



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(1): 242-244

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Received: 04-11-2018

Accepted: 08-12-2018

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Enhancement of seed quality through orgopriming in brinjal (*Solanum melongena* L.)

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Abstract

Brinjal crop production is adversely affected by its reduced germination percentage. Orgo priming of the brinjal seeds are having several positive effects on the seed quality and thereby increase the germination percentage. So an experiment was carried out to utilize several orgopriming techniques for the improvement of seed vigor and to find their efficient concentration. As orgopriming agents, varying concentrations of Panchagavya, Cow urine and Coconut water were used. The treated seeds along with control were evaluated for their seed quality parameters under laboratory condition resulted a higher germination percentage with enhanced seed quality parameters in seeds primed with coconut water followed by cow urine. The best priming treatment recorded higher seed germination, root length, shoot length, dry matter production and vigour index which were by using coconut water as compared to other treatments. This proved that the orgopriming can be an effective way to enhance the seed quality in brinjal.

Keywords: brinjal, organic seed priming, seed viability, germination, vigour, seed quality

Introduction

Brinjal or eggplant (*Solanum melongena*) is a perennial solanaceous crop which is economically grown in India. The fruit or berry is consumed primarily as unripe cooked vegetable and preferred throughout Indian subcontinent. It is a low calorie food with low fat content and rich in protein, fibre, carbohydrates, vitamins and minerals. So it is suitable for a healthy diet with additional benefits due to free reducing sugars and amide proteins [1]. Rather than the benefits as a vegetable crop, brinjal is also known to have several therapeutical properties and used as a component in ayurvedic medicine. It is preferable for patients with type 2 diabetics [2] and those who are having liver complaints [3]. The higher phenolic content with high free radical scavenging properties makes it as a potential candidate for cancer treatments [4]. Additionally, roots of brinjal plant also have antiasthmatic properties and leaves are used externally for the treatment of burns, cold sores and abscesses [5].

The demand for the eggplant is increasing due to its nutritional and medicinal value. But the decrease in germination percentage is a major problem. There are also the reports of dormancy of a freshly harvested seed in many varieties. Several phytohormones are found to have crucial effect on seed dormancy and germination. There are several seed priming agents for improving the germination and breaking dormancy like potassium nitrate and phytohormones like GA₃ etc [5]. But the chemical treatments can cause residual effects while consuming as food or as medicine. So the priming with organic materials can be a better alternative. Orgo priming refers to soaking of seeds in solutions of various organics viz., coconut water, leaf extracts, cow urine, panchagavya, vermiwash, Trichoderma etc. either alone or in combinations [6]. The priming helps in improved germination by different solutions when imbibed by the seed [7]. The seed priming technique is found to have increase in performance of seeds in many crops [8]. So the investigation was aimed at utilizing some of the easily available organic substances for improved germination in brinjal seeds.

Materials and Methods

The genetically pure seeds of brinjal variety PKM1 were used for the study. Panchagavya 2% and 4%, Cow urine 2% and 4%, Coconut water 25% and 50% were used as the priming agents. The distilled water was used as the control for comparison. Seeds were soaked in these organic materials for twelve hours with a seed to solution ratio of 1:1 (weight: volume). After priming the seeds the seeds were removed from the solutions, rinsed in water,

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dried in shade at room temperature and the following seed parameters were assessed.

The germination test was conducted with 50 seeds in eight replications for each treatment in germination paper. The test conditions of 25 ± 2 °C and $95 \pm 2\%$ relative humidity (RH) were maintained in the germination room. At the end of 14th day, the numbers of normal seedlings (seedlings showing normal root and shoot development) were counted and the mean was expressed as percentage. The germination test was conducted in eight replications with 400 seeds as per ISTA rules [9]. Ten seedlings were randomly removed from each treatment carefully so as to remove the plant intact with entire root system. The length of root and shoot length of seedlings was recorded from the base of the seedling to the tip of the top most leaf in each plant and their mean was reported in cm. For dry matter production, the seedlings selected for root and shoot length were placed in a paper cover, shade dried for 24 hours and dried in a hot air oven maintained at 80 ± 2 °C for 24 hours. Then they were cooled in a desiccator, weighed and expressed as gram per 10 seedlings. Vigour index values were computed using the following formula and the mean values were expressed as whole numbers [10].

$$\text{Vigour index} = \text{Germination (\%)} \times \text{Total seedling length (cm)}$$

The data were analyzed statistically adopting the procedure described by Panse and Sukhatme [11].

Solutions used for orgoprimering

Panchagavya: The following ingredients were used to

prepare 20 litres of panchagavya stock solution. Cow dung (5 kg), cow's urine (3 l), cow milk (2 l), cow milk curd (2 l), cow clarified butter / ghee (1 l) (Plate 1). In addition, sugarcane juice (3 l) tender coconut water (3 l) and ripe banana (1 kg) were also added to accelerate the fermentation process. All the materials were added to a wide mouthed mud pot and kept open under shade. The contents were stirred twice a day for about 20 minutes; both in the morning and evening facilitate aerobic microbial activity for 15 days. From this panchagavya stock solution, two per cent and four per cent concentrations were prepared for the treatment.

Cow urine: freshly collected cow urine is used for preparing 2 percent and four percent solutions.

Coconut water: It is collected from tender coconut formed 5-7 months after the exertion.

Results and Discussion

As a basic input in agriculture, the healthy seed is a crucial factor in crop production. The good quality seed will respond to fertilizers and other inputs and finally decides the yield. The seed factors along with the environmental factors are influencing the germination percentage, initial vigor of the seedling, plant population per unit area, yield and productivity. As the decrease in seed germination and vigor was found to be a major problem, the experiment was conducted to evaluate the effect of orgoprimering on seed quality parameters in brinjal var. PKM1.

Table 1: Influence of orgoprimering on seed quality parameters in brinjal cv PKM1

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Dry matter production (mg seedling ⁻¹⁰)	Vigour index
Control	79	4.1	4.2	26.8	656
Panchagavya 2%	80	5.1	5.3	30.4	832
Panchagavya 4%	80	4.8	4.6	28.9	752
Cow urine 2%	85	6.1	6.2	35.3	1046
Cow urine 4%	82	5.8	5.7	32.1	943
Coconut water 25%	85	6	5.9	34.1	1012
Coconut water 50%	88	6.2	6.3	38.1	1100
Mean	83	5.4	5.5	32.2	906
SEd	1.03	0.06	0.04	0.40	10.2
CD (P=0.05)	2.15	0.13	0.09	0.83	21.2

There were significant differences in seed germination of treated seeds when compared to the control (71 percent) which was having lowest germination percent. The seeds treated with coconut water 50% showed the highest germination (88 percent). Coconut water 25% also showed a significant increase in germination (85 percent) which was on par with cow urine 2% (85%) Coconut water is very well known for its content of enzymes and growth promoting substances especially cytokinin. Combination of these beneficial factors might have contributed towards germination improvement. Mamaril and Lopez reported similar positive effect of coconut water in increasing biomass and fruit yield of sweet pepper [12]. Orgoprimering cow urine (4%) were also effective in enhancing the germination level significantly, over control.

The root length of 6.2 cm was observed in seeds treated with coconut water 50% followed by coconut water 25% (6.0 cm). The highest shoot length was also recorded in Coconut water 50% (6.3 cm) followed by cow urine 2% (6.2 cm). Seedling dry weight and f vigour index was recorded more in seeds primed with coconut water 50% (38.1 mg seedling⁻¹⁰).

Growth hormones in coconut water might have increased the average dry weight of the plant which can be due to increased cell division within the apical meristem of seedling roots.

Coconut water 50 per cent induced the maximum germination per cent, shoot length, dry matter production of seedlings and vigour index. So, we can conclude that the 50 percent coconut water can be effectively used for orgoprimering and is the ideal one followed coconut water 25% and cow urine 2%. As a conclusion, these organic substances can be effectively used for seed priming for increased germination and vigor with no adverse effect on environment and humans.

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