Effect of Different Dose of NPK on Flower Phenology of Dragon Fruit

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A B S T R A C T

An investigation was carried out with different doses of NPK nutrients (viz. T1 - N250 P2O5 150 K2O 100 g/pole; T2 - N300 P2O5 200 K2O 150 g/pole; T3 - N350 P2O5 250 K2O 200 g/pole; T4 - N400 P2O5 300 K2O 250 g/pole; T5 - N450 P2O5 350 K2O 300 g/pole; T6 - N500 P2O5 400 K2O 350 g/pole; T7 - N550 P2O5 450 K2O 400 g/pole and T8 - Control) in premises adjacent to the Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India during the years 2015 and 2016 to evaluate the effects of NPK nutrients on flower morphology of dragon fruit (*Hylocereus costaricensis*) cv. Royal Moroccan Red. The experiment was laid out in a randomised block design with 8 (eight) treatments and 3 (three) replications. Each treatment comprised of one pole having 4 (four) plants. The observations were recorded on days to first flower, flower length, androecium characters, gynoecium characters and different parts of perianth was observed. The days required to first flower was 431.25 days with application of N350 P2O5 350 K2O 200 g/pole and flowering became earlier by nearly 15 days over control. Among the different flower parameters, the length of upper, inner, outer and lower free perianth, style, stamen and the ovary were only significantly influenced due to the different treatments.

Keywords

Dragon Fruit, Flower morphology, Nutrient, NPK, Phenology

Introduction

*Hylocereus costaricensis* commonly called as Dragon fruit or Pithaya which is a native of Mexico and Central and South America (Britton and Rose, 1963; Mizrahi et al., 1997; Morton, 1987).

It is a long day plant with beautiful night blooming flower that is nicknamed as “Noble Woman” or “Queen of the Night”. The fruit is also known as Strawberry Pear, Dragon fruit, Pithaya, Night blooming Cereus, Belle of the night, Conderella plant and Jesus in the Cradle. It is a long day plant usually flowering starts from April to November sometimes extending till December and occurs in four to six flushes and sometimes to seven (Perween et al., 2018). Pithaya belongs to the genus *Hylocereus* (2n = 22). Young stems and fresh flower buds are eaten as vegetables, while dried ones are used for homemade medicine (Ortiz-Hernández, 1999).

In Taiwan, dry flowers are consumed as vegetables (Mizrahi and Nerd, 1999). Literature on morphology of dragon fruit lacking in general and on flower morphology in particular. There is no scientific information available in the India subcontinent on the
effect of nutrient on flower morphology of dragon fruit. Hence the present investigation was undertaken to evaluate the response of NPK on flower morphology of dragon fruit.

Materials and Methods

The present study was conducted with eight fertilizer treatments viz., T₁ = N₂₅₀P₁₅₀K₁₀₀, T₂ = N₃₀₀P₂₀₀K₁₅₀, T₃ = N₃₅₀P₂₅₀K₂₀₀, T₄ = N₄₀₀P₃₀₀K₂₅₀, T₅ = N₄₅₀P₃₅₀K₃₀₀, T₆ = N₅₀₀P₄₀₀K₃₅₀, T₇ = N₅₅₀P₄₅₀K₄₀₀, T₈ = Control and Organic manure @ 20 kg/pillar containing four plants was laid out in Randomized Block Design with 4 replications of NPK fertilizers combination at as conducted at premises of Faculty of Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India during the period of 2015-2016.

The experimental field was situated at 23.5° N latitude and 89° E longitude on elevation 9.75 above mean sea level (MSL). Characters observed were days to first flower, flower length, androecium characters, gynoecium characters and different parts of perianths. Days to first flower was taken by days count from planting to first flower bloom of the plant.

All measurements were taken by slide caliper except length of flower taken by scale along with the perianth (upper, middle and lower) length. The data on different parameters were analyzed using analysis of variance (ANOVA) based on randomized block design (RBD).

Results and Discussion

The minimum days required to first flower was 431.25 in the treatment T₇ (N₃₅₀P₂₀₀K₂₅₀) which significantly differed with T₂ (439.75 days) and maximum days (445.75) were required to first flowering in control (T₈). Highest stamen length of 11.25 cm was observed in T₆ receiving N₃₀₀P₂₅₀K₃₀₀ followed by T₈ (11.03 cm) and lowest stamen length was recorded in treatment T₂ (9.99 cm) which was at par with T₇ (10.11 cm). Ovary and style length varied significantly among the different treatments. The highest style length was observed in T₂ (22.72 cm) receiving N₂₀₀P₂₀₀K₂₀₀O₁₅₀ g/pillar followed by T₇ (21.99 cm) and lowest in T₄ (20.21 cm) supplied with of N₄₀₀P₂₀₀K₂₀₀. Among the treatments highest ovary length was recorded in treatment supplied with N₄₅₀P₂₀₀K₂₅₀ (32.26 cm) and lowest in control (31.35 cm). Perianth observed in pithaya flowers was hypothetically classified into four types:

a. Upper inner free perianth, b. Upper outer free perianth, c. Middle free perianth and d. Lower free perianth. Upper inner free perianth was free from the flower however, their lower part is indistinctly joined to the other flower parts. Length of upper free perianth varied significantly among the treatments with highest value of 13.42 cm in T₂ (N₃₀₀P₂₀₀K₂₀₀) and lowest upper inner free perianth length of 13.17 cm in T₈ (control). Upper outer free perianth was similar to upper inner perianth but having green colour with reddish margin (Fig. 1 and 2).

Length of upper outer free perianth varied significantly among the treatments while number and diameter varied insignificantly. Highest upper outer free perianth length of 13.43 cm observed in T₇ (N₅₅₀P₂₀₀K₂₀₀) and lowest in T₅ (12.75cm). Middle free perianth was similar to upper outer perianth but smaller in size. Length of lower free perianth varied significantly among the treatments with highest value in the treatment T₇ (33.72cm) and lowest in T₁ (33.27cm). The unusually large, tubular style is 20 cm in length and 0.5 cm in diameter (Perween et al., 2018); the stigmas having 21 slender lobes, creamy green in colour (Daubresse Balayer et al., 1999; Luders, 1999; Perween et al., 2018) (Table 1 and 2).
### Table 1: Effect of nutrients on perianth of dragon fruit

| Treatment | Upper inner free perianth | Upper outer free perianth | Middle free perianth | Lower free perianth |
|-----------|---------------------------|--------------------------|----------------------|---------------------|
|           | Number (cm)               | Length (cm)              | Diameter (mm)        | Number (cm)         | Length (cm) | Diameter (mm) | Number (cm) | Length (cm) | Diameter (mm) |
| T₁        | 10.50                     | 13.20                    | 13.35                | 11.50               | 13.24        | 13.16         | 9.00        | 8.52        | 13.06         |
| T₂        | 11.00                     | 13.42                    | 13.26                | 11.00               | 13.24        | 13.20         | 9.50        | 8.57        | 13.02         |
| T₃        | 11.25                     | 13.25                    | 13.22                | 11.50               | 13.22        | 13.21         | 9.75        | 8.51        | 13.04         |
| T₄        | 11.50                     | 13.30                    | 13.33                | 10.50               | 12.83        | 13.22         | 9.00        | 8.62        | 13.05         |
| T₅        | 11.50                     | 13.20                    | 13.29                | 10.75               | 12.75        | 13.21         | 10.00       | 8.63        | 13.04         |
| T₆        | 11.50                     | 13.30                    | 13.27                | 11.25               | 13.10        | 13.23         | 9.50        | 8.61        | 13.09         |
| T₇        | 11.00                     | 13.37                    | 13.26                | 11.25               | 13.43        | 13.19         | 9.00        | 8.56        | 13.09         |
| T₈        | 11.00                     | 13.18                    | 13.28                | 12.50               | 13.20        | 13.19         | 9.00        | 8.51        | 13.06         |
| CD₀/₀.₅  | NS                        | 0.14                     | NS                   | 0.23                | NS           | NS            | NS          | NS          | 0.15          |

### Table 2: Effect of nutrients on gynoecium characters of dragon fruit

| Treatment | Days to first flower | Flower length (cm) | Petal number | Petal length (cm) | Stamen length (cm) | Anther length (mm) | Anther diameter (mm) | Style length (cm) | Style diameter (mm) | Number of stigmas | Stigma lobe length (mm) | Stigma lobe diameter (mm) | Ovary length (mm) |
|-----------|----------------------|--------------------|--------------|-------------------|--------------------|--------------------|----------------------|------------------|----------------------|-------------------|------------------------|------------------------|---------------------|
| T₁        | 440.50               | 30.11              | 11.44        | 22.25             | 10.37              | 8.71               | 0.958                | 21.37            | 5.58                | 24.00             | 21.77                  | 1.442                  | 31.42               |
| T₂        | 439.75               | 30.46              | 11.18        | 22.25             | 9.99               | 8.71               | 0.950                | 22.72            | 5.60                | 24.75             | 22.12                  | 1.425                  | 31.40               |
| T₃        | 431.25               | 30.49              | 11.25        | 22.25             | 10.86              | 8.73               | 0.955                | 20.50            | 5.48                | 24.25             | 21.79                  | 1.450                  | 31.54               |
| T₄        | 440.75               | 30.62              | 11.17        | 21.75             | 10.45              | 8.72               | 0.958                | 20.21            | 5.63                | 23.75             | 21.51                  | 1.435                  | 31.52               |
| T₅        | 441.25               | 30.77              | 11.39        | 22.00             | 10.64              | 8.70               | 0.948                | 20.41            | 5.48                | 24.50             | 22.21                  | 1.433                  | 32.26               |
| T₆        | 441.25               | 31.07              | 11.27        | 21.50             | 11.25              | 8.71               | 0.955                | 20.28            | 5.63                | 24.50             | 21.62                  | 1.430                  | 31.39               |
| T₇        | 442.75               | 31.00              | 11.33        | 22.25             | 10.11              | 8.75               | 0.968                | 21.99            | 5.55                | 24.00             | 22.25                  | 1.433                  | 31.49               |
| T₈        | 445.75               | 30.05              | 11.28        | 22.00             | 11.03              | 8.73               | 0.950                | 21.55            | 5.55                | 24.25             | 21.73                  | 1.423                  | 31.35               |
| CD₀/₀.₅  | 6.7437               | NS                 | NS           | 0.5281            | NS                 | 0.66               | NS                   | NS               | NS                   | NS                | NS                     | NS                     | 0.18                |

NS- Non-significant

NOTE: T₁ - N₂₅₀P₂O₅₁₅₀K₂O₁₀₀; T₂ - N₃₀₀P₂O₅₂₀₀K₂O₁₅₀; T₃ - N₃₅₀P₂O₅₂₅₀K₂O₂₀₀; T₄ - N₄₀₀P₂O₅₃₀₀K₂O₂₅₀; T₅ - N₄₅₀P₂O₅₃₅₀K₂O₃₀₀; T₆ - N₅₀₀P₂O₅₄₀₀K₂O₃₅₀; T₇ - N₅₅₀P₂O₅₄₅₀K₂O₄₀₀; T₈ - Control.
Fig. 1 Different floral parts of dragon fruit flower

- Cross section of flower (Dorsal view)
- Style and Stigma lobes
- Cross section of flower (Ventral view)
- Upper inner perianth
- Upper outer perianth
- Middle perianth
- Lower perianth
- Ovary (cross section)
- Stamens and stigma
Fig.2 1- Flower bud initiation, 2, 3 and 4 - Flower buds, 5- Mature flower bud ready to bloom, 6 and 7 – Blooming of flowers

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