ULST Timisoara
Multidisciplinary Conference on Sustainable Development
15-16 May 2025

The influence of hormonal balance in the multiplication of two varieties of *Hylocereus undatus*

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Abstract: Dragon fruit (*Hylocereus undatus*) belongs to the Cactaceae family and is a species cultivated for fruit consumption due to its rich content of vitamins, minerals and an excellent source of antioxidants (betacyanin), but also vegetable albumin, vitamins and water-soluble fibres. The best method for rapid plant multiplication is cell and tissue culture, so in this study we followed the influence of different growth hormones on micropropagation and rooting, in two varieties of pitaya (Vietnamese White dragon fruit and Red Jiana Dragon Fruit). Thus, the shoots obtained from the seeds were grown on Murashige and Skoog (MS) culture medium supplemented with two types of cytokinins: 6-benzyl amino purine (BAP) – 2.5 mg/l and kinetin (KIN) – 2 mg/ l, respectively naphthaleneacetic acid (NAA) – 1 mg/l, for multiplication, and for the rooting of the shoots, Murashige and Skoog (MS) medium supplemented with 1 mg/l IBA, respectively the medium without growth regulators, was used. The results obtained were different depending on the variety, but also on the type of growth regulators used.

Keywords: pitaya; micropropagation; Murashige and Skoog; growth regulators, culture media, in vitro culture

• Introduction

Pitaya (*Hylocereus undatus*), also known as "dragon fruit", is a species of tropical cactus native to Central and South America, recognized for its spectacular fruits, with high nutritional value and significant economic potential. In recent years, interest in pitaya cultivation has increased considerably, due to its high content of antioxidants, vitamins (C, B), minerals and beneficial effects on health, which has led to a growing demand in international markets. However, conventional propagation of pitaya by seeds or vegetative cuttings presents a series of limitations, such as high genetic variability, low rooting rates and the long time required to obtain mature plants. In this context, in vitro multiplication represents an efficient and rapid alternative for obtaining a large number of uniform, healthy and pathogen-free plants, in a short time and in a limited space. In vitro culture technologies applied to *Hylocereus undatus* have demonstrated promising results in terms of plant regeneration from different types of explants (seeds, stems, buds, cladode segments), optimization of culture media and use of growth regulators. Therefore, the present study aims to investigate the efficiency of micropropagation protocols applied to pitaya, thus contributing to the development of sustainable propagation methods for this species with high agronomic and commercial value.

• Material and method

The culture medium has a complex composition, the chemical elements indispensable for the growth of plant explants cultivated on aseptic media being established over time by specialists in the field of plant nutrition, following in vitro tests on the reaction of different types of inocula to different culture media (Murashige and Skoog, 1962; Gamborg and Philips, 1965). Regarding the nutritional support, this was provided by the Murashige-Skoog (MS) culture medium, a medium used both for aseptic seed germination and for multiplication. For aseptic seed germination, a simple MS culture medium was used, consisting of macroelements, and agar, the pH of the culture medium being the same in all stages of in vitro cultivation, 5.8. For multiplication, the same Murashige-Skoog culture medium was used, supplemented with benzylaminopurine in two variants (table 1).

Table 1

Hormonal variants used in multiplication

No.	Pitaya Varieties	Culture medium variant	Hormonal variants
1.	White Pitaya	M1	MS + 2 mg/l BAP
		M2	MS + 4 mg/l BAP
2.	Red Pitaya	M1	MS + 2 mg/l BAP
		M2	MS + 4 mg/l BAP

• Conclusions

1. The multiplication technique used for micropropagation of *Hylocereus undatus* genotypes is the induction of adventitious buds directly on explants.

2. Seeds harvested from *Hylocereus undatus* fruits, regardless of genotype, show good germination capacity, with a plus for the White pitaya genotype.

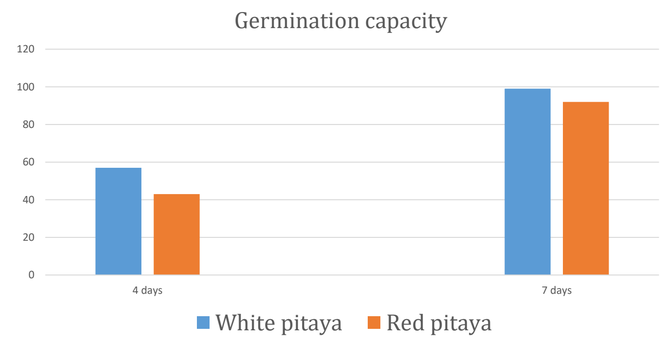
3. The environmental variant that ensures the formation of a higher number of adventitious buds on inoculated explants is M2 (MS+ 4 mg/l BAP).

4. The White pitaya genotype ensures the formation of a higher number of adventitious buds compared to Red pitaya

• Results and discussions

1.Experimental results regarding the average number of germinated seeds at different time intervals

The results regarding aseptic seed germination were recorded at different time intervals (4 and 7 days respectively). Pitaya (*Hylocereus undatus*) seeds generally have good germination capacity, however, differences were recorded in terms of germination between the two variants at the two time intervals (Graph 1). From the data presented, it can be observed that the White pitaya genotype has better germination capacity both 4 and 7 days after inoculation. It can also be observed that the White pitaya genotype has a germination capacity approaching 100% after 7 days (Graph 1).

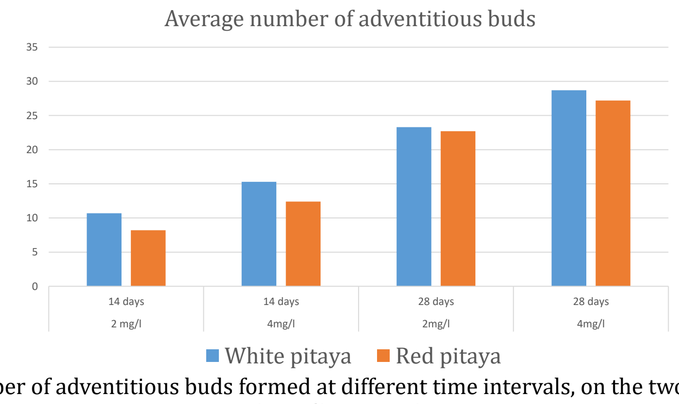


Graph 1 Germination capacity of the two pitaya genotypes, 4 and 7 days after inoculation, respectively

2. Experimental results regarding the average number of adventitious buds formed

The multiplication method of this species (*Hylocereus undatus*) is the induction of adventitious buds directly on the inoculated explant, that is, a method of direct organogenesis, a technique that takes place under the influence of cytokinins in the culture medium. In the present work, we used the most used cytokinin for this multiplication method, namely benzylaminopurine (BAP), a cytokinin under the influence of which very good results were also obtained in other species such as: Parma violet, rose, geranium or petunia. In our experiments, we used two concentrations: 2mg/l (the most used), but also 4 mg/l, in order to monitor whether doubling the amount of cytokinin in the medium has a favorable effect on the induction of adventitious buds.

From the results presented in Graph 2 it can be seen that the White pitaya genotype has a better capacity for the formation of adventitious buds, after the first 14 days of subcultivation, while at 28 days the average number of adventitious buds formed was approximately the same in both genotypes (graph 2). Comparatively, between the two hormonal variants, the highest number of adventitious buds was obtained on the culture medium supplemented with 4 mg/l BAP, both at 14 days and at 28 days. Even though the culture medium was added with a double amount of cytokinin, the average number of adventitious buds was not doubled.



Graph 2 Average number of adventitious buds formed at different time intervals, on the two hormonal varieties, in the two pitaya genotypes