International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating: 5.29
IJABR 2025; 9(7): 603-606
www.biochemjournal.com
Received: 25-04-2025
Accepted: 30-05-2025

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Effect of foliar application of nano urea on growth and yield parameters of dragon fruit (*Hylocereus polyrhizus* Britton & Rose)

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i7h.4796

Abstract
The present investigation entitled "Effect of foliar application of nano urea on growth, yield and quality of dragon fruit (*Hylocereus polyrhizus* Britton & Rose.)" was carried out at Instructional farm, Polytechnic in Horticulture, Junagadh Agricultural University, Junagadh during the year 2024-25. The experiment was laid out in Randomized Block Design (RBD) with ten treatments which were replicated three time. The results revealed that growth and yield parameter were significantly influenced by the different treatments of nano urea was found significant and highest incremental plant height (65.33 cm) were recorded in 100% RDN + 0.6% Nano urea (T_4). number of flowers per pillar (25.28), number of fruits per pillar (23.07), yield per plant (1.93 kg), yield per pillar (7.73 kg) and yield per hectare (8.73 tonnes) were recorded in 100% RDN + 0.4% Nano urea (T_3).

Keywords: Dragon fruit, urea, nano urea, growth, yield, quality

Introduction
Dragon fruit is a recently introduced super fruit in India, considered to be a promising and remunerative fruit crop. It comes in the limelight because of its attractive fruit color and mouth-watering pulp with edible black seed imbedded inside the pulp. It worldwide recognition not only as an ornamental plant but also as a fruit crop and an industrial source of compounds. It has high demand in national and international markets. It is easy to cultivate and requires minimal care as compared to other fruit crops. Dragon fruit is not only popular for its unique appearance but also for its potential health benefits, its mild flavor, crunchy texture and subtle sweetness. It is high valued crop due to its exotic nature, limited availability and the labor intensive process of growing and harvesting the fruit.

The crop is a tropical fruit crop that belongs to the cactaceae family. The scientific name came from the greek word "hyle (woody)" and the latin words "cereus (waxen)" and "undatus", which refers to the wavy edges of its stems. Its fruit is the most magnificent in the cactaceae family which is known by many as "Noble Woman" or "Night Queen," this long-day plant is named for its exquisite night-blooming blooms.

There are four main species available depending on its appearance; (i) Red skin with red pulp (*Hylocereus polyrhizus*), (ii) Red skin with white pulp (*Hylocereus undatus*), (iii) Red skin with pink pulp (*Hylocereus costaricensis*) and (iv) Yellow skin with white pulp (*Hylocereus megalanthus*).

Urea is the most commonly used nitrogen source for foliar fertilization (Etehadnejad and Aboutalebi, 2014; Fernandez *et al.*, 2013; Swietlik and Faust, 1984) [9, 10, 25] due to several characteristics, including its high solubility in water, nonpolarity, rapid leaf absorption and low phytotoxicity (Bondada *et al.*, 2001; Etehadnejad and Aboutalebi, 2014; Yamada *et al.*, 1965) [7, 9, 30]. Although foliar fertilization isn't aimed to completely replace soil fertilization, it has been found that the effects of foliar applications of urea are similar or even better than those of soil applications regarding improvements in fruit yield and quality (Blasberg, 1953; Fisher and Cook, 1950; Hasani *et al.*, 2016) [6, 11, 13].

Materials and Methods

An investigation on "Effect of foliar application of nano urea on growth and yield parameters of dragon fruit (*Hylocereus polyrhizus* Britton & Rose.)" was carried out at Instructional farm, Polytechnic in Horticulture, Junagadh Agricultural University, Junagadh during the year 2024-25. The experiment was laid out in a five-year-old trees with uniform sized trees spaced at 3.6 m × 2.4 m. The design was Randomized Block Design which included ten treatments with three replicates, 100% RDN (T_1), 100% RDN + 0.2% Nano urea (T_2), 100% RDN + 0.4% Nano urea (T_3), 100% RDN + 0.6% Nano urea (T_4), 80% RDN + 0.2% Nano urea (T_5), 80% RDN + 0.4% Nano urea (T_6), 80% RDN + 0.6% Nano urea (T_7), 60% RDN + 0.2% Nano urea (T_8), 60% RDN + 0.4% Nano urea (T_9) and 60% RDN + 0.6% Nano urea (T_{10}).

Foliar spray of nano urea will be applied before flowering stage and then one month later. In RDF phosphorus and potash are apply as a basal dose and nitrogen apply through urea as per treatment. (RDF dose: NPK: 500:750:300 gm/pillar).

Results and Discussion

An appraisal of data in table 1 and 2 shows the effect of different level of nano urea on incremental plant height, yield per plant, yield per pillar and yield per hectare in dragon fruit.

Effect on growth parameters

Effect of different level of foliar spray of nano urea on incremental plant height of dragon fruit was depicted in Table 1. The maximum incremental plant height (65.33 cm) was registered in 100% RDN + 0.6% Nano urea (T_4). However, minimum incremental plant height (47.70 cm) was recorded in treatment 100% RDN (T_1).

This might be due to the fact that foliar application of nano urea help in the efficient absorption and translocation of nitrogen to different plant part due to their small size which helps in easy penetration through stomatal opening and effective distribution throughout the plant system, enough nitrogen supply might have enhanced the activity of enzymes and auxin metabolism in plant, leading to larger cells and cell elongation, resulting in taller plant (Rajesh *et al.*, 2021) [22]. These findings are similar with those of Badran and Savin (2018) [2] in bitter almond, Al-Asally and Al-Hijemy (2022) [1] in mandarin, Jangid *et al.* (2022) [14] in custard apple, Bhatti *et al.* (2023) [4] and Singh *et al.* (2023) [23] in guava, Meena *et al.* (2023) [19] in ber, Bhakher *et al.* (2023) [3] in sunflower, Divya *et al.* (2024) [12] in custard apple who reported that growth and growth attributes concerning increased nitrogen application rate indicates maximum vegetative growth of plants under higher nitrogen availability.

Table 1: Effect of foliar application of nano urea on incremental plant height in dragon fruit.

Tr. No.	Treatments	Incremental plant height (cm)
T_1	100% RDN	47.70
T_2	100% RDN + 0.2% Nano urea	56.13
T_3	100% RDN + 0.4% Nano urea	63.17
T_4	100% RDN + 0.6% Nano urea	65.33
T_5	80% RDN + 0.2% Nano urea	50.17
T_6	80% RDN + 0.4% Nano urea	56.90
T_7	80% RDN + 0.6% Nano urea	56.33
T_8	60% RDN + 0.2% Nano urea	52.13
T_9	60% RDN + 0.4% Nano urea	50.43
T_{10}	60% RDN + 0.6% Nano urea	56.97
S.Em.±		2.113
C.D. at 5%		6.28
C.V.%		6.59

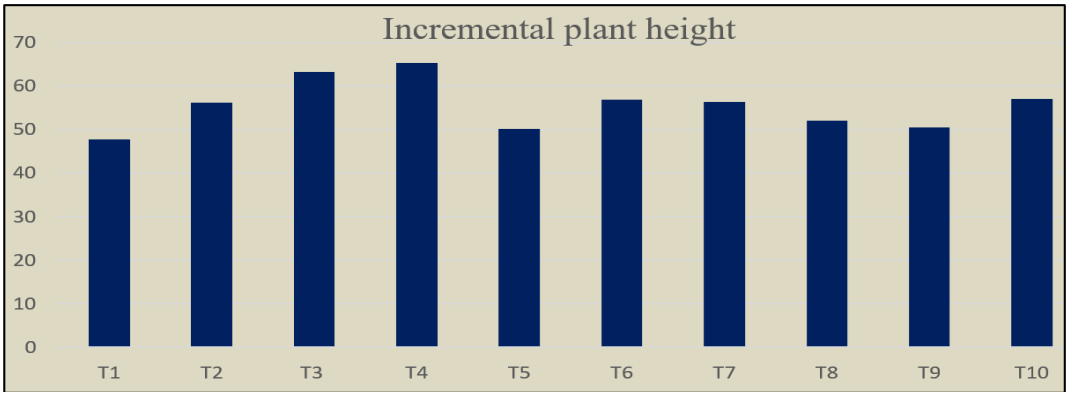

Fig 1: Effect of foliar application of nano urea on incremental plant height in dragon fruit.

Effect on yield parameters

The variation due to different treatments of nano urea was found significant on number of flowers per pillar, number of fruits per pillar, yield per plant, yield per pillar and yield per hectare. Significantly maximum number of flowers per pillar (25.28), number of fruits per pillar (23.07), yield per plant (1.93 kg), yield per pillar (7.73 kg) and yield per hectare (8.73 tonnes) were recorded in 100% RDN + 0.4% Nano urea (T_3). However, the minimum number of flowers per pillar (21.51), number of fruits per pillar (19.17), yield per plant (1.32 kg), yield per pillar (5.30 kg) and yield per hectare (6.07 tonnes) were recorded in 100% RDN (T_1).

The improvement in crop yield observed with foliar nitrogen fertilization is likely due to nitrogen's essential physiological and metabolic functions during flowering and fruit development. These include supporting carbohydrate supply, which is crucial for flower bud formation, initiation and growth of flowers, ovule longevity, successful pollination, and fertility. The improvement in fruit yield per pillar following the foliar application of nano urea could be attributed to better fruit retention on the tree, which in turn reduces the percentage of fruit drop (Bisen *et al.*, 2020) [5] in guava. These findings align with the observations of Lovatt (1994) [16] in avocado, and those of Stiles (1999) [24] and Etehadnejad and Aboutalebi (2014) [9] in apple.

Table 2: Effect of foliar application of nano urea on yield per pillar, yield per plant and yield per hectare in dragon fruit

Tr. No.	Treatments	Fruit yield (kg/plant)	Fruit yield (kg/pillar)	Fruit yield (t/ha)
T_1	100% RDN	1.32	5.30	6.07
T_2	100% RDN + 0.2% Nano urea	1.64	6.55	7.63
T_3	100% RDN + 0.4% Nano urea	1.93	7.73	8.73
T_4	100% RDN + 0.6% Nano urea	1.56	6.27	7.21
T_5	80% RDN + 0.2% Nano urea	1.44	5.73	6.62
T_6	80% RDN + 0.4% Nano urea	1.77	7.07	8.03
T_7	80% RDN + 0.6% Nano urea	1.39	5.56	6.34
T_8	60% RDN + 0.2% Nano urea	1.43	5.73	6.61
T_9	60% RDN + 0.4% Nano urea	1.53	6.21	7.27
T_{10}	60% RDN + 0.6% Nano urea	1.48	5.92	6.76
S.Em.±		0.059	0.239	0.274
C.D. at 5%		0.17	0.71	0.81
C.V.%		6.67	6.67	6.67

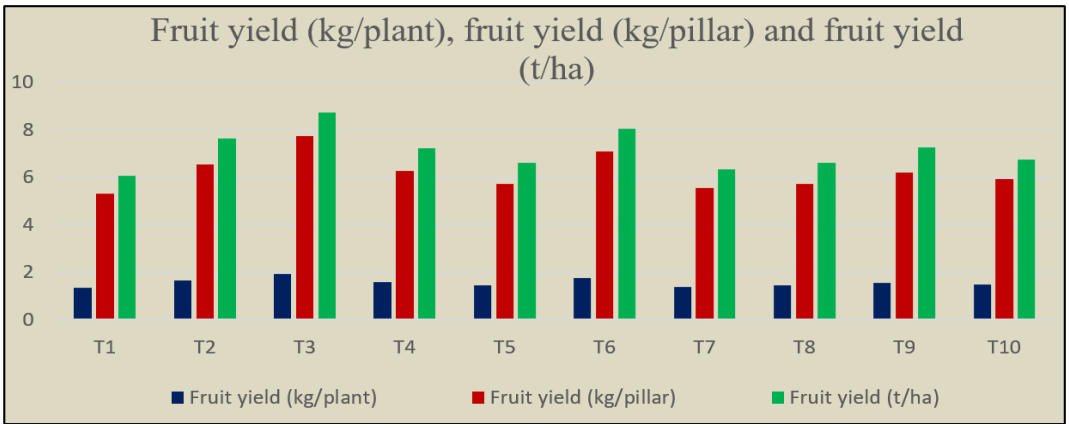

Fig 2: Effect of foliar application of nano urea on yield per plant, yield per pillar and yield per hectare in dragon fruit

Conclusion

From the present investigation, it can be concluded that growth parameter the apply 100% RDN + 0.6% Nano urea gave maximum incremental plant height. In terms of yield parameters, the maximum number of flowers per pillar, number of fruits per pillar, yield per plant, yield per pillar and yield per hectare observed in 100% RDN + 0.4% Nano urea in dragon fruit.

Acknowledgement

I humbly acknowledge the guidance of my major and minor guide, full co-operation by the Head and entire staff, Department of Fruit Science for giving me proper guidance, providing field and necessary other inputs for research problem as well as Department of Agricultural Statistics to analyse the data.

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