



Study on the Growth and Development of two Dragon Fruit (*Hylocereus undatus*) Genotypes

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Abstract

A preliminary investigation was carried out under the AEZ- 29 at the Agricultural Research Station, Bangladesh Agricultural Research Institute (BARI), Pahartali, Chittagong during December 2010 to May 2012 to evaluate two dragon fruit genotypes. The longer plant (272.13 cm) was recorded in HUP 002 while it was 263.34 cm in HUP 001 after one and half year of planting. Flower bud emergence took place after 17 months (on 9 May, 2012) in HUP 001, while it commenced in HUP 002 after 15 months (on 22 March, 2012). Flower bud required 28 days bloom from emergence and the fruit matured after 33 days from anthesis in HUP 001, while that required 35 days for HUP 002 and fruits become matured after 32 days from anthesis. Larger number (8) of flowers per plant was observed in HUP 002 while the lower was noted in HUP 001(6). Numerous anthers were observed below the stigma with attractive white petals in both the varieties. The fruit weights ranged from 200 -375 in HUP 002 but 150-200g in HUP 001. The edible portions were 91.0 and 92.0 with 12.0 and 11.4 % TSS in HUP 001 and HUP 002, respectively. Fruit pulp colour was white in HUP 001 while red in HUP 002.

Keywords: Dragon fruit, plant growth, floral and fruit characteristics

1. Introduction

The origin of *Hylocereus* spp. is the tropical and sub-tropical forest regions of Mexico and Central and South America (Mizrahi *et al.*, 1997). From the centre of its origin, dragon fruit spread to tropical and sub-tropical America, Asia, Australia and the Middle East. It is cultivated in at least 22 countries of the tropics, such as, Australia, Cambodia, China, Israel, Japan, Nicaragua, Peru, Philippines, Spain, Sri Lanka, Taiwan, Thailand, South Western USA and Vietnam etc. (Mizrahi and Nerd, 1999; Novel and Barrera, 2002).

Dragon fruit (*H. undatus*) is popular in South East Asia. It is an edible vine cactus species belonging to the family Cactaceae which has received world wide recognition - first, as an ornamental plant and then as a fruit crop. It is well known for its rich nutrient contents specially vitamin C, phosphorus, calcium as well as its antioxidant characteristics (Morton, 1987). The fresh fruit contain 82.5-83.0% moisture, 0.16-0.23% protein, 0.21-0.61% fat, 0.7-0.9% fibre. Hundred gram fresh fruit pulp contains 6.3-8.8 mg calcium, 30.2-36.1 mg phosphorous, 0.5-0.61 mg iron and 8-9 mg vitamin C (Taiwan Food Industry Development and Research

Authorities, 2005). It is perennial and fast growing climber with triangular or rarely four or five ridged stems. The stem is fleshy, vine like with many branched segments. Each segment has three wavy wings and 1-3 spines or sometimes spineless. These spines form aerial roots which adhere, helps to climb and keep the plant erect. Its fruit is beautiful with bright red skin studded with green scales and white or red flesh with numerous tiny black seeds. The flower is so beautiful that its nick name is “Novel woman” or “Queen of the night”.

In Bangladesh, dragon fruits were introduced by some private entrepreneurs from different countries for growing as ornamental plants. Some of the elite farmers in different places of Bangladesh like Ashulia, Dhaka and Halda Valley Tea State, Fatikchari, Chittagong already started its commercial cultivation. Research on it has already been started at BARI, Gazipur & the Germplasm Center, BAU, Mymensingh. Already mass media like different TV channels and newspapers have drawn public attention of Bangladesh regarding the cultivation of this nutritious fruit. However, published information on this crop in Bangladesh is very scanty. Hence, research on this crop should be emphasized. Therefore, the present investigation was undertaken to study the growth behavior, floral biology and fruiting behavior of this newly introduced crop.

2. Materials and Methods

Cuttings of dragon fruit were collected from the Germplasm Centre of Bangladesh Agricultural University (BAU), Mymensingh as HUP 001 and Halda Valley Tea state, Fatikchari, Chittagong as HUP 002 and twelve plants of each genotypes were planted during December 2010 at a spacing of 2 x 2M (Jacobs and Dimitri, 1999) at the Agricultural Research Station, BARI, Pahartali, Chittagong. The plants were supported by RCC pillars having a base at the top of the pillar to allow the plants to grow properly. Manures and fertilizers were applied as per recommendation made by Rahim *et al.*, (2009) @ 40 kg cowdung/pit & 50-100-100-10-10-10 g/pit of Urea, TSP, MoP, gypsum, borax

and zinc-sulphate, respectively. The full amounts of fertilizers were applied at the time of land preparation as basal dose. The cuttings were planted after 30 days of fertilizer application. Irrigation and other intercultural operations were done as per requirements. Dithane M-45 was applied @ 2 g/liter of water to control red rust disease.

Data on the plant height, number of segments and the number of side segments were collected at every 30 days interval. Other parameters on days after transplanting to anthesis, time of anthesis, duration of anthesis, number of calyx, number of petals, stigma segments, length of flower (cm), colour of anthers, colour of stigma, petal colour, number of anthers, number of flowers per plant, date of harvest, days to harvest, number of fruits per plant, fruit weight (g), fruit length (cm), fruit breadth (cm), pulp colour, edible portion (%) and total soluble solids (TSS) were recorded. Five fruits were used as sample for measuring the fruit data. Data were analyzed statistically following paired T-test.

3. Results and Discussion

The mean data of all the parameters were calculated and are presented in Tables 1 and 2 and Figures 1, 2 and 3. The taller plants (272.1 cm) were recorded in HUP 002 while 263.3 cm in HUP 001 after one and half year (Fig. 1). Number of segments per plant was 7.2 in HUP 002 while 5.7 in HUP 001 (Fig. 2). Number of side segments per plant was 5.11 in HUP 002 while it was 4.70 in HUP 001 (Fig. 3). Flower bud emergence took place after 17 months (on 9 May, 2012) in HUP 001 while after 15 months (on 22 March, 2012) in HUP 002. Flower bud required 29 days to bloom in HUP 001 while 35 days in HUP 002. Anthesis started at 3-4 pm and continued 4-5 hours to anthesis. Pushpakumara *et al.* (2005) reported similar results. Higher number of flower (8) was observed in HUP 002 while the lower number (6) was counted in HUP 001. The flower was 30 cm long with 65 calyx and 22 petals in HUP 002 while those were 28 cm long with 53 calyx and 18 petals in HUP 001 (Table 1).

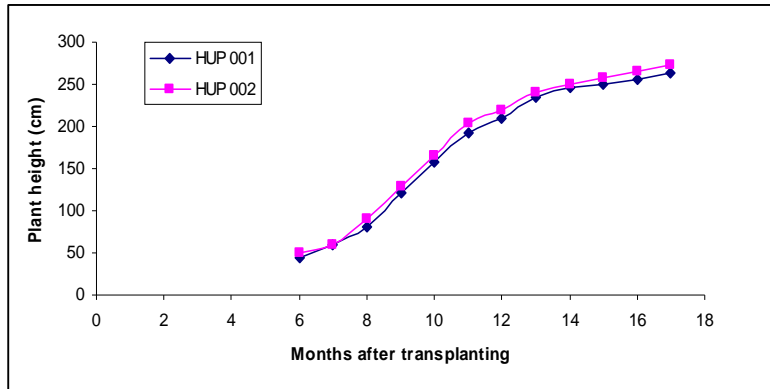


Fig. 1. Plant height of the studied dragon fruit genotypes

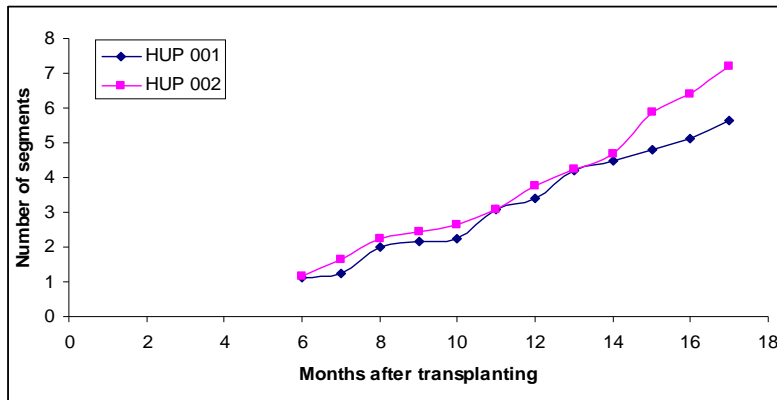


Fig. 2. Number of segments of the studied dragon fruit genotypes

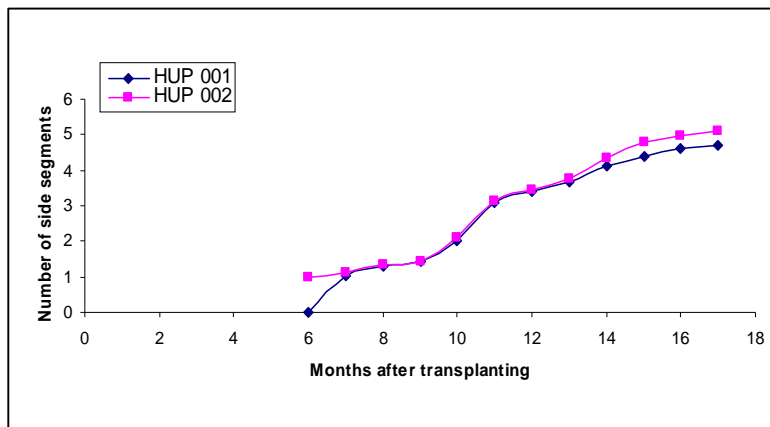


Fig. 3. Number of side segments of the studied dragon fruit genotypes

Table 1. Floral characteristics of the studied two dragon fruit genotypes

Accession Nos.	Days after transplanting to flower bud initiation	Days to anthesis	Time of anthesis	Duration of anthesis (hours)	No. of sepals	No. of petals	Stigma's Segments (Nos.)	Length of the flower (cm)	Colour of the anthers	Colour of the stigma	Corolla colour	Number of anthers	Number of flower /plant
HUP 001	17 months (9 May, 2012)	29	3-4 pm	4 -5	53.0	18.0	31.0	28.0	Yellow	Light green	White	Numerous	6
HUP 002	15 months (22 March, 2012)	35	3-4 pm	4 -5	65.0	22.0	36.0	30.0	Yellow	Light green	Attractive white	Numerous	8
T-test value	-	3.46	-	-	4.61	1.97	1.22	1.90	-	-	-	-	0.85
Level of significance	-	NS	-	-	*	NS	NS	NS	-	-	-	-	NS

* significant at 5% level of degree of freedom.

Table 2. Fruit characteristics of the studied two dragon fruit genotypes

Accession Nos.	Days to fruit harvest from anthesis	No. of fruits/plant	Wt. of fruit (g)	Fruit length (cm)	Fruit breadth (cm)	Skin colour at maturity	Pulp colour	Edible portion (%)	TSS (%)
HUP 001	33 (09.07.2012)	5	171.0 (150-200)	9.6	5.9	red	White	91.0	11.2
HUP 002	32 (29.05.2012)	6	300.0 (200-375)	8.5	8.60	red	red	92.0	12.0
T-test value	0.57	0.57	70.81	0.60	1.49	-	-	0.24	0.36
Level of significance	NS	NS	**	NS	NS	-	-	NS	NS

** significant at 1% level of degree of freedom.

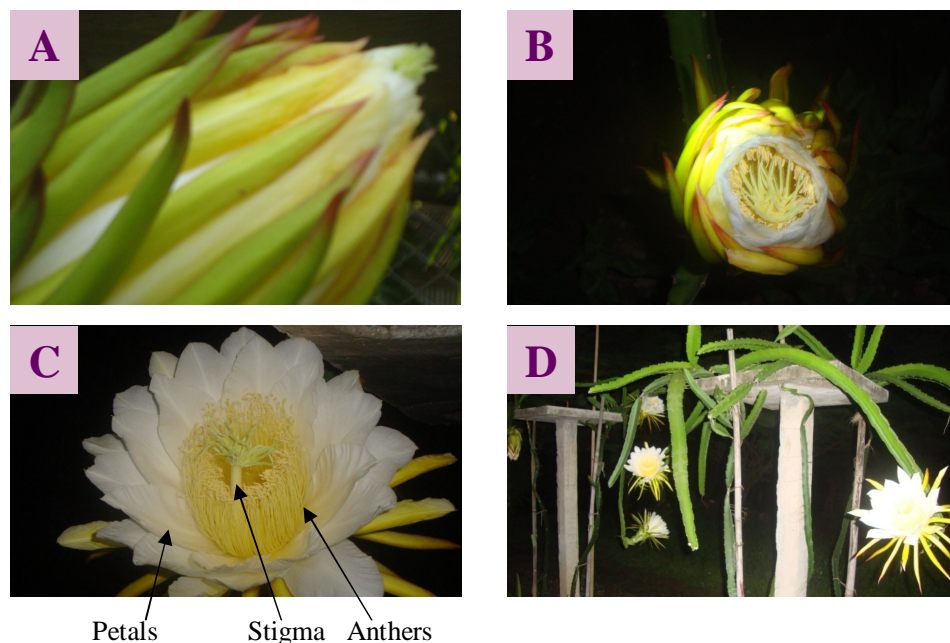


Fig. 4. A. Anthesis started, B. Mid phase of flowering anthesis, C. Completion of anthesis showing different flower parts and D. Dragon fruit plant with flowers after anthesis (same for both the genotypes)

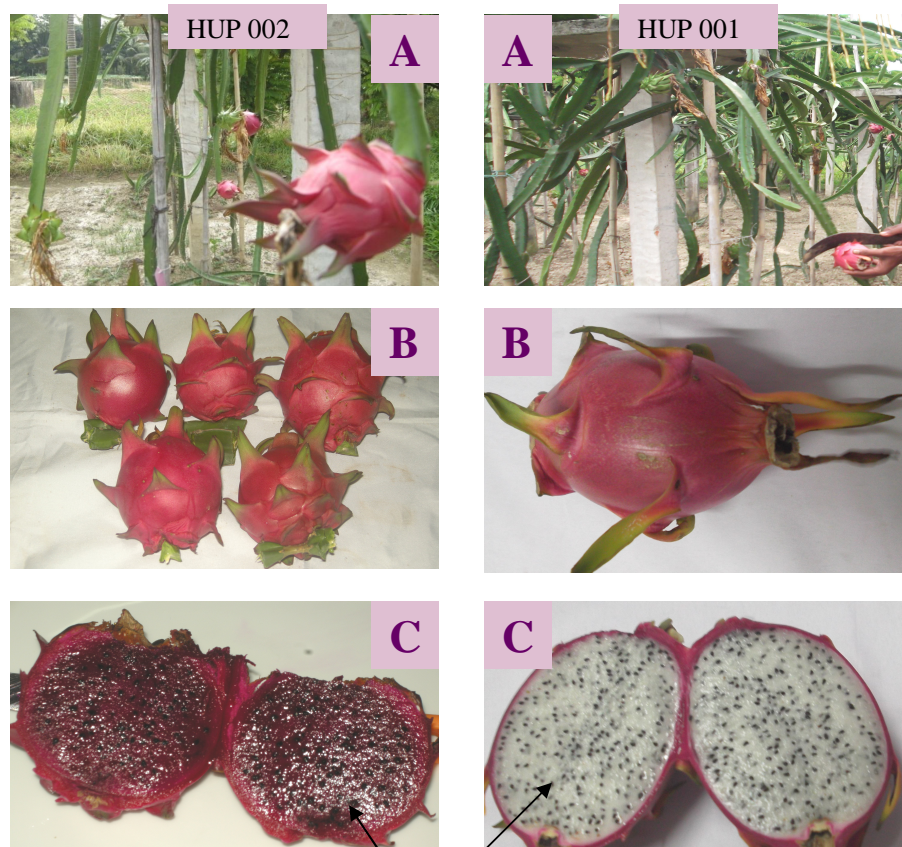


Fig. 5. A. Dragon fruit plant with ripe fruits, B. Harvested fruits and C. Cross-section of dragon fruit

Similar findings were reported in Wikipedia (2012) mentioning the length of flower 25-30 cm, which is supportive for the results of the present study. Numerous anthers were observed below the stigma with attractive white petals (Fig. 4).

The fruit changes its peel colour from green to red at mature stage in both the genotypes. Matured fruits were harvested after 33 days of anthesis in HUP 001 while after 32 days in HUP 002. Nerd *et al.* (1999) and Pushpakumara *et al.* (2005) also found that ripened fruits could be harvested between 30-50 days after pollination. Fruit weight ranged from 200 – 375 g in HUP 002 while from 150-200 g in HUP 001. Jacobs (1999) mentioned that fruit weights ranged from 150-600 g. Fruit shape was oval in HUP 001 while round in HUP 002. Fruit pulp colour was red in HUP 002 whereas white in HUP 001. Rahim *et al.* (2009) also mentioned variable pulp colour in dragon fruits. Numerous small black tiny seeds similar to black cummin were scattered in the pulp in both the genotypes (Fig. 5). Edible portion was 92.0 in HUP 002 while 91.0% in HUP 001. TSS were 11.20 and 12.0 % in HUP 001 and HUP 002, respectively (Table 2). These results are in accordance with those of Islam *et al.* (2012) who reported 11.0 % TSS in fresh dragon fruit juice.

4. Conclusions

From the above results, it is evident that dragon fruit could be grown successfully in chittagong region. However, considering the number of flowers, weight of fruit and other characteristics, the genotype HUP 002 was found promising. Research could be strengthened on different cultural practices as well as varietal development.

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