

Optimizing Germination Conditions for Dragon Fruit Seeds East Nimar region, Khandwa, MP.

ABSTRACT

Present study was carried out to find perfect pre-treatment methods for enhancing germination percentage and vigour of the seeds. Irrespective of all treatments. The experiment laid out in randomized block design (RBD) with three replications. The nursery experiment was carried out during the 2024 at the School of Agriculture science, at Dr. C.V. Raman University in Khandwa, Madhya Pradesh Seeds of Dragon fruits among seven treatments were pretreated with different pre-treatments viz. T-1 Darkness+ water soaking 12 hours, T-2 Darkness + water soaking 24 hours, T-3 Continuous light (24h) + water soaking 12 hours, T-4 Continuous light (24h) + water soaking 24 hours, T-5 Alternating light (12h light/12h dark) + water soaking 12 hours, T-6 Alternating light (12h light/12h dark) + water soaking 24 hours, T-7 Control (no pre-treatment) to observe their effects on germination percentage, germination value, mean germination time and seedling vigour index. seeds were pre-treated with T-6 Alternating light (12h light/12h dark) recorded average highest germination percentage 94.66% while control showed lowest germination percentage 78.66 % as compared to other pre-treatments among all treatments and average highest mean germination value 9.57 while T7 Control showed lowest mean germination value 6.71 as compared to other pre-treatments among all treatments. seeds were pre-treated with T-7 control recorded average highest mean germination time 21.21 days while T-6 Alternating light (12h light/12h dark) + water soaking 24 hours showed lowest mean germination time as compared to other pre-treatments among all treatments and seeds were pre-treated with T-6 Alternating light (12h light/12h dark) + water soaking 24 hours recorded average highest seedling vigor index 1161.94 while T-7 control showed lowest mean seedling vigor index 694.09 as compared to other pre-treatments among all treatments.

Keywords: Dragon fruit, Germination percentage, Germination value, Mean germination time, Seedling Vigor index.

Introduction

The climbing cactus known as dragon fruit (*Hylocereus undatus*) is an epiphytic perennial (Ahmed A. Elobeidy, 2006). Pink Dragon Fruit is a captivating and nutritious fruit, boasts an enchanting pink hue and scales-like exterior. Native to the lush regions of Central and South America, this vibrant fruit has been cherished for centuries. Dragon fruit is a climbing cactus species, As a member of the Cactaceae family or Pitaya family, it's also known by its alternate names: Pitahaya and Strawberry Pear. The fruit has three varieties: Pink Pitaya (white flesh with pink skin: *Selenicereus undatus*), Red Pitaya (red flesh with red skin: *Selenicereus costaricensis*), and Yellow Pitaya (white flesh with yellow skin: *Selenicereus megalanthus*).

Seed germination has other utility also. Speed of germination has long been used as indicator of vigour (AOSA, 1976). Seed vigour is an important factor determining seed quality in forest trees (Vlase and Voinesou, 1972). Seed vigour is one of the most important parameter in determining seed quality and it is the sum total of those properties of seed which determine the potential level of performance and activity of a non-dormant seed of a seed lot during germination and seedling emergence.

Seed dormancy is a physiological state that prevents germination under favorable conditions. Dragon fruit seed dormancy is a physiological phenomenon that limits germination under favorable conditions while determining the range of conditions that allow for germination. The intrinsic molecular processes governing dormancy may include an embryo or a coat component that interacts to determine the degree of 'whole-seed' dormancy (Hilhorst, Cohn 1995).

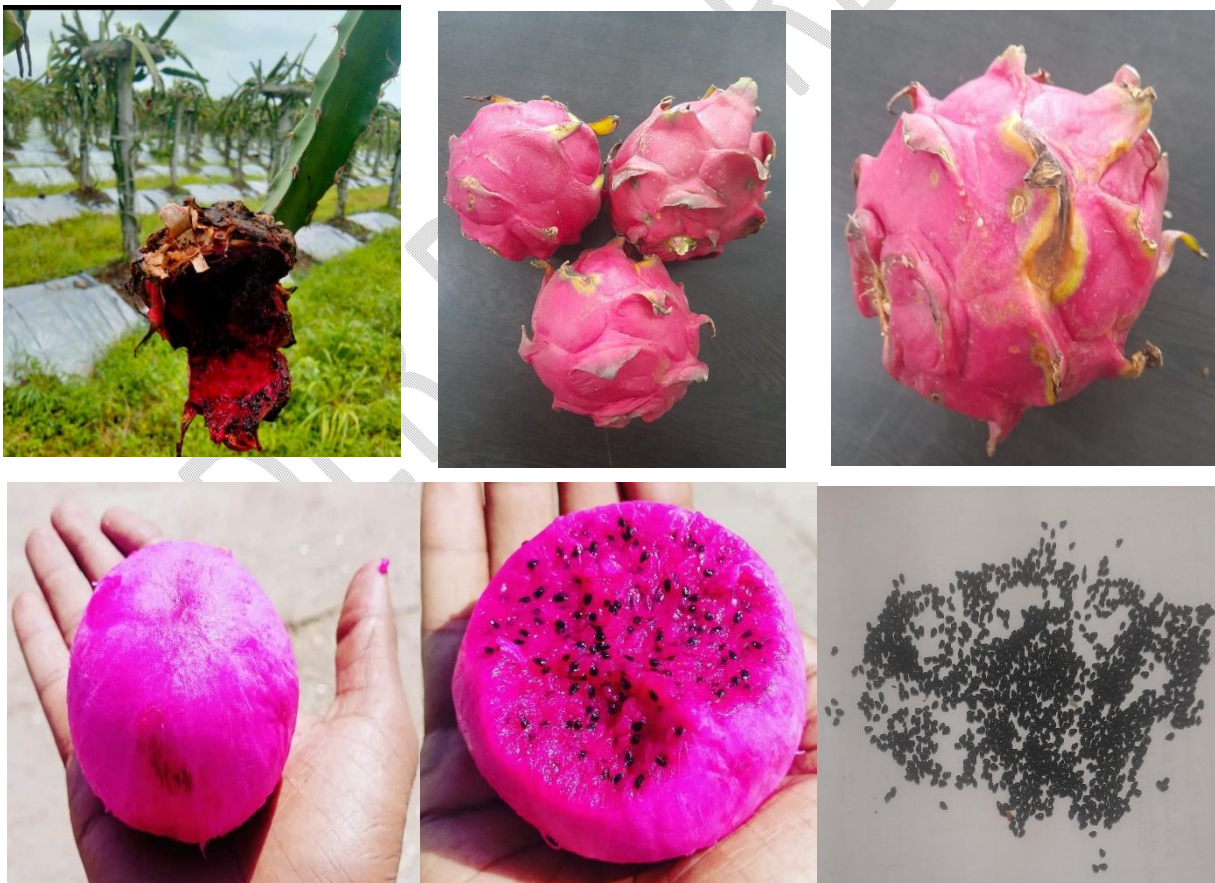
Dragon fruit is not only beautiful, but it is also high in nutritional content and bioactive components, including potent natural antioxidants (Huang Y. *et. al.*, 2021). Several studies show that dragon fruit has therapeutic potential for type 2 diabetes (Suryono J 2006). Dragon fruit includes a high concentration of vitamin "C," which is important for boosting the immune system and general health. Furthermore, dragon fruit is high in fiber, which helps to improve gut health and prevent constipation (Ghee LK, 2021). Dragon fruit also includes betalains and carotenoids, which, in addition to giving the fruit its brilliant color, are powerful antioxidants. These molecules help neutralize damaging free radicals in the body, lowering the risk of chronic illnesses and improving general cellular health (Hossain FM. *et.al.* 2021). Dragon fruit is also

high in iron, magnesium, and potassium, which are all necessary elements. which are essential for a variety of biological activities, including muscular contraction, neuronal transmission, and blood pressure control (Luu TTH *et.al.* 2021).fruit is not only a visual delight but also packed with nutrients: Rich in vitamins C and B2, Good source of potassium, iron, and magnesium Antioxidant properties and low calorie count.

MATERIAL AND METHODS

Study area

The experiment on Dragon fruit was conducted in the nursery of Dr. C.V. Raman University Khandwa M.P. The study location comes under tropical and subtropical climate zone and is located at 21°50'N, latitude and 76°13'E longitude and the maximum and minimum height above mean sea level is 905.56 m and 180.00 m respectively.



Picture 1. Visual appearance of Dragon Fruits

Experimental details:

Seeds were taken from a fresh dragon fruit with pink skin and pink meat collected by farmers. The fruit was then chopped into little pieces and the seeds taken from them. We treated the seeds under varied environments, as shown below.

T-1 Darkness+ water soaking 12 hours

T-2 Darkness + water soaking 24 hours

T-3 Continuous light (24h)+ water soaking 12 hours

T-4 Continuous light (24h)+ water soaking 24 hours

T-5 Alternating light (12h light/12h dark)+ water soaking 12 hours

T-6 Alternating light (12h light/12h dark)+ water soaking 24 hours

T-7 Control

Seeds were sowed in three replications of plastic bags measuring 30x20 cm each. Before seeding, polybags were filled with a potting mixture made up of soil, FYM, and sand in a 1:2:1 ratio. The seed was then planted into plastic bags. Seed germination was monitored everyday for at least 28 days, or until no additional germination occurred. Weeding, cleaning, and watering of polybags were done manually as needed for the duration of the experiment, which might last up to a year. A was deemed germinated when the plume protruded one millimeter above the soil surface. The poly bags were arranged in an RBD sequence with three replications.

After each pre-treatment the seeds were sown in polybags for germination test in the nursery and the following parameters were recorded as given below:

Germination percent (GP): It was the percent of the sown seeds germinated at the completion of test period, i.e., 28 days after sowing (ISTA, 1999). It was calculated by the following formula:

Total number of seed germinated

$$\text{GP (\%)} = \frac{\text{Total number of seed germinated}}{\text{Total number of seeds sown}} \times 100$$

Total number of seeds sown

Germination value (GV): It is an index combining speed and completeness of seed germination. It was calculated as per the method given by Czabator (1962):

$$\text{GV} = \text{PV} \times \text{MDG}$$

Where, GV = Germination value

PV = Peak value of germination and

MDG = Mean daily germination

Mean germination time (MGT): The time taken to complete germination was determine as MGT in days according to Bonner (1983) and Dey (2012) as given in below:

Σ (Daily germination x Days)

Mean Germination Time = -----

Number of seed sown

Where, n = number of seed, which were germinated on day D, and D is number of days counted from the beginning of germination

Seedling vigor index (SVI): The seedlings vigour index was calculated as per the formula given by Abdul-Baki and Anderson, 1973. It reflex the health of the seedling produced.

SVI = Germination percentage (%) x Seedling length (cm)

Results & Discussion

Data pertaining to the pre-treatment of seeds among seven treatments have been furnished in the table 1 and fig 1. Seeds of among seven treatments of *Dragon fruits* were pretreated with different pre-treatments viz. T-1 Darkness+ water soaking 12 hours, T-2 Darkness + water soaking 24 hours, T-3 Continuous light (24h) + water soaking 12 hours, T-4 Continuous light (24h) + water soaking 24 hours, T-5 Alternating light (12h light/12h dark) + water soaking 12 hours, T-6 Alternating light (12h light/12h dark) + water soaking 24 hours, T-7 Control (no pre-treatment) to observe their effects on germination percentage, germination value, mean germination time and seedling vigour index. Germination potential of all treatments differed significantly due to pre-treatments. Irrespective of treatments, the average germination was 84.33, 86.33, 84.33, 87.66, 86.66 , 94.66 and 78.66, respectively when seeds were pre-treated with T-6 Alternating light (12h light/12h dark) recorded average highest germination percentage 94.66% while control showed lowest germination percentage 78.66 % as compared to other pre-treatments among all treatments.



Picture 2. Juvenile phase of Dragon fruits

Table 1. Effect of pre-treatments on seed germination percentage (GP), Germination Value Mean germination time (days) and Seedling vigour Index

Name of Treatment	Germination percentage (%)	Germination Value	Mean germination time (days)	Seedling vigour Index
T-1 Darkness+ water soaking 12 hours	84.33	7.24	18.65	787.53
T-2 Darkness + water soaking 24 hours	86.33	7.78	18.48	911.82
T-3 Continuous light (24h) + water soaking 12 hours	84.33	8.25	18.25	931.55
T-4 Continuous light (24h) + water soaking 24 hours	87.66	8.47	18.44	676.06
T-5 Alternating light (12h light/12h dark) + water soaking 12 hours	86.66	7.58	18.58	760.61
T-6 Alternating light (12h light/12h dark) + water soaking 24 hours	94.66	9.57	15.92	1161.94
T-7 Control	78.66	6.71	21.21	694.09
Mean	86.06	7.94	18.50	846.23
CV (%)	2.126	4.238	4.327	6.796
S.Em (+)	1.054	0.194	0.462	33.202
SE(d)	1.491	0.275	0.654	46.955
CD (p=0.05)	3.284	0.606	1.440	103.440

Germination value of all treatments differed significantly due to pre-treatments. Irrespective of treatments, the average germination value was 7.24, 7.78, 8.25, 8.47, 7.58, 9.57 and 6.71 respectively when seeds were pre-treated with T-6 Alternating light (12h light/12h dark) + water soaking 24 hours recorded average highest mean germination value 9.57 while T7 Control showed lowest mean germination value 6.71 as compared to other pre-treatments among all treatments. Data pertaining to the pre-treatment of seeds among seven treatments have been furnished in the table 1 and fig 1.

Mean germination time of all treatments differed significantly due to pre-treatments. Irrespective of treatments, the average mean germination time was 18.65, 18.48, 18.25, 18.44, 18.58, 15.92 and 21.21 respectively when seeds were pre-treated with T-7 control recorded average highest mean germination time 21.21 days while T-6 Alternating light (12h light/12h dark) + water soaking 24 hours showed lowest mean germination time as compared to other pre-treatments among all treatments. Data pertaining to the pre-treatment of seeds among seven treatments have been furnished in the table 1 and fig 1.

Seedling vigor Index of all treatments differed significantly due to pre-treatments. Irrespective of treatments, the average mean germination time was 787.53, 911.82, 931.55, 676.06, 760.61, 1161.94 and 694.09 respectively when seeds were pre-treated with T-6 Alternating light (12h light/12h dark) + water soaking 24 hours recorded average highest seedling vigor index 1161.94 while T-7 control showed lowest mean seedling vigor index 694.09 as compared to other pre-treatments among all treatments. Data pertaining to the pre-treatment of seeds among seven treatments have been furnished in the table 1 and fig 1.

Above this context, the present study was carried out to find perfect pre-treatment methods for enhancing germination percentage and vigour of the seeds. Irrespective of all treatments The results are well in line with the findings reported by Anagha, P., *et al.*, (2023) Improving seed germination and seedling growth of dragon fruit (*Hylocereus undatus*). After maturity and collection, seeds are required to germinate to assess the proper growth and survival of seedlings.

Effect of pre-treatments on seed germination percentage (GP), Germination Value (GV), Mean Germination Time (MGT) and Seedling Vigour Index (SVI)

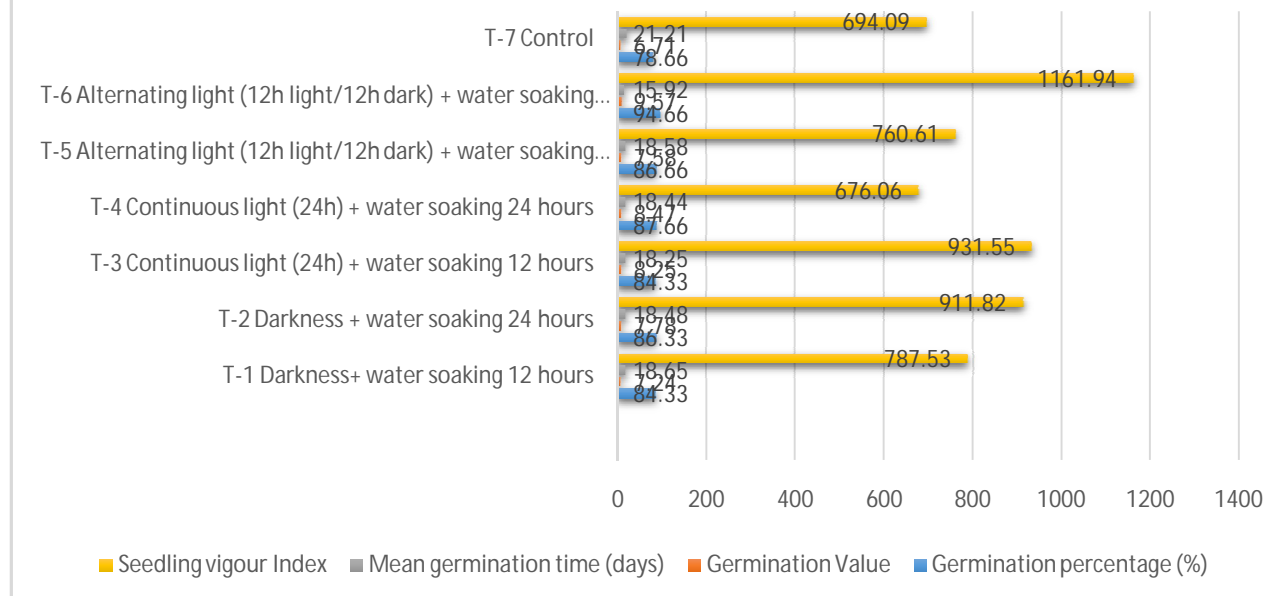


Fig.1 Effect of pre-treatments on seed germination percentage (GP), Germination Value (GV), Mean Germination Time (MGT) and Seedling Vigour Index (SVI)

Conclusion

Study was carried out to find perfect pre-treatment methods for enhancing germination percentage and vigour of the seeds. Irrespective of all treatments. The experiment laid out in randomized block design (RBD) with three replications. The nursery experiment was carried out during the 2024 at the School of Agriculture science, at Dr. C.V. Raman University in Khandwa, Madhya Pradesh Seeds of Dragon fruits among seven treatments were pretreated with different pre-treatments viz. T-1 Darkness+ water soaking 12 hours, T-2 Darkness + water soaking 24 hours, T-3 Continuous light (24h) + water soaking 12 hours, T-4 Continuous light (24h) + water soaking 24 hours, T-5 Alternating light (12h light/12h dark) + water soaking 12 hours, T-6 Alternating light (12h light/12h dark) + water soaking 24 hours, T-7 Control (no pre-treatment) to observe their effects on germination percentage, germination value, mean germination time and seedling vigour index. seeds were pre-treated with T-6 Alternating light (12h light/12h dark) recorded average highest germination percentage 94.66%.

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