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EFFECT OF DIFFERENT SEED TREATMENT ON DRAGON FRUIT (*Hylocereus undatus* Britt. & Rose) SEED GERMINATION AND SEEDLING GROWTH

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ABSTRACT
An investigation was carried out to determine the most suitable seed treatment for better germination and establishment of healthy dragon fruit seedlings. Freshly extracted dragon fruit seeds were subjected to different seed treatments *viz.*, hydrochloric acid (HCL) quick dip for 5 seconds (T1), GA_3 500 ppm for 12 hours (T2), Water soaking for 12 hours (T3), Thiourea at 1% for 12 hours (T4), GA_3 250 ppm for 12 hours (T5), KNO_3 at 1%for 12 hours (T6), quick dip in hot water for 5 seconds (T7) and Control with three replications. The results revealed that seeds treated with 500 ppm of GA_3 gave early germination (4.66 days), highest germination percentage (100.00%), survivability percentage (88.46%), vigour index (333.00) and vegetative growth parameters like number of roots (3.66), longest length of roots (1.55cm), shoot length (1.78cm), seedling height at 90 DAT (20.23 cm), number of sprouts at 90 DAT (8.66) and longest sprout length (13.73 cm). The results suggest that seed treatment with GA_3 500 ppm is found to be better in germination and seedling growth.

INTRODUCTION

Dragon fruit (*Hylocereus undadus* Britt. & Rose) belongs to the family Cactaceae having a vast scope for cultivation in dry and marginal lands of India. It is already considered a promising crop to be raised in dry regions (Vaillant *et al.*, 2005) of different countries. It is also having numerous health benefits like, prevention of memory loss, reduce blood sugar level in diabetic patients, prevention of oxidation, aiding in healing of wounds *etc.* as

Very limited research works have been taken in this crop in India. Dragon fruit can be propagated sexually by seed as well as asexually by grafting and stem cuttings. Seedlings become ready for field planting by 9-10 months after sowing. This method is very simple and can be practiced with the objectives of obtaining variability for breeding programmes (ElObeidy, 2006). This method also helps to meet the demand of planting materials in new areas as a single fruit contains more than 1000 seeds.

Various physical and chemical treatments given to the seeds are found to be effective in increasing germination percentage and seedling vigour in various crops. Wagh *et al.* (1998) found that seed treatment of aonla with 500ppm GA_3 resulted in the highest per cent age germination and superior seedling parameters. So, treatment of dragon fruit seeds with different physical and chemical methods may enhance its germination but a few works have been conducted on dragon fruit in this regard.

It is necessary to find out the best seed treatment to get efficient germination and healthy seedlings. With this background this present study was conducted to know the effect of different seed treatments on seed germination and seedling growth parameters in dragon fruit.

MATERIALS AND METHODS

The present experiment was carried out at College of Horticulture, Mysuru, Karnataka during the year 2016-17. The experiment was laid out in completely randomized design with eight treatments such as hydrochloric acid (HCL) quick dip for 5 seconds (T1), GA_3 500 ppm for 12 hours (T2), Water soaking for 12 hours (T3), Thiourea at 1%for 12 hours (T4), GA_3 250 ppm for 12 hours (T5), KNO_3 at 1%for 12 hours (T6), quick dip in hot water for 5 seconds (T7) and Control with three replications. Seeds were extracted from well ripened dragon fruits later seeds were treated and sown in portray containing cocopeat and maintained under laboratory at ambient condition. Observations were recorded on days taken for initiation of germination, fifty per cent germination, complete germination, germination per cent, number of roots, longest root length, seedling height, vigour index, number of sprouts, sprout length and per cent survivability. The germination percentage was calculated by dividing total

number of seeds germinated with the number of seeds sown and was multiplied by 100.

Seedling vigour was calculated using the following formula (Abdul-Baki and Anderson, 1973)

Vigour index = (Root length + Shoot length) X Germination percentage

Survival per cent of the seedlings was calculated 90 days after transplanting by using the following formula and expressed in percentage.

$$\text{Survival percentage} = \frac{\text{Number of seedlings alive 3 months after transplanting X 100}}{\text{Number of seedlings transplanted}}$$

RESULTS AND DISCUSSION

Effect of different seed treatments on dragon fruit seed germination is presented in the Table 1. Significantly less number of days for initiation of germination(4.67days), fifty per cent (11.33 days) and complete germination (16.66 days) was recorded in seeds treated with 500ppm of GA_3 which were on par with seeds treated with 250 ppm GA_3 (6.00, 14.00 and 18.33 days respectively) while, more number of days (10.33days) for initiation of germination was recorded control. This may be due to the early release of dormancy and consequently seed germination with increased concentration of GA_3 up to 500ppm as reported by Chandra and Govind (1990), Parmer *et al*. (2016). These results were confirmation with Pawashe *et al*. (1997).

The germination per cent was significantly varied among different treatments, 100 per cent germination was recorded in seeds which were treated with 500ppm and 250ppm of GA_3 and lowest germination per cent (76.33%) was observed in control (Table 1). This might be due to its participation in the synthesis of enzymes like alpha-amylase, which converts starch into simple sugars during the process of germination. This might also be due to the fact that gibberrellic acid plays an important role in breaking the seed dormancy by diffusion of endogenous auxin and giberellin like substances which intern results in early and increased germination percentage (Pawshe *et al.,* 1997). The results are in conformity with the findings of Babu *et al*. (2010), Anjanawe *et al*. (2013) and Gurung *et al*. (2014). Seeds which were treated with 500ppm of GA_3 has been recorded significantly highest vigour index and survivability per cent (333.0 and 88.46%) compared to other treatment while it was found lowest (109.91 and 78.94%) in case of control that is seeds without any treatment (Table 1 and 2). This might be also due to the fact that this hormone increases osmotic uptake of nutrients, causing elongation of the cells in the sub-apical region of roots and shoots as reported by Shanmugavelu (1966) and Salisbury and Ross (1989) which helps in better survival of seedlings.

Rooting parameters like root number and longest root length were found significantly maximum (3.66 and 1.55cm) in case of seeds which were treated with 500ppm of GA_3 and these were recorded minimum (1.93 and 0.73cm) in case of control (Table 2). This may be attributed to the cell multiplication and elongation in the cambium tissue of the internodal region by activation of metabolic processes or removal of inhibitory parts

Table 1: Response of dragon fruit seeds to growth regulator and chemicals on germination of dragon fruit

Treatment	Days taken for Initiation of germination	Fifty per cent germination	Complete germination	Germination percentage (%)	Survivability percentage (%)
T1 (HCL)	07.33	16.66	23.33	096.66 (080.37)	80.00 (63.45)
T2 (GA_3 500ppm)	04.66	11.33	16.66	100.00 (089.41)	88.46 (70.26)
T3 (Water)	07.66	16.66	26.66	086.66 (068.59)	81.82 (64.77)
T4 (Thiourea 1%)	10.00	19.66	29.33	083.33 (065.92)	85.71 (67.07)
T5 (GA_3 250ppm	06.00	14.00	18.33	100.00 (089.04)	84.00 (66.20)
T6 (KNO_3 1%)	08.33	18.66	24.66	093.33 (075.05)	82.61 (66.44)
T7 (Hot water dip)	09.00	19.00	27.66	080.00 (063.44)	80.00 (63.85)
T8 (Control)	10.33	21.00	30.33	076.33 (060.92)	78.94 (62.70)
SEm ±	00.72	01.05	00.35	01.15	00.91
CD @5%	02.34	03.33	02.78	03.86	02.96

Table 2: Response of dragon fruit seeds to growth regulator and chemicals on root characters shoot length and vigour index

Treatment	Longest root length (cm)	No of Roots	Shoot length (cm)	Vigour index
T1 (HCL)	0.86	2.66	1.58	235.85
T2 (GA_3 500ppm)	1.55	3.66	1.78	333.00
T3 (Water)	1.03	2.33	1.56	224.44
T4 (Thiourea 1%)	1.08	1.98	0.71	139.99
T5 (GA_3 250ppm	1.38	3.66	1.70	308.00
T6 (KNO_3 1%)	1.25	2.33	1.20	228.65
T7 (Hot water dip)	1.01	1.93	1.00	160.80
T8 (Control)	0.73	1.93	0.60	109.91
SEm ±	0.07	0.26	0.10	004.10
C.D @ 5%	0.25	0.88	0.35	013.42

Table 3: Response of dragon fruit seeds to growth regulators and chemicals on seedling height, number of sprouts and longest sprout length after transplanting

Treatment	Seedling Height at 90DAT (cm)	Number of sprouts at 90DAT	Longest sprout length at 90DAT (cm)
T1 (HCL)	13.36	5.66	08.20
T2 (GA_3 500ppm)	20.23	8.66	13.73
T3 (Water)	13.53	6.00	08.96
T4 (Thiourea 1%)	14.06	4.66	10.20
T5 (GA_3 250ppm	19.46	8.66	10.73
T6 (KNO_3 1%)	12.73	4.33	08.23
T7 (Hot water dip)	11.76	4.66	06.60
T8 (Control)	10.50	3.00	05.93
SEm ±	00.69	0.66	00.98
CD @5%	02.24	2.20	03.38

DAT- Days after transplanting

by GA_3. This result was supported by Wagh *et al*. (1998) who found that seed treatment of aonla with 500ppm GA_3 resulted in the highest percentage germination (87.25%, compared to 46.25% in control) and more number of leaves and root, which may be due to GA which help the seeds for better germination, seedling growth and vigour.

Shoot length was significantly highest in case of seeds treated with 500ppm of GA_3 (1.78cm) and it was statistically similar with the seed treatment with GA_3 250ppm (1.70 cm) and HCL (1.58 cm) while, it was found to be minimum in control (0.60 cm) (Table 2). This may be also due to the fact that this hormone increases osmotic uptake of nutrients, causing elongation of the cells in the sub-apical region of roots and shoots as reported by Shanmugavelu (1966).

Response of dragon fruit seeds to growth regulators and chemicals on seedling height, number of sprouts and longest sprout length after transplanting are presented in the Table 3. Seedling height at 90 days after transplanting was found maximum (20.23cm) in case of seeds which were treated with 500ppm of GA_3 and it was on par with seeds treated with 250 ppm GA_3 (19.46cm) while, it was found minimum (10.50 cm) in case of control. This may be attributed to the cell multiplication and elongation in the cambium tissue of the intermodal region. Significant and highest number of sprouts at 90 DAT was found in seeds treated with 500ppm and 250ppm of GA_3 (8.66) while, it was minimum in control (3.00).

A significant difference in longest sprout length was found among different treatments where the highest sprout length at 90 DAT was found in the seeds treated with 500 ppm GA_3. (13.73cm) and it was on par with seeds treated with 250 ppm of GA_3 (10.73cm) while, it was recorded minimum in case of control. The maximum in above parameters of GA_3 treated seeds may be attributed to the cell multiplication and elongation in the cambium tissue of the intermodal region, because GA_3 apparently activates the metabolic processes or nullifies the effect of growth inhibitors (Singh *et al*., 1989).

Among different seed treatments soaking seeds in GA_3 500 ppm is found to be better in terms of germination behaviour and other growth characters of seedlings.

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