Effect of different levels of control released fertilizer on plant growth and establishment of dragon fruit (Hylocereus polyrhizus) under Prayagraj agro climatic condition cv. red flesh

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Abstract
This study aims to determine the response of the growth of dragon fruit (Hylocereus polyrhizus) with the treatment of different levels of control released fertilizer. This research was conducted from October 2020 until February 2021 at the Research farm of Department of Horticulture, SHUATS, Prayagraj. The study used a randomized block design (RBD), with nine treatments, replicated thrice. The treatments were: T1-Control (100% RDF), T2-C.R.F @ 2g, T3-C.R.F @ 3g, T4-C.R.F @ 4g, T5-C.R.F @ 5g, T6-C.R.F @ 6g, T7-C.R.F @ 7g, T8-C.R.F @ 8g, T9-C.R.F @ 9g. From the present experimental findings it is found that the T8-C.R.F @ 9g was found superior over other treatments in terms of establishment of Dragon fruit. The results revealed that maximum plant height (38.25cm), number of branches (3.73), Main stem width (18.53cm), number of sprouting (3.83), stem length (between two nodes)18.14cm and Survival percentage (100%) of plant were recorded in T8 (C.R.F @ 9g).

Keywords: dragon fruit, red flesh and control release fertilizer.

Introduction
Fruits are nature’s marvelous gift for mankind. Most of us love fruits because of their colour, flavor and taste, but they also provide unique and vital nutrients for our body. Fruits are loaded with many vitamins, minerals, antioxidants like polyphenolic flavonoids, vitamin C and anthocyanins. These compounds not only protect human body from oxidative stress of free radicals but also boost the immunity level of the body.

The fruit of several different tropical climbing plants of the genus Hylocereus, family Cactaceae, is known as dragon fruit or pitaya. Dragon fruit (Hylocereus polyrhizus) is originated from Mexico and Central South America. It is thought to be a promising and profitable fruit crop. It have a highly appealing colour and mellow mouth melting pulp, as well as amazing nutritional characteristics and a black coloured edible seed embedded in the pulp (Herawati et al., 2020).

It can be consumed raw or processed into a variety of useful items. The fruit has therapeutic characteristics that have been linked to the prevention of colon cancer and diabetes, as well as the neutralisation of hazardous compounds like heavy metals, as well as the reduction of cholesterol and high blood pressure. High sugar levels were also observed to be controlled by the fruit. It’s a fruit that’s good for your health. It is extensively favoured since it is regarded as a future fruit crop (Verma et al., 2019).[9]

Dragon fruit are cultivated in south-east Asia mainly Thailand and Vietnam, the United states, Israel, Australia and the Canary Islands. Dragon fruit is a fleshy berry, which is oblong with red and yellow scaly peel. The flesh may be red or white depending on the species. Seeds of dragon fruit are very small, numerous and black, covered with the flesh. The red flesh varieties contain a natural antioxidant called Lycopene which is known to fight cancer, heart disease and low blood pressure. (Sonawane et al., 2017).[8]

Controlled-release fertilizer (C.R.F.) which is a good alternative of soluble fertilizer to increase FUE and minimize nutrient losses, especially N, in the field environment (Zhao et al., 2013).[12] The coating material of C.R.F. plays an important role in gradually releasing the nutrient and the most important parameters for controlling nutrient release which include the thickness of the coating membrane, followed by temperature, soil microbial activity, granule radius etc. and they are controlled to match the nutrient requirement of the plants.
In India, area under cultivation of dragon fruit was gradually increased from 4 to 400 ha in different states during 2005–2017. Cultivation of dragon fruit was first started by the farmers from Karnataka, Gujrat, Maharashtra, Kerala, Tamil Nadu, West Bengal, Andhra Pradesh, Odissa, Telangana and Andaman & Nicobar Islands. Its cultivation has extended to Rajasthan, Punjab, Haryana, Madhya Pradesh, Uttar Pradesh and North Eastern States. (Arivalgan et al., 2019) [1].

Materials and Methods
The present Study entitled “Effect of different levels of control released fertilizer on plant growth and establishment of Dragon fruit (Hylocereus polyrhizus) under Prayagraj agro climatic condition cv. Red Flesh” was carried out during October to February 2020 in the research field of department of horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) India. The experiment was conducted in randomized block design (RBD) with 9 treatments of Control released fertilizers with 3 replications. Total number of treatments were thirteen viz: T0 (control (100% RDF)), T1 (C.R.F @ 2g), T3(C.R.F @ 3g), T5 (C.R.F @ 4g), T4 (C.R.F @ 5g), T6 (C.R.F @ 6g), T8 (C.R.F @ 7g), T7 (C.R.F @ 8g), T9 (C.R.F @ 9g). Cultivar Red Flesh were used.

The area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh which experience extremely hot summer and fairly cold winter. The maximum temperature of location reaches upto 46 °C- 48 °C and seldom falls as low as 2 °C – 5 °C. The relative humidity range between 20 - 94%. The average rainfall in this area is around 1013.4mm annually. However, occasional precipitation is also not uncommon during winter month.

Result and Discussion
The results of the present investigation, regarding the effect of different levels of control released fertilizer on plant growth and establishment of Dragon fruit (Hylocereus polyrhizus) under Prayagraj agro climatic condition “cv. Red Flesh” have been discussed and interpreted in light of previous research work done in India and abroad. The experiment was conducted in Randomized Block Design with 9 treatment and 3 replications. The result of the experiment is summarized below. The data presented in Table 1 clearly revealed that various vegetative growth attributing characters were significantly influenced by different combinations of control released fertilizers.

Maximum vegetative growth in term of plant height
Significantly higher plant height at 150DAT. The significantly highest plant height - (38.25cm) was noticed in T5 (C.R.F @ 9g) followed by T7, T8, T4 and T0. The treatments T7 and T0 were to and at par with each other. The minimum plant height (33.61cm) was observed in T1 (C.R.F @ 2g). The highest dose of Control released fertilizers might have accelerated cell division and tissue formation resulting in more vegetative growth and hence increasing plant height. Further findings were reported by Sandeep et al., 2018 and Verma et al., 2019 [8].

In term of number of branches per plant. The significantly highest Number of branches per plant - (3.73cm) was noticed in T5 (C.R.F @ 9g) followed by T7, T8, T4 and T0. The treatments T0, T6, T5, T4 and T8 were to and at par with each other. The minimum Number of branches per plant (1.78cm) was observed in T1 (C.R.F @ 2g). The higher dose of Control released fertilizers might have been supplied sufficient nutrient to plants and there by higher value of number of branches similarly in T7, T9, T2, T4 and control (100% RDF) higher value were recorded in Plant height at par with T5. However T8 was significantly superior over T3, T2 and T7. Supply of nutrients from soil with comparatively more translocation and lesser retention root to aerial parts for protoplasmic proteins and synthesis of other compounds. Similar finding were reported by Chang Tien et al., 2016 [3] and Perween et al., 2018 [7].

Significantly higher, Main stem width - (18.53cm) was noticed in T6 (C.R.F @ 9g) followed by T5, T0, T6, T7 and T8. The treatments T0 and T7 were to and at par with each other. The minimum Main stem width (15.15cm) was observed in T1 (C.R.F @ 2g). The this might have occurred due to increased photosynthetic area and translocation of photosynthesis in plants which subsequently accelerated the formation of large sized stem circumference of dragon fruit. Similar findings were reported by Sandeep et al., (2018) there were significant differences in terms of main stem circumference.

In terms of Number of sprouting - (3.83cm) was noticed in T5 (C.R.F @ 9g) followed by T7, T6, T5, T4 and T0. The treatments T0 and T7 were to and at par with each other. The minimum Number of sprouting (2.25cm) was observed in T1 (C.R.F @ 2g). Control released fertilizers might have been supplied sufficient nutrient to plants and there by higher value of Number of sprouting similarly in T7, T8, T5 and control (100% RDF) higher value were recorded in Number of sprouting at par with T5. However T5 was significantly superior over T1, T2 and T7. Similar findings were reported by Sangeeta et al., (2017) and Verma et al., 2019 [8].

In term of Stem length (between two nodes) The significantly highest stem length - (18.14cm) was noticed in T5 (C.R.F @ 9g) followed by T7, T6, T3, T4 and T0. The treatments T0, T6, T7 and T0 were to and at par with each other. The minimum stem length (11.15cm) was observed in T1 (C.R.F @ 2g). Control released fertilizers might have been supplied sufficient nutrient to plants and there by higher value of stem length similarly in T7, T6, T4 and T0 (100% RDF) higher value were recorded in stem length at par with T5. However T5 was significantly superior over T1, T2 and T7. Similar findings were reported by Seran and Thiores (2015) and Verma et al., (2019) [9].

The significantly highest Survival percentage - (100%) was noticed in T8 (C.R.F @ 9g) followed by T5, T7, T3, T4 and T0. The treatments T0, T5, T6 and T7 were to and at par with each other. The minimum Survival percentage (33.33%) was observed in T1 (C.R.F @ 2g). Similar findings were reported by Sandeep et al., 2018.

Conclusion
Based on the present experimental findings it is concluded that the treatment T8 (C.R.F @ 9g) was found superior over other treatments in terms of plant height number of branches, Main stem width, Number of sprouting, Stem length (between two nodes) and Survival percentage (%). While using C.R.F. it is noticed that the total cost of the cultivation per hectare which is lower than that of recommended dose of fertilizer. In this experiment it is concluded that the labour cost and Amount of fertilizer is reduced. There is minimum nutrient loss through leaching which prevents the frequently application of fertilizer.
Table 1: Effect of different levels of control released fertilizer on growth parameters of dragon fruit.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Treatment</th>
<th>Plant height at 150 DAT</th>
<th>Number of branches at 150 DAT</th>
<th>Main stem width plant-1 at 150 DAT</th>
<th>Number of sprouting at 150 DAT</th>
<th>Stem length between two nodes at 150 DAT</th>
<th>Survival %</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₀</td>
<td>Control (RDF 100%)</td>
<td>37.52</td>
<td>3.58</td>
<td>18</td>
<td>3.7</td>
<td>17.18</td>
<td>100.00%</td>
</tr>
<tr>
<td>T₁</td>
<td>C.R.F @ 2g</td>
<td>33.69</td>
<td>1.78</td>
<td>15.15</td>
<td>2.25</td>
<td>11.15</td>
<td>33.33%</td>
</tr>
<tr>
<td>T₂</td>
<td>C.R.F @ 3g</td>
<td>34.08</td>
<td>1.92</td>
<td>15.45</td>
<td>2.66</td>
<td>13.41</td>
<td>44.00%</td>
</tr>
<tr>
<td>T₃</td>
<td>C.R.F @ 4g</td>
<td>34.9</td>
<td>2.22</td>
<td>16.1</td>
<td>2.81</td>
<td>14.88</td>
<td>55.00%</td>
</tr>
<tr>
<td>T₄</td>
<td>C.R.F @ 5g</td>
<td>35.75</td>
<td>2.62</td>
<td>16.67</td>
<td>2.93</td>
<td>14.98</td>
<td>66.66%</td>
</tr>
<tr>
<td>T₅</td>
<td>C.R.F @ 6g</td>
<td>36.19</td>
<td>2.81</td>
<td>17.07</td>
<td>3.05</td>
<td>15.79</td>
<td>88.66%</td>
</tr>
<tr>
<td>T₆</td>
<td>C.R.F @ 7g</td>
<td>36.2</td>
<td>3.14</td>
<td>17.3</td>
<td>3.15</td>
<td>16.38</td>
<td>100%</td>
</tr>
<tr>
<td>T₇</td>
<td>C.R.F @ 8g</td>
<td>37.26</td>
<td>3.33</td>
<td>17.5</td>
<td>3.27</td>
<td>16.64</td>
<td>100%</td>
</tr>
<tr>
<td>T₈</td>
<td>C.R.F @ 9g</td>
<td>38.25</td>
<td>3.73</td>
<td>18.53</td>
<td>3.83</td>
<td>18.14</td>
<td>100%</td>
</tr>
</tbody>
</table>

F-Test  | S               | S                     | S                             | S                                | S                             | S                                      | S          |
S. Ed. (±)  | 0.59            | 0.11                  | 0.4                           | 0.33                            | 1.02                          | 0.11                                    | 0.11       |
C.D. At 5%  | 1.25            | 0.23                  | 0.85                          | 0.712                           | 2.17                          | 0.23                                    |            |

References


