Effects of seed priming and its duration on bitter gourd

Sarthi and Dr. Monisha Rawat

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Abstract
The poor seedling problem in bitter gourd is caused by the embryo being enclosed by a thick seed coat that prevents germination by putting mechanical restrictions on embryo development. Pre-germinated bitter gourd seeds may be planted to overcome this problem. Crop priming is the process of enhancement of germination and uniform emergence of seedlings under field conditions. As it can foster vigour and crop growth and ultimately increase yields. It is a very low-cost hydration technique in which seeds are prepared with various chemicals or also with natural water. The seeds are re-dried after processing and shown in the field. For improved crop stand, germination and yield of different vegetable crops, seed priming is commonly adopted. Hydropriming, osmopriming, halopriming, solid matrix priming, biopriming and hormonal priming are different priming techniques to boost plant growth, improve stress tolerance, increase nutrient efficiency and other plant growth factors.

Keywords: Seed priming, hydropriming, halopriming, osmopriming

Introduction
After drying, the seeds are re-dried and can be seen in the field. Seed priming is commonly used for improved crop status, germination and yield of various vegetable crops.

Solid matrix priming, Halopriming, Hydropriming, osmopriming, hormonal priming and Biopriming are a number of priming techniques designed to promote plant growth, improve stress tolerance, increase nutrient production and other plant growth factors. Bitter Gourd (Momordica charantia L.) (2n=22) is widely cultivated crop in Asia and Africa and it is tropical and subtropical crop which is grown for its edible fruit and is considered to be a major crop of the Cucurbitaceae family. It has a bitter taste compared to other cucurbits (Behera et al., 2008) [2]. It is common in India with medical, economic and economic applications. It is commonly cultivated in India, Indonesia, Malaysia, Singapore, Thailand, Japan, tropical Africa and South America (Miniraj et al. 1993) [34]. Thanks to its high medicinal nature, bitter gourd is known to be the most important vegetable crop (Anonymous, 2011). Piles, leprosy and jaundice are also treated with fruit and leaves. Roots are helpful with haemorrhoids. Karela contains a variety of biologically active plants that include chemicals, including triterpenes, proteins, hormones, alkaloids, saponins, flavonoids and acids, which regulate anti-fungal, antibacterial, anti-parasitic, anti-viral, anti-fertility, anti-tumour, Hypoglycemic and anti-carcinogenic. There is a charantin agent in the bitter gourd that is used to treat diabetes to automatically regulate blood sugar levels. In traditional medicine, stems, foundation, leaves and fruits of bitter gourd have been used to treat diseases such as hyper lipidaemia, intestinal disorder, menstrual and microbial infections (Yibchok et al. & Hsu (2006) [24]. Fruits are iron-rich (2.0mg/100 g), vitamin A, B, C and a good protein supply (2 per cent). The sub-optimal temperatures i.e below 18°C by which germination of bitter gourd seed is adversely affected (Fonseka and Fonseka, 2011). In addition to this thick coat of embryo confinement, germination is impaired by the application of a mechanical constraint on embryo development (Pandita and Nagarajan 2004) [15]. The rate of seed germination is not 100 per cent due to the presence of hard seed coat (Pandita and Nagarajan, 2004) [15]. Crop priming is an effective method for enhancing seed germination and vigour. Priming increases the rate of germination, speed of germination, time of germination and seed priming is one of the most critical aspects of improving the yield and consistency of bitter gourd (Farooq et al., 2006) [40].

Impact of seed priming with their different methods
Crop priming is crop hydration controlled to a degree that allows for continuity of pre-germinative metabolic activity, but interrupts the actual production of the radicle. Choudhary et al. (2008) (2008) [35] Essentially, the priming seed is a physiological process in which the seeds are pre-soaked before planting.
allowing partial imbibition on their own, while preventing germination by Nascimento et al. (2004) [13]. Saleem et al. (2014) [10] concluded that seed soaking in water for 12 hours is capable of promoting the growth of bitter gourd cultivars in germination and seedling growth. It was concluded that under the agro-climatic conditions of the Bhimber district of Azad Kashmir, the seed soaking of the Palee cultivar for 12 hours showed the best results in maximum germination and increased growth.

Lin & Sung, (2001) [30] noted that the embryo of bitter gourd plants, which affects germination and induces low field emergence and seedling establishment, is enclosed by a thick seed coat. Crop soaking is also a positive prerequisite for a definite successful seedling establishment for bitter gourd growers under sub-optimal temperature conditions. Thirusenduraselvi and Jerlin (2007) define an appropriate pre-germination process that could provide the maximum percentage of the emergence of bitter gourd cv. 100% pre-germination of bitter gourd seeds was obtained after soaking and among the different treatments when immersed in panchakavya @ 3% solution for 9 h with 7 days of incubation, which was equal to soaking in KNO3 @ 2 percent.

Hydropriming
Soak the seeds in water before sowing, that may or may not be proceeded through air drying process of the seeds. In both saline and non-saline conditions, hydropriming will improve the percentage of seed germination and the growth of seedlings (Roy and Srivastava, 1999) [27]. Bitter gourd seed hydropriming has the ability to increase seed germination, seedling growth and bitter gourd yield. Crop soaking in hot water (45°C) effectively improved germination speed, seedling vigour, other growth parameters such as primary branch length, leaf distance, etc. and reproductive characteristics such as first flowering days, first fruit setting and total fruit per plant for 5 minutes, while other water soaking treatments were also better at various temperatures and time (Tania et al. 2019) [38].

The increase in germination can also be related to metabolic repair processes after 72 hours of priming (Mehta et al. 2010) [36]. And under sub-optimal soil temperature conditions, 72 hours of seed hydro-priming at a temperature of 20 °C is optimal for increasing seed quality parameters (Mehta et al. 2014) [37].

Osmopriming
Osmopriming is the immersion of seeds in osmotic solutions containing chemicals such as polyethylene glycol (PEG), mannitol, glycerol, sorbitol etc., also known as osmoconditioning (B. Raj and K. Raj, 2019) [32]. Seeds are immersed in an aerated solution of sugar (sorbitol, mannitol, etc.) or polyethylene glycol (PEG) during osmopriming, typically accompanied by surface drying or re-drying. Several studies have reported that under ideal and sub-optimal conditions, osmopriming increases seedling and seedling / crop development (Sher et al., 2019) [21]. Relative to other treatments and unprimed, PEG osmopriming at 5 per cent of 12 hours Bitter Guard shows a substantially high percentage of seed germination, seedling length, fresh weight, dry weight, germination rate and growth rate. Less priming time efficiency decreased seed germination and vigour (Saini et al. 2017) [19] and embryo expansion and endosperm compression, along with tissue deformation, were influenced by osmopriming (Lipty and Zariffa 1993) [7]. A number of other studies have recorded that PEG priming increased the germination of muskmelon (Nascimento 2003) [13], bitter gourd (Pandita and Nagarajan 2004; Thirusenduraselvi and Jerlin 2009) [15, 22]. Osmopriming with PEG significantly increased soya seed growth and crop yield (Arif et al. 2008) [1].

Halopriming
In this technique, the seeds are immersed in inorganic salt solution, i.e. NaCl, KNO3, CaCl2, CaSO4, etc. A number of studies have shown major improvements in seedling growth, germination, planting and final yield in salt-affected soil in response to halo-priming (Khan et al., 2009) [5]. Improvement in 5-007-amylose and dehydrogenase activities due to seed priming with potassium nitrate in muskmelon (Singh et al. 1999). Salinity increased electrolyte leakage in snake melon seedlings, but KNO3 primed seeds had lower electrolyte leakage and higher DW (dry weight) seedlings compared to other treatment seedlings (Gharahlar et al., 2010) [17]. The effect of priming NaCl on salinity toll was higher than that of non-primed seed (Nascimento, 2003) [12]. In addition to mediated osmocontrol by the aggregation of organic solutes, NaCl priming of melon seeds has improved the resistance of seedling salinity by encouraging K and Ca aggregation increase (Sivritepe et al. 2002).

Solid Matrix Priming
Because of the high cost of osmotic agents, solid matrix priming (SMP) or matricconditioning, and mechanical aeration problems of osmopriming (Paparella et al. 2015) [31]. This process involves the incubation of seeds with a small volume of water in a solid insoluble matrix such as charcoal, peat moss, vermiculite, diatomaceous earth, clay, sand and confers a gradual imbibition (Mondal and Bose, 2014) [30]. The preparation of seeds of cucumber cv K-75 with various solid matrix carriers viz., Perlite, Sphagnum moss, Cocopeat, Vermiculite, Saw dust, Wheat bran, Corn cobs, Bituminous soft coal, The findings showed that for most horticultural traits and for yield and yield contributing characteristics, the strong matrix priming of the seed with Cocopeat followed by Perlite provided the best findings (Mehta et al., 2013) [8]. Kanwar and Mehta (2017) [6] resulted that seed priming with solid matrix carrier ‘Perlute’ for 72 hrs may be used as an effective pre-sowing treatment to improve the emergence, growth and yield properties of seedlings in bitter gourd.

Biopriming
Biopriming is a seed therapy that includes seed inoculation with beneficial microorganisms (biological aspect) and seed hydration control (physiological aspect) for the management of biotic and abiotic stress (Bisen et al., 2015) [3]. Biopriming with beneficial microbes offers groundbreaking crop protection, according to Rakshit et al. (2015) [3], by enhancing the quality of seeds, seedling vigour and plant ability to withstand sub-optimal growth conditions, by ensuring sustainable crop production Mahmood et al. (2016) [9] reviewed the fact that biopriming accelerates the germination process, ensures the uniformity of the emergence of seedlings and thus increases crop yields and efficiency. The involvement of Trichoderma asperellum cucumber roots activates salicylic acid and jasmonate pathways in the plant and enhances the activity of peroxides, thereby ensuring defence for cucumber plants against foliar pathogens (Segarra et al., 2007) [20].
Seed Priming with Plant Growth Regulators, Hormones, and Other Organic Sources

In order to boost the production and productivity of field and horticultural crops under optimum and sub-optimal conditions, hormone-priming plants, growth-promoting rhizobacteria and other organic sources have been reported. Seed priming with plant growth regulators, hormones and other organic sources is a viable solution to improve seed germination, crop production and crop productivity. (Sher et al. 2019) [21].

Various plant growth hormones such as GA3, kinetin, NAA and ascorbate are treated in hormonal priming seeds. This are essentially pre-soaking therapies that encourage the growth and production of seedlings (Ashraf et al., 2001). Uh, HM et al. (2018) [18] concluded that, for twenty-four hours, the seeds treated with gibberlic acid @ 100 ppm resulted in increased germination of certain bitter gourd genotypes by increasing water permeability, encouraging digestive enzymes, and also based on the genetic structure of the crop. Hassan local (75.80) percent demonstrated slightly improved germination of all genotypes compared to all other genotypes. Nagamani et al. (2015) [14] The influence of growth regulators was more apparent in the rainy season than in the spring summer season. GA3 @ 50 ppm, NAA @ 200 ppm, ethereal @ 50 ppm were successful for enhancement of vegetative growth, fruit and seed yield and change of sex speech.

Conclusion

Under adverse agro-climate conditions, seed priming enhanced stand establishment with increased tolerance to stress situations, increased disease resistance, improved germination, seedling growth, and other seed quality parameters among all seed vigour classes. Seed priming is an environmentally safe and effective technology which can be easily adopted by resource-poor farmers and benefited the farmers in a number of ways. Seed priming is a tool for sustainable agriculture. Due to its simplicity and reduced cost and therefore, for its subsequent highest likelihood of a large-scale commercial use, seed priming is an interesting alternative.

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