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Paramanand Prajapati
Research Student, Department of Horticulture, SHUATS, Naini Prayagraj, Uttar Pradesh, India

Samir E Topno
Assistant Professor, Department of Horticulture, SHUATS, Naini Prayagraj, Uttar Pradesh, India

Vijay Bahadur
Assistant Professor, Department of Horticulture, SHUATS, Naini Prayagraj, Uttar Pradesh, India

Corresponding Author
Paramanand Prajapati
Research Student, Department of Horticulture, SHUATS, Naini Prayagraj, Uttar Pradesh, India

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

Paramanand Prajapati, Samir E Topno and Vijay Bahadur

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 2020until 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 T_0Control (100% RDF), T_1C.R.F @ 2g,T_2 C.R.F @ 3g, T_3 C.R.F @ 4g, T_4 C.R.F @ 5g, T_5 C.R.F @ 6g, T_6 C.R.F @ 7g, T_7 C.R.F @ 8g, T_8 C.R.F @ 9g. From the present experimental findings it is found that the T_8 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 T_8 (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, dragon fruit was first introduced during the late 1990s. 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 three replications. Total number of treatments were thirteen *viz.*T_0 (control (100% RDF)), T_1 (C.R.F @ 2g), T_2(C.R.F @ 3g), T_3 (C.R.F @ 4g), T_4 (C.R.F @ 5g), T_5 (C.R.F @ 6g), T_6 (C.R.F @ 7g), T_7 (C.R.F @ 8g), T_8 (C.R.F @ 9g),CultivarRed 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 ºC- 48 ºC and seldom falls as low as 2 ºC – 5 ºC. 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 treatement 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 T_8 (C.R.F @ 9g) followed by T_7, T_6, T_5, T_4 and T_0. The treatments T_7 and T_0 were to and at par with each other. The minimum plant height (33.61cm) was observed in T_1 (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. Similar finding were reported by Sandeep *et al.,* 2018 and Verma *et al.,* 2019 [9].

In term of number of branches per plant. The significantly highest Number of branches per plant - (3.73cm) was noticed in T_8 (C.R.F @ 9g) followed by T_7, T_6, T_5, T_4 and T_0. The treatments T_0, was to and at par with each other. The minimum Number of branches per plant (1.78cm) was observed in T_1 (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 inT_7, T_6, T_5, T_4 and control (100% RDF) higher value were recorded in Plant height at par withT_8. However T_8 was significantly superior over T_3, T_2 and T_1. 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 T_8 (C.R.F @ 9g) followed by T_7, T_6, T_5, T_4 and T_0. The treatments T_0, and T_7 were to and at par with each other. The minimum Main stem width (15.15cm) was observed in T_1 (C.R.F @ 2g). 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 T_8 (C.R.F @ 9g) followed by T_7, T_6, T_5, T_4 and T_0. The treatments T_0, and T_7 were to and at par with each other. The minimum Number of sprouting (2.25cm) was observed in T_1 (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 T_7, T_6, T_5, T_4 and control (100% RDF) higher value were recorded in Number of sprouting at par with T_8. However T_8 was significantly superior over T_3, T_2 and T_1 Similar findings were reported by Sangeeta *et al.,* (2017) and Verma *et al.,* 2019 [9].

In term of Stem length (between two nodes) The significantly highest stem length - (18.14cm) was noticed in T_8 (C.R.F @ 9g) followed by T_7, T_6, T_5, T_4 and T_0. The treatments T_0, T_6, and T_7 were to and at par with each other. The minimum stem length (11.15cm) was observed in T_1 (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 T_7, T_6, T_5, T_4 and control (100% RDF) higher value were recorded in stem length at par with T_8. However T_8 was significantly superior over T_3, T_2 and T_1.Similar findings were reported by Seran and Thiresh (2015) and Verma *et al*., (2019) [9].

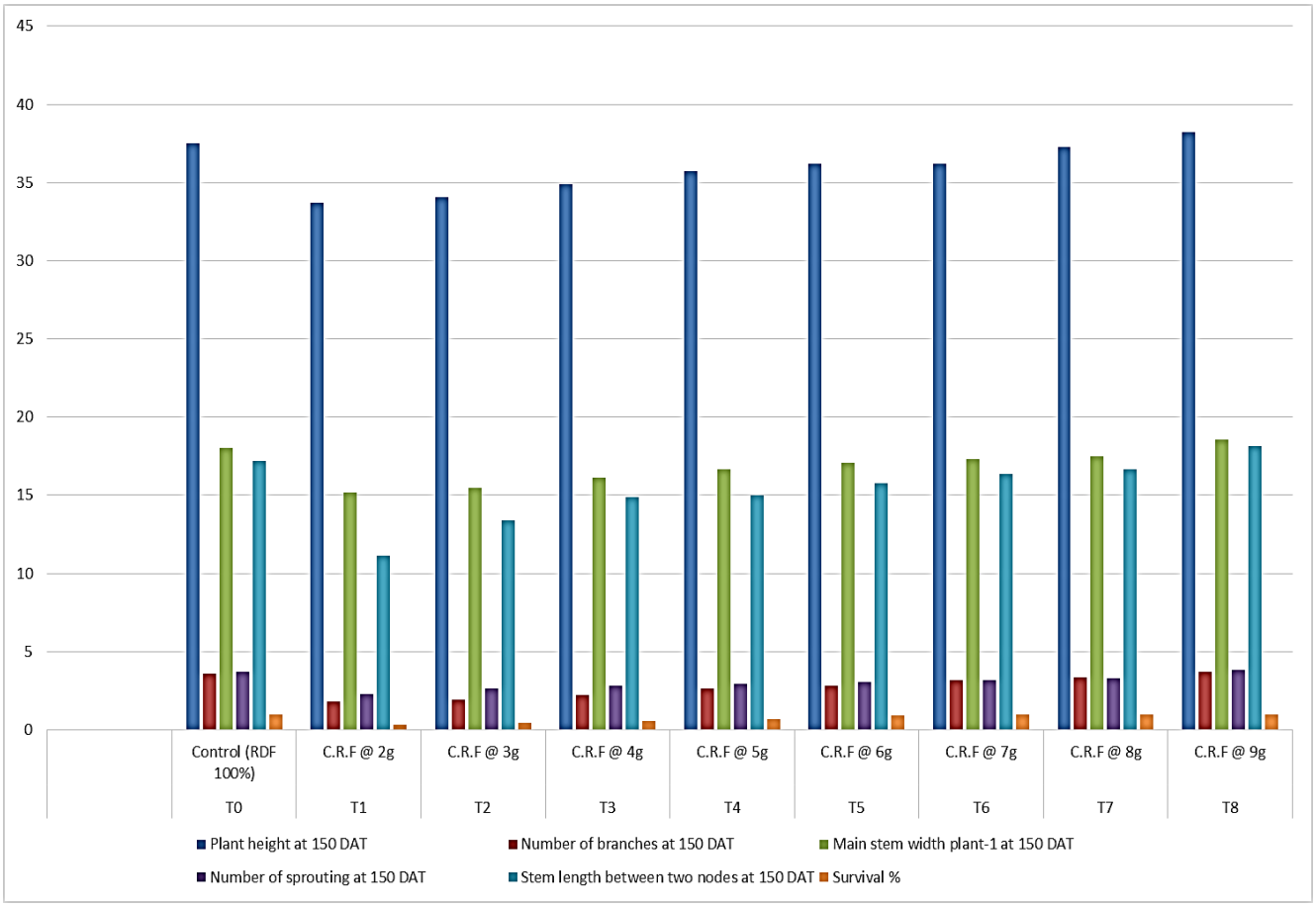
The significantly highest Survival percentage - (100%) was noticed in T_8 (C.R.F @ 9g) followed by T_7, T_6, T_5, T_4 and T_0. The treatments T_0, T_5, T_6, and T_7 were to and at par with each other. The minimum Survival percentage (33.33%) was observed in T_1 (C.R.F @ 2g).Similar findings were reported by Sandeep *et. al.,* 2018.

Conclusion

Based on the present experimental findings it is concluded that the treatment T_8 (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.

Symbol	Treatment	Plant height at 150 DAT	Number of branches at 150 DAT	Main stem width plant-1 at 150 DAT	Number of sprouting at 150 DAT	Stem length between two nodes at 150 DAT	Survival %
T_0	Control (RDF 100%)	37.52	3.58	18	3.7	17.18	100.00%
T_1	C.R.F @ 2g	33.69	1.78	15.15	2.25	11.15	33.33%
T_2	C.R.F @ 3g	34.08	1.92	15.45	2.66	13.41	44.00%
T_3	C.R.F @ 4g	34.9	2.22	16.1	2.81	14.88	55.00%
T_4	C.R.F @ 5g	35.75	2.62	16.67	2.93	14.98	66.66%
T_5	C.R.F @ 6g	36.19	2.81	17.07	3.05	15.79	88.66%
T_6	C.R.F @ 7g	36.2	3.14	17.3	3.15	16.38	100%
T_7	C.R.F @ 8g	37.26	3.33	17.5	3.27	16.64	100%
T_8	C.R.F @ 9g	38.25	3.73	18.53	3.83	18.14	100%
F- Test		S	S	S	S	S	S
S.Ed. (±)		0.59	0.11	0.4	0.33	1.02	0.11
C.D. At 5%		1.25	0.23	0.85	0.712	2.17	0.23



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