling vigour index I = Germination (%) × Seedling dry weight (g)

Seedling vigour index II = Germination (%) × Mean seedling length (cm).

## 3. Result and Discussion

It is evident from the table-1 that significantly maximum increase in total germination occurs in $T_6$ Poly Ethylene Glycol 5% for 12 hrs (87%) followed by $T_5$ Poly Ethylene Glycol 5% for 6 hrs (85%) while lowest germination $T_0$ (67%) was observed with unprimed control treatment. Venkatasubramanian and Umarani (2007) [6] finished similar result who reported that matric priming for egg plant and chilli is established as best methods of priming treatment capable of improving of germination percentage. Similar finding has been studied by Mavi *et al.* (2006) which show that the priming seed widely used commercial process that accelerates the germination rate. Significantly maximum increase in Speed of germination occurs in $T_6$ Poly Ethylene Glycol 5% for 12 hrs (18) followed by $T_5$ Poly Ethylene Glycol 5% for 6 hrs (10.50%) while lowest Speed of germination $T_0$ (3.75%) was observed with unprimed control treatments. Jianhua and Mcdonald (1997) reported that in case of accelerated aged seeds, halopriming for small-seeded crops is established as best method of priming capable of improving speeds of germination. It is evident from the table that significantly maximum increase in seedling length occurs in T6 Poly Ethylene Glycol 5% for 12 hrs (40.18) followed by $T_4$ Poly NaCl 2% for 12 hrs (38.24%) while lowest seedling length T0 (13.87%) was observed with unprimed control treatment. Mavi *et al*. (2006) who reported that priming treatment increased seedling size. It is evident from the table that significantly maximum increase in Seedling fresh weight occurs in $T_6$ Poly Ethylene Glycol 5% for 12 hrs (40.18) followed by $T_4$ Poly NaCl 2% for 12 hrs (38.24%) while lowest seedling length $T_0$ (13.87%) was observed with unprimed control treatment. Seedling fresh weight of plants derived from primed seed was higher than unprimed seeds (Hassanpouraghdam *et al*. 2009). It is evident from the table that significantly maximum increase in Seedling dry weight occurs in $T_6$ Poly Ethylene Glycol 5% for 12 hrs (1.98) followed by $T_4$ Poly NaCl 2% for 12 hrs (1.42%) while lowest seedling length $T_0$ (0.42%) was observed with unprimed control treatment. Similar result has been reported by Demir kaya *et al.* (2006). It is evident from the table that significantly maximum increase in Vigour index length occurs in $T_6$ Poly Ethylene Glycol 5% for 12 hrs (3495.66) followed by $T_5$ Poly Ethylene Glycol 5% for 6 hrs (3081.25) while lowest Vigour index length $T_0$ (929.29) was observed with unprimed control treatment. It is evident from the table that significantly maximum increase in Vigour index mass occurs in $T_6$ Poly Ethylene Glycol 5% for 12 hrs (172.26) followed by $T_4$ NaCl 2% for 6 hrs (113.06) while lowest Vigour index mass $T_0$ (28.14) was observed with unprimed control treatment. These results are in agreement with the finding of Venkatasubramanian and Umrani (2007).

**Table 1:** Mean performance data for 9 seedling characters in Bitter gourd (*Momordica charantia* L.)

| S. No. | Treatment | Germination (%) | Speed of Germination | Shoot length (cm) | Root length (cm) | Seedling length (cm) | Seedling fresh weight (gm) | Seedling dry weight (gm) | Vigour index length (cm) | Vigour index mass (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | $T_0$ | 67 | 3.75 | 5.56 | 8.30 | 13.87 | 4.02 | 0.42 | 929.29 | 28.14 |
| 2. | $T_1$ | 72 | 7.0 | 8.78 | 12.45 | 21.26 | 6.01 | 0.58 | 1530.72 | 41.76 |
| 3. | $T_2$ | 74 | 8.0 | 10.12 | 15.05 | 25.18 | 6.42 | 0.62 | 1863.32 | 45.88 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 4. | $T_3$ | 79 | 9.50 | 15.40 | 18.20 | 33.60 | 7.46 | 0.82 | 2654.40 | 64.78 |
| 5. | $T_4$ | 80 | 13.0 | 17.30 | 21.15 | 38.24 | 10.02 | 1.42 | 3059.20 | 113.06 |
| 6. | $T_5$ | 85 | 10.50 | 16.22 | 20.52 | 36.25 | 8.98 | 0.97 | 3081.25 | 82.45 |
| 7. | $T_6$ | 87 | 18 | 18.20 | 21.90 | 40.18 | 11.38 | 1.98 | 3495.66 | 172.26 |
| 8. | Mean | 77.75 | 9.89 | 13.08 | 16.79 | 29.87 | 7.76 | 1.49 | 2381.63 | 118.21 |
| 9. | F-test | S | S | S | S | S | S | S | S | S |
| 10. | S. Ed. (±) | 0.752 | 0.321 | 0.391 | 0.602 | 0.605 | 0.279 | 0.153 | 61.55 | 11.94 |
| 11. | CD (P=0.05) | 1.564 | 0.658 | 0.801 | 1.253 | 1.259 | 0.58 | 0.317 | 128 | 24.83 |

## 4. Conclusion

It is concluded from the present study that the seeds of bitter gourd were treated with $T_6$ (PEG @ 5% for 12 hrs) was found to be the best priming treatment compared to control in all seedling parameters followed by $T_4$ (NaCl @ 2% for 12 hrs) in respect to speed of germination, seedling length, fresh weight, dry weight and vigour index II in Bitter gourd seeds.

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