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Amit Kumar
M.Sc. Fruit Science, RVSKVV, Gwalior, Madhya Pradesh, India

Dr. PKS Gurjar
Scientist of K.V.K. RVSKVV, Gwalior, Madhya Pradesh, India

Dr. Arjun Kashyap
Assistant Professor Cont. (Department of Horticulture College of Agriculture Gwalior, Madhya Pradesh, India

Vikash Mandloi
Ph.D. Scholar, RVSKVV, Gwalior, Madhya Pradesh, India

Arun Parteti
M.Sc. Fruit Science, RVSKVV, Gwalior, Madhya Pradesh, India

Corresponding Author:
Amit Kumar
M.Sc. Fruit Science, RVSKVV, Gwalior, Madhya Pradesh, India

Response of pre-sowing seed treatments on growth of Ber (*Zizyphus mauritiana* L.)

Amit Kumar, Dr. PKS Gurjar, Dr. Arjun Kashyap, Vikash Mandloi and Arun Parteti

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Abstract
The present investigation entitled "Response of Pre-sowing seed treatments on growth of ber (*Zizyphus mauritiana* L.)" the experiment was conducted at dry land horticulture field sirsod, College of Agriculture, Gwalior (M.P.) during 2018-19. The experiment was laid out in Completely Randomized Block Design with twelve treatments including control and replicated three times each. The twelve treatments consisting of three factors i.e. cow urine, water and plant growth regulators are T_0 (Control), T_1 (GA_3 @ 200 ppm for 24 hrs.), T_2 (GA_3 @ 300 ppm for 24 hrs.), T_3 (GA_3 @ 400 ppm for 24 hrs.), T_4 (NAA @ 50 ppm for 24 hrs.), T_5 (NAA @ 100 ppm for 24 hrs.), T_6 (NAA @ 200 ppm for 24 hrs.), T_7 (soaking in water for 24 hrs.), T_8 (soaking in water for 48 hrs.), T_9 (soaking in water for 72 hrs.), T_{10} (Cow urine for 24 hrs.) and T_{11} (Cow urine for 48 hrs.) T_{12} (Cow urine for 72 hrs.) respectively were tested under the experiment. The observations were recorded on different aspects of root growth and survival *viz*. diameter of tap root The result of experiment revealed that the GA_3 @ 400 ppm for 24 hr (T_3) significantly reduce the mortality of plants and improved other parameter like Days taken to start germination (9.00), Days taken to 50% germination (13.00), Germination percent (73.33% and 76.00%) at 30 and 60 DAS, Height of seedling (29.67, 34.67 and 39.00 cm) at 60, 90 and 120 DAS, Number of leaves per seedling (33.00, 55.00 and 67.33) at 60, 90 and 120 DAS, Fresh weight of shoot (38.00 g) at 120 DAS and Dry weight of shoot (26.33 g) at 120 DAS.

Keywords: Response, pre-sowing seed treatments, growth, Ber, *Zizyphus mauritiana* L.

Introduction
Ber (*Zizyphus mauritiana* L.), is called as poor man's apple. It is one of the most ancient and common fruit's indigenous to India, belongs to the family Rhamnaceae. Ber is popular due to high economic returns, low cost of cultivation wider adaptability and ability to withstand drought (Pareek, 1983 and Pareek, 1993) [12, 13]. Generally ber seed are sown for root stock and growth are important constants in ber seeds. Many treatments like soaking in water, cow urine and PGRs are found suitable for enhancing the seed germination and growth of root stock.Pre-sowing treatments with Soaking in water, cow urine and plant growth regulators have a significant role on the seed germination, seed emergence, seedling height, number of leaves, number of roots and several % ber crops. Soaking seeds in aqueous solutions of GA_3, NAA and soaking in water & cow urine has been found to induce early germination, enhance germination percentage and promote seedling growth in fruit crops like Mango, Custard apple, Karonda and Tamarind etc.Plant growth regulators like GA_3 and NAA enhance the germination, growth and survival of seedlings. GA_3 is used for weakening of the seed coat so that the radical of the seedling can break through the seed coat. The seed soaked in GA_3 and NAA for 24 hour resulted in high germination and shoot length. The germination of seeds is also accelerated by soaking in cow urine and water for 24, 48 and 72 hours, in which germination is occurred more than doubled. Cow urine contains Iron, urea, Uric acid, estrogens and progesterone which affect the inhibitory responses to shoot growth and seedling vigour.

Material and Methods
The experiment was conducted at the dry land horticulture field sirsod, Department of Horticulture, College of Agriculture, Gwalior (M.P.).

The experiment was laid out in Completely Randomized Design (CRD). All the treatments were replicated thrice. The experiment was under taken in order to Effect of Pre-sowing seed treatments on root growth and survival of Indian ber (*Zizyphus mauritiana* L.). Selected well ripened healthy, disease free three kg fruits of ber were taken and seeds were extracted carefully. Extracted seeds were washed in tap water and dried under shade for 24 hours. Poly bags of length 20 cm and diameter of 30 cm having 200 gauge thicknesses were used. The bags were filled with the media comprised of soil + send + FYM in the ratio of 2:1:1, respectively. Required quantity 200, 300, 400 mg of GA_3 and 50, 100, 200 mg NAA were weighing with the help of an electronic balance. After weighing growth regulators were transferred separately into different glass beaker with the help of soft brush. For dissolving the growth regulators, a few drops of 95% ethyl alcohol were added just to dissolve the growth regulators. 1000 ml of distilled water was added in each concentration of growth regulators containing labelled beakers to make the solution of 200, 300, 400 ppm of GA_3 and 50, 100,200 ppm NAA. One seed were hand dipped at 2 cm depth in each poly bag. Watering and other operation were done as per requirements.

Result and Discussion

Minimum (9.00) days was observed for seed germination under T_3 (GA_3 at 400 ppm for 24 hr) while in T_0 (Control), maximum (15.33) days was seen. Hence, due to involvement of GA_3 activation of cytological enzymes takes place which increases in cell wall plasticity and better absorption of water. These findings are supported by Parameshwari and Srimathi (2008) [10]

Among the different treatment of NAA, the minimum (10.33) days taken to start germination was recorded under T_7 (NAA @ 200 ppm for 24 hr) which was significantly lower than T_5(NAA @ 100 ppm for 24 hr) and T_4 (NAA @ 50 ppm for 24 hr). These findings were closely related to Patil *et al.* (2012) [14].

Among the different treatment of cow urine and water the minimum (11.33) days taken to start germination was recorded under T_{12} (Cow Urine for 72 hr) which was significantly lower than other lover time of soaking of water and cow urine.

Treatment T_3 (GA_3 @ 400 ppm for 24 hr) has taken minimum days i.e. (13.00) for 50% germination and maximum days taken by control treatment i.e. (22.67). Similar result has been reported by Lavania *et al.* (2006) [6] that the seed germination of *Pinus wallichiana* was maximum with the application of 400 ppm GA_3 for 24 hr at par with 300 ppm GA_3 for 24 hr. These results indicate that increasing concentration of GA_3 leads to maximum germination and also similar result has been reported by Pawar V.B. *et al.* (2010) [15, 16] and Lay P. *et al.* (2015) [7].

Among different concentrations of NAA T_7 (NAA @ 200 ppm for 24 hr) has taken minimum (15.33) days to 50 percent germination with respect to other concentration of NAA. These findings were closely related to Kalalbandi *et al.* (2003) [4]

Among cow urine and water soaking at different time, minimum (17.33) days taken to 50 percent germination were recorded with T_{12} (Cow urine for 72 hr) and maximum (21.00) days taken 50 percent germination observed in T_8 (water soaking 24 hrs.) These results were supported by Singh and Bhargawa (2009) [20].

The maximum value of germination was recorded (73.33 and 76.00) percent when seed soaked in T_4 (GA_3 @ 400 ppm for 24 hr) whereas minimum value of (57.00 and 60.67) percent germination was recorded under control treatment (T_0). It might be due to GA_3 which would have triggered the activity of specific enzymes that promoted early germination, such as α-amylase, which have brought an increase in availability of starch assimilation. Similar work has been reported by Parameshwari and Srimathi (2008) [10]

Among the different treatments of NAA, the maximum percentage of germination at 30 and 60 DAS (68.33 and 72.00) percent recorded with T_6 (NAA @ 200 ppm for 24 hr). These results were closely related to Kalalbandi *et al.* (2003) [4], Shinde *et al.* (2008) [18]

Among cow urine and water soaking at different time the maximum percentage of germination percent (65.67 and 69.00) was recorded with T_{12} (Cow urine for 72 hr). These findings were supported by Singh and Bhargawa (2009) [20].

Maximum height of shoot (29.67, 34.67 and 39 cm) was recorded at successive growth stages under the treatment T_4 (GA_3 at 400 ppm for 24 hr). However, minimum heights (19.67, 27.33 and 27.67 cm) of shoots were recorded under T_0 (Control). It was due to additional GA_3, activated α-amylase which digested the available carbohydrate into simple sugar so that energy and nutrition were easily available to faster growing seedlings. Increase in plant height due to GA_3 has also been reported by Babu *et al.* (2010) [1]. In the seedlings of Cape gooseberry resulted in highest plant height which was due to GA_3 promote the growth of the plant by the promotion of cell elongation. The similar result was found by Wanyama *et al.* (2006) [21], Mishra *et al.* (2017) [8, 9] and Kumar *et al.* (2008) [5].

Among different concentration of NAA T_6 (NAA @ 200 ppm for 24 hr) recorded maximum height (26.33, 32.33 and 34.33 cm) of shoot at 60, 90 and 120 days. This result was closely relegated to Choudhary and Chakrawar (1982) [3] and Kalalbandi *et al.* (2003) [4].

Among Cow urine T_{12} (Cow urine for 72 hr) recorded maximum height (24.33, 31.67 and 31.33 cm) of shoot at 30, 60, 90 and 120 days. Similar results were reported by Rao (1975) [17] and Parameswari *et al.* (2001) [11].

The maximum number (33.00, 55.00 and 67.33) of leaves per seedling was observed under treatment T_3 (GA_3 at 400 ppm) whereas treatment T_0 i.e. was recorded minimum number (23.67, 40.67 and 51.67) of leaves per seedling at all stages of observations. The increase may be due to cell division and enhancing activity of apical meristem which may be promoted by the growth hormones. This similar results has been reported by Mishra *et al.* (2017) [8, 9] and Pawar V.B. *et al.* (2010) [15, 16] says that increase in number of leaves might be due to the reason that GA_3 helps in invigoration of physiological process of plant and stimulatory effect of chemicals to form new leaves at a faster rate.

Application of NAA at 200 ppm for 24 hr recorded significantly higher number (31.33, 51.67 and 63.67) of leaves per seedling over their respect to lower concentration. These results were closely releated to Choudhary and Chakrawar (1982) [3] and Behera *et al.* (2017) [2].

Application of Cow urine for 72 hr recorded significantly higher number (30.33, 49.00 and 58.67) of leaves per seedling over other lover time of soaking of cow urine and water. Similar results were reported by Rao (1975) [17].

Maximum fresh weight (38.00 g) of shoot was recorded under T_3 (GA_3 400 ppm for 24 hr) whereas, minimum fresh weight (24.00 g) of shoot was recorded under control T_0. Hence,

fresh weight of shoot due to GA_3 might have resulted in more production of photosynthesis, which might be responsible for improving the fresh weight of shoot.

Among the different concentration of NAA showed significant effect on fresh weight of shoot at 120 DAS, the fresh weight of shoot at 120 DAS T_6 (NAA @ 200 ppm for 24 hr) treatment were found superior under NAA.

The difference in fresh weight of shoot at 120 DAS under various time of soaking of Cow urine and water, the maximum fresh weight (29.33 g) of shoot was recorded under T_{12} (Cow urine for 72 hr) roots.

Maximum dry weight (26.33 g) of shoot was recorded under T_3 (GA_3 400 ppm for 24 hr) whereas, minimum dry weight (13.00 g) of shoot was recorded under control T_0. Hence, dry weight of shoot due to GA_3 might have resulted in more production of photosynthesis, which might be responsible for improving the dry weight of shoot.

Among the different concentration of NAA showed significant effect on dry weight of shoot at 120 DAS, the dry weight of shoot at 120 DAS T_6 (NAA @ 200 ppm for 24 hr) treatment were found superior under NAA.

The difference in dry weight of shoot at 120 DAS under various time of soaking of Cow urine and water, the maximum dry weight (18.33 g) of shoot was recorded under T_{12} (Cow urine for 72 hr) roots. Similar findings were reported by Shinde V. V. and Malshe K. V. (2015) [19].

Table 1

Treatment	Days taken to start germination	Days taken to 50% germination	Germination percentage at		Height of seedling (cm)		
			30 days after sowing	60 days after sowing	60 days after sowing	90 days after sowing	120 days after sowing
T_0 - Control	15.33	22.67	57.00	60.67	19.67	27.33	27.67
T_1 - GA_3 @ 200 ppm for 24 hr.	10.00	14.67	71.00	73.00	27.00	32.67	36.67
T_2 - GA_3 @ 300 ppm for 24 hr.	9.33	14.00	71.33	74.00	28.00	33.00	37.33
T_3 - GA_3 @ 400 ppm for 24 hr.	9.00	13.00	73.33	76.00	29.67	34.67	39.00
T_4 - NAA @ 50 ppm for 24 hr.	11.00	16.67	67.00	70.33	25.00	32.00	33.00
T_5 - NAA @ 100 ppm for 24 hr.	10.67	16.00	67.67	71.33	26.00	32.67	32.67
T_6 - NAA @ 200 ppm for 24 hr.	10.33	15.33	68.33	72.00	26.33	32.33	34.33
T_7 - Soaking in water for 24 hr.	14.33	21.00	60.33	63.67	21.33	29.33	27.00
T_8 - Soaking in water for 48 hr.	13.33	20.33	61.67	64.67	22.67	30.00	28.67
T_9 -Soaking in water for 72 hr.	12.67	20.00	62.67	65.67	23.00	30.67	29.00
T_{10} - Soaking in cow urine for 24 hr.	12.33	19.00	63.00	67.00	23.33	31.00	29.67
T_{11} - Soaking in cow urine for 48 hr.	12.00	18.00	64.00	67.67	24.00	31.33	31.00
T_{12} - Soaking in cow urine for 72 hr.	11.33	17.33	65.67	69.00	24.33	31.67	31.33
S. Em	0.506	0.480	1.327	1.636	0.852	0.816	1.128
C.D. at 5% level	1.504	1.427	3.941	4.858	2.531	2.425	3.351

Table 2

Treatment	Number of leaves per seedling			Fresh weight of shoot (g)	Dry weight of shoot (g)
	60 days after sowing	90 days after sowing	120 days after sowing	120 days after sowing	120 days after sowing
T_0 - Control	23.67	40.67	51.67	24.00	13.00
T_1 - GA_3 @ 200 ppm for 24 hr.	32.00	52.67	64.67	34.67	22.00
T_2 - GA_3 @ 300 ppm for 24 hr.	32.33	53.67	65.00	35.33	24.33
T_3 - GA_3 @ 400 ppm for 24 hr.	33.00	55.00	67.33	38.00	26.33
T_4 - NAA @ 50 ppm for 24 hr.	30.33	50.67	60.67	31.33	20.00
T_5 - NAA @ 100 ppm for 24 hr.	28.67	51.67	62.00	32.00	20.67
T_6 - NAA @ 200 ppm for 24 hr.	31.33	51.67	63.67	33.33	21.00
T_7 - Soaking in water for 24 hr.	23.33	44.67	54.00	26.33	14.33
T_8 - Soaking in water for 48 hr.	25.67	45.33	55.00	26.67	16.33
T_9 -Soaking in water for 72 hr.	27.33	46.33	56.33	27.33	16.67
T_{10} - Soaking in cow urine for 24 hr.	27.33	46.67	56.67	28.33	17.33
T_{11} - Soaking in cow urine for 48 hr.	29.00	48.67	57.33	29.00	18.00
T_{12} - Soaking in cow urine for 72 hr.	30.33	49.00	58.67	29.33	18.33
S. Em	0.790	0.887	1.330	0.698	0.592
C.D. at 5% level	2.346	2.634	3.950	2.073	1.758

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