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Evaluation of various seed treatments for improving germination and seedling vigour of Dragon fruit under shade net house

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Abstract
An experiment was conducted to evaluate the different seed treatments for improving germination and seedling vigour of Dragon fruit under shade net house of pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon (C.G.) during the year 2024-25. Freshly extracted dragon fruit seeds were subjected to different seed treatment *viz.* Control-(T_0), GA_3 @ 100 ppm (T_1), GA_3 @ 150 ppm (T_2), KNO_3 @ 2% (T_3), KNO_3 @ 3% (T_4), NAA @ 100 ppm (T_5), NAA @ 150 ppm (T_6), Thiourea @ 250 ppm (T_7), Thiourea @ 500 ppm (T_8), BA @ 15 ppm (T_9), BA @ 20 ppm (T_{10}) The experiment was laid out in CRD with 3 replications. The results of the experiment revealed that seed treated with GA_3 @ 150 ppm took minimum days (4.05) for seed germination, 7.25 days for 50 percent germination recorded maximum germination percentage (91.00%), seedling vigour index-I (1748.11) and seedling vigour index-II (804.44).

Keywords: Dragon fruit, germination, seedling vigour etc.

Introduction
Dragon fruit (*Hylocereus undatus*), also known as pitaya, strawberry pear, night-blooming cereus, queen of night, or honorable queen (Martin *et al.,* 1987) [5], is now acknowledged for its remarkable nutritional and therapeutic qualities. It is a genuine superfood with antioxidant, anti-inflammatory, antibacterial, and anticancer properties due to its abundance of bioactive components such flavonoids, phenols, anthocyanins and betalains (Kumar *et al.,* 2018) [4]. Dragon fruit farming has a lot of potential in India, particularly in semi-arid areas, but the scarcity of high-quality planting material is still a problem. To increase genetic diversity for breeding programs, the crop can be reproduced sexually through seeds and asexually through grafting or stem cuttings (Pimenta, 1990) [8]. Studying germination and preserving genetic resources are aided by sexual propagation. (Salgotra and chauhan, 2023) [12]. Plant growth regulators such as GA_3, NAA, BA, KNO_3 and thiourea have been shown to improve seed germination and seedling growth; GA_3 increases enzyme activity, NAA encourages roots, BA supports shoot growth and KNO_3 and thiourea aid in breaking seed dormancy (Ramteke *et al.,* 2015) [9].

Materials and Methods
The experiment was carried out during the year 2024-25 at Pt. Kishori Lal Shukla, College of Horticulture and Research Station, Rajnandgaon (C.G.). The experiment was laid out in Completely Randomized Design with eleven treatments *viz.* Control (T_0), GA_3 @ 100 ppm (T_1), GA_3 @ 150 ppm (T_2), KNO_3 @ 2% (T_3), KNO_3 @ 3% (T_4), NAA @ 100 ppm (T_5), NAA @ 150 ppm (T_6), Thiourea @ 250 ppm (T_7), Thiourea @ 500 ppm (T_8), BA @ 15 ppm (T_9), BA @ 20 ppm (T_{10}) and three replications. Fresh Dragon fruit seeds were extracted from well ripened dragon fruits. Seeds were treated and sown in portray containing media combination of soil, sand, cocopeat and vermicompost. Observations were recorded during the investigation for various parameters *viz.* days required for seed germination, days required for 50 percent germination, germination percentage, seedling vigour index-I, seedling vigour index-II and

analyzed statically to find out the significant results.

Results and Discussion

Days required for seed germination

The data analysis revealed that there was significant differences among different seed treatments with respect to days required for seed germination. The minimum number of days (4.05 days) required for seed germination (4.05 days) was observed in T_2-GA_3 @ 150 ppm, which was at par with T_1-GA_3 @ 100 ppm with number of days (6.10 days) required for seed germination at 5% level of significance. However, the maximum number of days (6.10 days) required for seed germination was observed under the treatment T_0-Control with distilled water, which was statistically at par with T_9-BA @ 15 ppm requiring 5.86 days for seed germination at 5% levels of significance under the present investigation. The GA_3 treated seed took minimum days for seed germination might be due to the fact that GA_3 involved in the activation of cytological enzymes which stimulates α- amylase enzyme that converts insoluble starch into soluble sugars and it also initiates the radical growth by removing some metabolic blocks. Similar findings were also reported by Anagha *et al.* (2024) [1] and Soren *et al.* (2025) [14] in Dragon fruit.

Days required for 50 percent germination

The analysis revealed significant differences among different seed treatments with respect to days required for 50 percent germination. The minimum number of days (7.25 days) required for 50 percent germination was observed in T_2-GA_3 @ 150 ppm, which was at par with T_1-GA_3 @ 100 ppm recording 7.44 number of days required for 50 percent germination at 5% level of significance. However, the maximum number of days (15.02 days) required for 50 percent germination was observed under the treatment T_0-Control with distilled water. It might be due to the promotive effect of GA_3, as reported by Chiranjeevi *et al.* (2017) [2] in Aonla, Pavithra *et al.* (2018) [7] in Surinam cherry

Germination percentage (%)

The maximum germination percentage (91.00) was noticed under the treatment T_2-GA_3 @ 150 ppm, which was at par with T_1, T_6 & T_5 recording germination percentage 88.25, 87.45 & 85.55, respectively. However, the minimum germination percentage (70.00) were observed under the treatment T_0-Control with distilled water. The increased germination percentage in gibberellic acid treated seeds might be due to its participation in the synthesis of enzymes alpha-amylase, which converts starch into simple sugars during the process of germination. These sugars provide energy required for metabolic processes associated with seed germination. The results are in conformity with the findings of Sandesh and swany (2018) [13] in Dragon fruit, Rana *et al.* (2020) [10] in Papaya.

Table 1: Influence of different seed treatment on seed germination of dragon fruit under shade net house

Treatment	Days required for seed germination	Days required for 50% germination	Germination percentage (%)
T_0 Control (Distilled water)	6.10^{h}	15.02^{g}	70.00^{f}
T_1 GA_3 @ 100 ppm	4.35^{ab}	7.44^{a}	88.25^{ab}
T_2 GA_3 @ 150 ppm	4.05^{a}	7.25^{a}	91.00^{a}
T_3 KNO_3 @ 2%	5.08^{de}	10.87^{cd}	82.12^{bcde}
T_4 KNO_3 @ 3%	4.85^{cd}	10.65^{c}	84.34^{bcd}
T_5 NAA @ 100 ppm	4.75^{cd}	8.70^{b}	85.55^{abcd}
T_6 NAA @ 150 ppm	4.50^{bc}	8.44^{b}	87.45^{abc}
T_7 Thiourea @ 250 ppm	5.46^{ef}	11.78^{ef}	81.33^{cde}
T_8 Thiourea @ 500 ppm	5.25^{ef}	11.50^{de}	83.00^{bcde}
T_9 BA @ 15 ppm	5.86^{gh}	12.40^{f}	77.55^{e}
T_{10} BA @ 20 ppm	5.64^{fg}	12.12^{e}	80.00^{de}
S.E.M ±	0.13	0.28	2.16
C.D. @ 5%	0.39	0.84	6.37
C.V.	4.59	4.69	4.51

***** The superscript letter indicates that the treatment means with same letters are at par at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD- value comparison of treatment means.

Seedling Vigour Index-I

The maximum seedling vigour index-I (1748.11) was noticed under the treatment T_2-GA_3 @ 150 ppm, which was significantly followed by T_1-GA_3 @ 100 ppm recording seedling vigour index-I (1637.03) at 5% level of significan. However, the minimum Seedling Vigour Index-I (656.60) was observed in T_0-Control with distilled water. It might be due to the activity of GA_3, which attributed to enlarged embryos, higher rate of metabolic activity, respiration, better utilization and mobilization of metabolites to growth points and higher activity of enzymes, which leads to increase in root length, shoot length, in turn increase in seedling vigour. The results are in close conformity with findings of Gurung *et al.*, (2014) [3] in passion fruit.

Seedling Vigour Index-II

The maximum seedling vigour index-II (804.44) was noticed under the treatment T_2-GA_3 @ 150 ppm, which was significantly followed by T_1-GA_3 @ 100 ppm recording seedling vigour index-II (747.47) at 5% level of significance. However, the minimum seedling vigour index-II (380.50 g) was observed in T_0-Control with distilled water. Enhanced activity of GA_3, which plays a crucial role in promoting overall seedling growth and development. might be the reason behind the above results. These results are in close conformity with the findings of Samir *et al.* (2015) [11] in Khirni and Parmar *et al.* (2016) [6] in Custard apple.

Table 2: Influence of different seed treatment on seedling vigour of dragon fruit under shade net house

Treatments	seedling vigour index-I	Seedling vigour index-II
T_0 Control with (Distilled water)	656.60^{g}	380.50^{g}
T_1 GA_3 @ 100 ppm	1637.03^{b}	747.47^{b}
T_2 GA_3 @ 150 ppm	1748.11^{a}	804.44^{a}
T_3 KNO_3 @ 2%	962.44^{e}	582.23^{de}
T_4 KNO_3 @ 3%	1098.10^{d}	607.24^{cd}
T_5 NAA @ 100 ppm	1375.64^{c}	622.80^{cd}
T_6 NAA @ 150 ppm	1448.17^{c}	648.00^{c}
T_7 Thiourea @ 250 ppm	866.16^{f}	493.67^{f}
T_8 Thiourea @ 500 ppm	1000.15^{e}	508.79^{f}
T_9 BA @ 15 ppm	941.45^{ef}	537.42^{ef}
T_{10} BA @ 20 ppm	1143.20^{d}	556.80^{e}
S.E.M ±	31.33	15.45
C.D. @ 5%	92.00	45.62
C.V.	4.63	4.79

***** The superscript letter indicates that the treatment means with same letters are at par at 5% level of significance, while the means with different letters are significantly different at 5% level of significance. These letters have been affixed based on CD-value comparison of treatment means.

Conclusion

From the findings of the present study, it may be concluded that different seed treatments exert a significant influence on the germination and seedling growth of dragon fruit *(Hylocereus undatus).* Among all the treatments evaluated, GA_3 proved to be the most effective in enhancing seed germination percentage, seedling vigor, and overall growth performance, indicating its potential as a superior treatment for improving early establishment in dragon fruit cultivation.

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