

Short Communication

**DEVELOPMENT OF RAPID MULTIPLICATION
TECHNIQUE FOR DRAGON FRUIT (*HYLOCEREUS* SPP)**

W.A.WIJITHAWARNA ¹, S.P.NISSANKA ², S.H.S.A.DE SILVA ³ AND
N.D.RANAWAKA ⁴

¹ Grain Legumes & Oil Crops Research and Development Centre, Angunakolapelessa, Sri Lanka

² University of Peradeniya, Sri Lanka,

³ Field Crops Research and Development Institute, Mahalluppallama, Sri Lanka

⁴ Regional Agricultural Research and Development Centre, Aralaganwila, Sri Lanka.

INTRODUCTION

The fruit of several cactus species belongs to the genus *Hylocereus* (sweet pitayas), are commonly known as dragon fruit is vine-like epiphytic cacti. It is also known as strawberry pear or nanettika fruit (Chang and Yen, 1997). Dragon fruits are native to Central and South America and also cultivated in Asian countries such as Taiwan, Vietnam, Thailand, the Philippines, Sri Lanka and Malaysia. They are also found in Hawaii, Israel, northern Australia and southern China. Dragon fruit has adapted to live in dry tropical climates with a moderate amount of rain. Dagon fruit is not very sweet fleshy fruit but it has anti oxidants and lycopin like valuable organic chemicals that could increase demand in export market.

Quality planting materials is one of the major problems. There are some problems about plants regenerated by seeds and stem cuttings, as plants regenerated by seeds show self-incompatibility and cross pollination is essential to set fruits (Chang and Yen, 1997). Few years ago the price of single plant was Rs. 1,000.00 and now it has come down to Rs. 250-450. Average planting materials requirement of dragon fruit is 3,500-4,000 plants/ha. Based on this, the cost of planting materials for a single hectare of land is about 1.4 million rupees. With the continuous publicity programmes via the mass media, more growers attended for dragon fruit cultivation and the demand for planting materials have been increased and shortage of planting material was evicted. Therefore, it is essential to develop a rapid multiplication technique for dragon fruit. Spreading of stem spots diseases from the cuttings is a serious problem in current situation. Because of that, a nursery propagation method is needed to avoid these problems and production of healthy planting materials with hygienic conditions and rapidly is assured. Therefore, the present study was conducted to introduce a new method for rapid multiplication like

tissue culture as a simple technology for dragon fruit. The specific objectives were to: (i) develop new rapid propagation method for dragon fruit; (ii) compare effectiveness of rapid propagation method for different species; and (iii) compare the performances of seedlings and mature stem cuttings during the propagation.

MATERIALS AND METHODS

The experiments were carried out under protected conditions at the Regional Agricultural Research and Development Centre, Aralaganwila (low country Dry zone (DL_{2b})) during the period of 2008 to 2009. Three species of dragon fruit, namely, *Hylocereus undatus* ((Haw.) Britt & Rose), *Hylocereus costaricensis* (F.A.C. Webber) Britto and *Hylocereus monacanthus* (Lem.) Britt & Rose and two types of plants generating mechanisms (mature stem cuttings and seedlings) and three techniques (single plant production as the control, regular cuttings harvesting and plant production and cumulative plant production) of planting materials production were tested for three seasons. The experiment was designed as a three factor factorial RCBD with 3 replicates. All practices were carried out under protected conditions. A statistical analysis was done using Minitab and SAS programmes.

The seeds of the selected dragon fruit cultivars were sown in the seedling trays which were filled with sterilized normal potting media with sand, top soil and compost 1:1:1 ratio and placed under protected house. Two weeks after germination, the seedlings were transplanted into individual containers. Natural bending of seedling gives new shoots and 100s of poly bag sets prepare for shoot production. At the same time, 30 cm long mature stem cutting prepared for new plant production. All cuttings were treated with fungicides to avoid rotting and keep 5-7 days under shaded and placed in poly bags individually. Three months aged seedlings (with multi shoots) and rooted stem cuttings were placed under protected condition (40-50% shade) as poly bag masses (each 100 bags together). Harvesting of suitable stem cuttings for plant production was collected with time and established. Establishment rate was about 85-90 % in all types. After placing every poly bagged seedlings and rooted plants in each cultivar with 3 replicates the following data was collected for analysis. Parameter such as harvesting of shoots was done in two months intervals. Percentage of successive plants, number of cuttings from each poly bag masses, length, width and other characters of rooted cuttings, time taken to reach to suitable stage for planting were recorded. Growth parameters of newly generated plants and time taken to flowering, fruiting and fruit characters by the plants produced through different methods were also recorded.

RESULTS AND DISSCUSSION

Influence of species on number of plants

Significant difference was observed among the evaluated three species *H. undatus*, *H. monacanthus* and *H. costaricensis* in production of plants. The highest number of plants production was recorded in *H. costaricensis* (4,555 plants) and the lowest value recorded in *H. undatus* (3,769 plants).

Number of plants and type of planting materials

There was a significant difference between the types of plants used for producing planting materials. The highest value was recorded when using plants generated by seedlings. Plants generated by seedlings may process higher vigour. Therefore, it can produce more plants. Seedling is a sexual propagated plant and due to segregation they were not shown unique characters.

Number of plants and multiplication technology

There were significant differences among three techniques for the planting materials production (Table 1). Highest number of plants produced by the cumulative method (cumulatively used the produced plants again as the mother stock for few months). Further, all the types of dragon fruit plants showed the ability to generate new shoots even under low amount of resources. Shoots harvesting was done by two months interval and did not show clear difference in every harvest. Plant can regenerate new shoots continuously because of its photosynthetic efficiency and other beneficial characters.

Table.1. Influence of multiplication technology on number of plants production.

<i>Technique</i>	<i>Number of plants produced</i>
1.Single plant production	100.0c
2.Regular cuttings harvesting	1,829.3b
3.Cumulative plant production	10,482.8a

Note: Means with the same letters in columns are not significantly different according to the DMRT at 5 % level.

Although it is possible to produce very large number of planting materials within shorter period, the seedlings generated plants need more time to flowering than mature stem cuttings generated plants. Normal regular cuttings harvesting also gave a higher number of plants than single plant production method. Therefore, it is possible to use

both methods for mass propagation of dragon fruit. The species *H. undatus* was not shown significant difference between seedlings generated plants and mature stems cuttings generated plants for fruit colour, fruit size, fruit shape and quality of the fruit and probably indicating lack of self-incompatibility.

Time taken to flowering

There was no significant difference among species tested on time taken to flowering. Most of plants were taken around 400 days from establishment to first flowering (Table 2).

Table 2. Time taken to flowering of mature stems cuttings generated plants.

<i>Species</i>	<i>Days to first flowering</i>
<i>Hylocereus undatus</i>	402.55 a
<i>Hylocereus costaricensis</i>	400.55a
<i>Hylocereus monacanthus</i>	397.99 a

Note: Means with the same letters in columns are not significantly different according to the DMRT at 5 % level.

In this experiment species *H. undatus* and *H. costaricensis* were used for the evaluation. According to the results, the seedlings generated plants of showed self incompatibility and did not showed more fruits. *H. costaricensis* was recorded higher percentage of flower senescence after bloom while *H. undatus* recorded less than 5 % of flower senescence due to success of self pollination.

Seedling generated plants gave the highest number of plants than mature stem cuttings generated plants in *H. undatus*. Seedlings generated plants have taken more than one year to get flowers and mature stems plants have taken flowers within one year (Table 3). Morphology of the flowers of both types did not show any differences and able to produce fruits with the rate of more than 80 %. Flowering pattern also same in both types.

Table 3. Time taken to flowering among type of plants generated in *H. undatus*.

<i>Type of plant generated</i>	<i>Days to first flowering</i>	<i>Mean average fruit size</i>
Seedlings generated plants	455.148a	460.33a
Mature stem cuttings generated plants	345.481b	467.00a

Note: Means with the same letters in columns are not significantly different according to the DMRT at 5 % level.

There was a significant difference between treatments. Plants generated from mature stem cuttings reached to first flowering earlier than plants generated from seedlings. According to the ANOVA, the results showed that there was no significant difference between mature stem cuttings plants and seedlings generated plants by rapid

method for the size of the fruit. But it can vary according to the climatic conditions and management practices. In drier areas, produced small fruits than wet areas (Wet zone) but sweetness is slightly higher in drier areas.

CONCLUSIONS

In this experiment, the results show that by using cumulative method in each species of Dragon fruit, a high rate of planting materials can be obtained similar to like tissue culture technology. The method of dragon fruit planting materials production was proposed as multi shoot technology, which is a new type of planting materials production technology for the cactus family.

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