



ISSN Print: 2664-6064
 ISSN Online: 2664-6072
 NAAS Rating (2025): 4.69
 IJAN 2025; 7(12): 51-55
www.agriculturejournal.net
 Received: 28-09-2025
 Accepted: 30-10-2025

Jalandra AR
 Department of Fruit Science,
 ASPEE College of
 Horticulture, Navsari
 Agricultural University,
 Navsari, Gujarat, India

Tandel BM
 Department of Fruit Science,
 ASPEE College of
 Horticulture, Navsari
 Agricultural University,
 Navsari, Gujarat, India

Bhamini Parekh
 Department of Fruit Science,
 ASPEE College of
 Horticulture, Navsari
 Agricultural University,
 Navsari, Gujarat, India

Limbachiya PV
 Department of Fruit Science,
 ASPEE College of
 Horticulture, Navsari
 Agricultural University,
 Navsari, Gujarat, India

Corresponding Author:
Jalandra AR
 Department of Fruit Science,
 ASPEE College of
 Horticulture, Navsari
 Agricultural University,
 Navsari, Gujarat, India

Effect of organics on growth and nutrient status of dragon fruit

Jalandra AR, Tandel BM, Bhamini Parekh and Limbachiya PV

DOI: <https://www.doi.org/10.33545/26646064.2025.v7.i12a.329>

Abstract

A field experiment was conducted at Regional Horticulture Research Station, ASPEE College of Horticulture, Navsari Agricultural University, Navsari during 2022-23 and 2023-24 to evaluate the effect of biocompost and biostimulants on growth and Nutrient content of plant of dragon fruit under Completely Randomized Design with factorial concept (FCRD) with 24 treatment combinations. Soil application of biocompost @ 20 kg per pole significantly enhanced canopy volume (0.37 m³), cladode diameter (5.2 cm), number of cladodes (37.3 nos.), N content of cladode (0.91 %), P₂O₅ content of cladode (1.09 %) and Plant K₂O content (1.11 %). Among biostimulants, soil application of 30 % *Gliricidia* leaf extract recorded maximum canopy volume (0.35 m³), N content of cladode (0.94 %) and Plant K₂O content (0.99 %), while 30 % *Jeevamrith* recorded maximum number of cladodes per pole (35.9) and P₂O₅ content of cladode (0.88 %). Interaction between 20 kg biocompost and 30 % *Gliricidia* leaf extract produced highest canopy volume (0.41 m³).

Keywords: Dragon fruit, biocompost, biostimulants, gliricidia leaf extract, jeevamrith

1. Introduction

Dragon fruit (*Hylocereus spp.*), an herbaceous perennial climbing cactus of the family Cactaceae, has rapidly gained global popularity due to its exotic appearance, nutritional richness, and adaptability. Native to tropical Mexico and South America, it is now cultivated across Asia, including India where it is locally termed 'Kamalam'. The crop's appeal lies in its unique flavor, high antioxidant content (betacyanins) and diverse utilization in food, pharmaceuticals and cosmetics (Tamanna *et al.*, 2018) ^[12].

Commercially, four major types are grown worldwide: red skin-white flesh (*H. undatus*), red skin-red flesh (*H. polyrhizus*), red skin-purple flesh (*H. costaricensis*) and yellow skin-white flesh (*H. megalanthus*) [(Sharma *et al.*, 2021)]. In India, cultivation began in the late 1990s and has expanded to ~3,085 ha with productivity of 10.7 MT/ha, with Gujarat emerging as a one of the leading states (1,214 ha; 4,079 MT) [(Wakchuaure *et al.*, 2020)] ^[13].

In recent years, there has been a significant shift in agricultural practices across the globe, with increasing emphasis on sustainability, environmental conservation and organic farming. As the detrimental effects of chemical fertilizers and pesticides become more evident, both farmers and policymakers are exploring alternative methods that can maintain or improve crop productivity without harming soil health, human health or the environment.

Biocompost, derived from the controlled aerobic decomposition of organic materials, is a valuable soil amendment that enhances soil structure, increases microbial diversity and improves water holding capacity (Mahimaraja *et al.*, 2008) ^[8].

Gliricidia sepium leaves are nutrient rich and help to enrich soil fertility and maintain a good soil environment. As a cost effective and locally available biostimulant, *Jeevamrith* is especially relevant for small and marginal farmers practicing organic or low input agriculture. Further, application of *Jeevamrith* can help in reducing dependence on external inputs and promote a closed loop nutrient cycle on the farm. Novel organic liquid nutrients is a byproduct during extraction of fiber from banana pseudostem. Novel organic liquid nutrients contains nitrogen (0.062 %), phosphorous (0.018 %), potassium (0.180 %), calcium (0.031 %), magnesium (0.092 %), sulphur (0.010 %), *etc* (Champaneri, 2021) ^[12].

Moreover, with the rise in consumer demand for organic produce and sustainable farming methods, there is an urgent need to develop location specific, low cost and environmentally sustainable nutrient management packages for dragon fruit. Such information would be invaluable for extension workers, policymakers and farmers aiming to transition towards organic horticulture.

2. Materials and Methods

The investigation was conducted at Regional Horticulture Research Station, ASPEE College of Horticulture, Navsari Agricultural University, Navsari during the year 2022-23 and 2023-24. The experiment was laid out in Completely Randomized Design with factorial concept (FCRD) which comprising four different levels of biocompost viz., B₁: 10 kg per pole, B₂: 15 kg per pole, B₃: 20 kg per pole and B₄: Control, which was applied in two split, first at after last harvesting of fruits and second in month of March and six different levels of biostimulants namely, S₁: 15 % *Gliricidia* leaf extract, S₂: 30 % *Gliricidia* leaf extract, S₃: 15 % *Jeevamrith*, S₄: 30 % *Jeevamrith*, S₅: 3 % Novel organic liquid nutrients and S₆: 5 % Novel organic liquid nutrients. Total twelve liter of respective solution was applied per pole per year i.e., one liter solution of bio stimulants applied every month started from last year harvesting of fruits. All the twenty four treatment combinations were replicated thrice. The experiment was carried out on one year old dragon fruit plants. These plants were planted with spacing of 3 m × 3 m distance. Healthy and uniformly growing plants of white flesh varieties were selected for the experiment.

Canopy volume was calculated by measuring the canopy spread in both the North-South and East-West directions using a measuring tape. Canopy height was also recorded in the same manner at the end of the harvest. These measurements were then applied to the formula provided below and the resulting canopy volume was expressed in m³,

Calculation: $\text{canopy volume (m}^3\text{)} = \pi / 6 + N-S (m) \times E-W (m) \times H (m)$

The diameter of cladode was measured using a *Vernier caliper* at the middle portion, on the flattest face at the end of harvesting and expressed in centimeters. The N content (%), P₂O₅ content (%) and K₂O content (%) of dragon fruit cladodes was measured using Modified Kjeldahl's method, spectrophotometric method and flame photometric method, respectively. The data collected from all the characters involved under study were subjected to the statistical analysis under Completely Randomized Design with factorial concept (FCRD) as described by Panse and Sukhatme (1985)^[10]. The significance and non-significance of various treatment effects was judged with the help of 'F' test at 5 % of significance.

3. Results

3.1 Effect of Biocompost

The maximum canopy volume (0.34, 0.40 and 0.37 m³) was recorded in B₃ treatment (20 kg biocompost per pole) during both the years and in pooled analysis, respectively. While, the minimum canopy volume (0.24, 0.25 and 0.25 m³) was observed in B₄ treatment (Control) during both the years and in pooled analysis, respectively (Table.1).

The maximum cladode diameter (4.4, 5.9 and 5.2 cm) was recorded in B₃ treatment (20 kg biocompost per pole) during

the year 2022-23, 2023-24 and in pooled analysis, respectively. While, the minimum canopy volume (3.3, 3.9 and 3.6 cm) was observed in B₄ (Control) during both the years and in pooled analysis, respectively (Table.1).

The maximum numbers of cladodes per pole (25.4, 49.1 and 37.3) were recorded in B₃ treatment (20 kg biocompost per pole) during the individual years and in pooled analysis, respectively which was statistically at par with B₂ (15 kg biocompost per pole) treatment in first year of experiment. The minimum numbers of cladodes per pole (22.2, 35.4 and 28.8) were observed in control (B₄) during both the years and in pooled analysis, respectively (Table 1).

The maximum plant nitrogen content (0.88%, 0.93% and 0.91%) was recorded in B₃ (20 kg biocompost per pole) during both the years and in pooled analysis, respectively. While, the minimum plant nitrogen content (0.71%, 0.74% and 0.73%) was observed in B₄ treatment (Control) during both the years and in pooled analysis, respectively (Table 2). The maximum plant P₂O₅ content (1.08%, 1.11% and 1.09%) was recorded in B₃ treatment (20 kg biocompost per pole) during both the years and in pooled analysis, respectively. While, the minimum plant P₂O₅ content (0.60%, 0.62% and 0.61%) was observed in B₄ treatment (Control) during both the years and in pooled analysis, respectively (Table 2).

The maximum plant K₂O content (1.08%, 1.13% and 1.11%) was recorded in B₃ treatment (20 kg biocompost per pole) during both the years and in pooled analysis, respectively. While, the minimum plant K₂O content (0.76%, 0.77% and 0.76%) was observed in B₄ treatment (Control) during both the years and in pooled analysis, respectively (Table 2).

3.2 Effect of Biostimulants

The maximum canopy volume (0.33, 0.37 and 0.35 m³) was recorded in S₂ treatment (30 % *Gliricidia* leaf extract) during individual years and in pooled analysis, respectively which was statistically at par with S₁ treatment (15 % *Gliricidia* leaf extract) in both the years and in pooled analysis. While, the minimum canopy volume (0.27, 0.29 and 0.28 m³) was observed in S₅ treatment (3 % Novel organic liquid nutrients) during both the years and in pooled analysis, respectively (Table 1).

The maximum cladode diameter (4.2, 5.3 and 4.7 cm) was recorded in 30 % *Gliricidia* leaf extract (S₂) during both the years and in pooled analysis, respectively which was statistically at par with S₁, S₄, S₅, and S₆ in both the years; and with S₁, S₅, and S₆ in pooled analysis. The minimum cladode diameter (3.6, 4.7 and 4.1 cm) was observed in S₅ (3 % Novel organic liquid nutrients) during both the years and in pooled analysis, respectively (Table 1).

The maximum numbers of cladodes per pole (26.1, 45.8 and 35.9) were recorded in S₄ treatment (30 % *Jeevamrith*) during first year, second years and in pooled analysis, respectively which was statistically at par with S₃ treatment (15 % *Jeevamrith*) in both the year and in pooled analysis. While, the minimum numbers of cladodes per pole (22.8, 39.0 and 30.9) were observed in S₁ treatment (15 % *Gliricidia* leaf extract) during both the individual years and in pooled analysis, respectively (Table 1).

The maximum plant P₂O₅ content (0.87%, 0.90% and 0.88%) was recorded in S₄ treatment (30% *Jeevamrith*) during both the years and in pooled analysis, respectively which was statistically at par with S₂, S₃, treatments in both the individual years and in pooled analysis. While, the minimum plant P₂O₅ content (0.74%, 0.75% and 0.74%)

was observed in S₅ treatment (3% Novel organic liquid nutrient) during both the years and in pooled analysis, respectively (Table 2).

The maximum plant nitrogen content (0.91%, 0.98% and 0.94%) was recorded in S₄ treatment (30% *Gliricidia* leaf extract) during both the years and in pooled analysis, respectively which was statistically at par with S₄ treatment (30 % *Jeevamrith*) in first year of experiment. While, the minimum plant nitrogen content (0.62%, 0.66% and 0.64%) was observed in S₅ treatment (3% Novel organic liquid nutrient) during both the years and in pooled analysis, respectively (Table 2).

The maximum plant K₂O content (0.97%, 1.02% and 0.99%) was recorded in S₂ treatment (30% *Gliricidia* leaf extract) during both the years and in pooled analysis, respectively which was statistically at par with S₁ treatment (15% *Gliricidia* leaf extract) in first years of experiment. While, the minimum plant K₂O content (0.89%, 0.92% and 0.90%) was observed in S₃ treatment (15% *Jeevamrith*) during both the years and in pooled analysis, respectively (Table 2).

3.3 Interaction Effect

The maximum canopy volume (0.35, 0.47 and 0.41 m³) was recorded in treatment combination 20 kg biocompost per pole + 30 % *Gliricidia* leaf extract (B₃S₂) during both the years and in pooled analysis, respectively, which was statistically at par with B₁S₂, B₂S₁, B₂S₂, B₃S₁, B₃S₃, B₃S₄, B₃S₅ and B₃S₆ combinations during first year of experiment. The minimum canopy volume (0.20, 0.21 and 0.20 m³) was recorded in B₄S₅ treatment combination i.e. control + 3 % Novel organic liquid nutrients during both the years and in pooled analysis respectively, which was statistically at par with B₄S₆ treatment combinations during both the years and in pooled analysis (Table 3).

4. Discussion

4.1 Growth Parameters

The increased in growth attributing characters might be due

to ideal C:N ratio of compost with comparatively higher nitrogen content. Addition of organic manure also enhanced soil structure which reduced the soil crusting and provide better soil environment for plant growth. The conspicuous impact of liquid organics on growth attributes might be due to their rapidly available form of nutrients, which are easily absorbed, leading to faster growth and development. Fermented liquid organic manures contain macro and micro nutrients, many vitamins, essential amino acids, numerable microorganism and growth promoting substances (Dhara *et al.*, 2018) [4]. Similar results were also observed by Chauhan *et al.* (2024) [13] in dragon fruit.

4.2 Nutrient Content

Increase in nutrient content might be attributed to their balanced and sustained nutrient release, which supports improved root development, microbial activity and enzymatic processes such as nitrate reductase activity, thereby enhancing nitrogen absorption and assimilation (Lalani and Bhalu, 2023) [7]. Similar result was also found by Morales *et al.* (2022) [9] in caliphate. The improved phosphorus content with application of compost can be attributed to balanced nutrient release (Bhoomika *et al.*, 2025) [1]. The consistent increase in K₂O uptake reflects the beneficial role of organic compost in improving cation exchange capacity, enhancing root growth and facilitating potassium translocation (Krutika *et al.*, 2024) [6].

5. Conclusion

The results of the present investigation indicated that dragon fruit plants treated with a soil application of 20 kg biocompost per pole (in two splits first at after last harvesting of fruits and second in month of March) and 30 % *Gliricidia* leaf extract (300 ml per pole at monthly interval started after last harvesting of fruit) individually and in combination exhibited significant improvement in growth and Nutrient content of plant in dragon fruit var. white flesh.

Table 1: Effect of organics on growth of dragon fruit

Treatments	Canopy volume (m ³)			Diameter of cladode (cm)			Number of cladode per poles		
	2022-23	2023-24	Pooled	2022-23	2023-24	Pooled	2022-23	2023-24	Pooled
Biocompost (B)									
B ₁ : 10 kg/ pole	0.29 ^c	0.31 ^c	0.30 ^c	3.72 ^c	4.92 ^c	4.32 ^c	24.28 ^a	40.39 ^c	32.33 ^c
B ₂ : 15 kg/ pole	0.32 ^b	0.35 ^b	0.33 ^b	4.03 ^b	5.32 ^b	4.68 ^b	25.06 ^a	42.56 ^b	33.81 ^b
B ₃ : 20 kg/ pole	0.34 ^a	0.40 ^a	0.37 ^a	4.43 ^a	5.91 ^a	5.17 ^a	25.44 ^a	49.11 ^a	37.28 ^a
B ₄ : Control	0.24 ^d	0.25 ^d	0.25 ^d	3.26 ^d	3.86 ^d	3.56 ^d	22.22 ^b	35.44 ^d	28.83 ^d
S.E.m.±	0.003	0.005	0.003	0.09	0.11	0.07	0.37	0.60	0.35
CD at 5 %	0.009	0.013	0.008	0.27	0.32	0.21	1.06	1.69	0.99
Biostimulants (S)									
S ₁ : 15 % GLE	0.31 ^b	0.36 ^a	0.34 ^b	3.79 ^a	4.95 ^a	4.37 ^b	22.83 ^b	39.00 ^b	30.92 ^b
S ₂ : 30 % GLE	0.33 ^a	0.37 ^a	0.35 ^a	4.15 ^a	5.30 ^a	4.72 ^a	23.42 ^b	42.75 ^a	33.08 ^b
S ₃ : 15 % <i>Jeevamrith</i>	0.29 ^b	0.32 ^b	0.30 ^d	3.59 ^b	4.68 ^b	4.13 ^c	25.83 ^a	43.75 ^a	34.79 ^a
S ₄ : 30 % <i>Jeevamrith</i>	0.30 ^b	0.33 ^b	0.31 ^c	3.81 ^a	4.85 ^a	4.33 ^b	26.08 ^a	45.75 ^a	35.92 ^a
S ₅ : 3 % NOLN	0.27 ^b	0.29 ^c	0.28 ^f	3.76 ^a	5.01 ^a	4.39 ^b	23.58 ^b	39.58 ^b	31.58 ^b
S ₆ : 5 % NOLN	0.28 ^b	0.31 ^b	0.29 ^e	4.06 ^a	5.22 ^a	4.64 ^a	23.75 ^b	40.42 ^b	32.08 ^b
S.E.m.±	0.004	0.006	0.003	0.12	0.14	0.09	0.46	0.73	0.43
CD at 5 %	0.011	0.016	0.010	0.33	0.40	0.25	1.30	2.07	1.21
Interaction effect (B x S)									
S.E.m.±	0.008	0.011	0.007	0.23	0.28	0.18	0.91	1.46	0.86
CD at 5 %	0.022	0.032	0.019	NS	NS	NS	NS	NS	NS
Interactions									
Source	Y x B	Y x S	Y x B x S	Y x B	Y x S	Y x B x S	Y x B	Y x S	Y x B x S
S.E.m.±	0.004	0.004	0.010	0.10	0.13	0.26	0.50	0.61	1.22
CD at 5 %	0.011	0.014	0.027	NS	NS	NS	1.39	1.70	NS
CV %	4.55	5.99	5.40	10.34	9.62	9.97	6.52	6.03	6.37
GLE = <i>Gliricidia</i> leaf extract; NOLN= Novel organic liquid nutrients									

Table 2: Effect of organics on nutrient content of dragon fruit

Treatments	Plant (cladode) N content (%)			Plant (cladode) P ₂ O ₅ content (%)			Plant (cladode) K ₂ O content (%)		
	2022-23	2023-24	Pooled	2022-23	2023-24	Pooled	2022-23	2023-24	Pooled
Biocompost (B)									
B ₁ : 10 kg/ pole	0.77	0.81	0.79 ^b	0.72	0.74	0.73 ^c	0.88	0.91	0.89 ^c
B ₂ : 15 kg/ pole	0.82	0.87	0.85 ^a	0.83	0.85	0.84 ^b	0.96	1.02	0.99 ^b
B ₃ : 20 kg/ pole	0.88	0.93	0.91 ^a	1.08	1.11	1.09 ^a	1.08	1.13	1.11 ^a
B ₄ : Control	0.71	0.74	0.73 ^c	0.60	0.62	0.61 ^d	0.76	0.77	0.76 ^d
S.E.m.±	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
CD at 5 %	0.03	0.04	0.02	0.04	0.05	0.03	0.03	0.03	0.02
Biostimulants (S)									
S ₁ : 15 % GLE	0.85	0.89	0.87 ^b	0.81	0.83	0.82 ^c	0.93	0.97	0.95 ^b
S ₂ : 30 % GLE	0.91	0.98	0.94 ^a	0.83	0.85	0.84 ^{bc}	0.97	1.02	0.99 ^a
S ₃ : 15 % Jeevamrith	0.84	0.88	0.86 ^b	0.84	0.88	0.86 ^b	0.89	0.92	0.90 ^d
S ₄ : 30 % Jeevamrith	0.88	0.91	0.89 ^b	0.87	0.90	0.88 ^a	0.90	0.94	0.92 ^{cd}
S ₅ : 3 % NOLN	0.62	0.66	0.64 ^d	0.74	0.75	0.74 ^d	0.91	0.94	0.92 ^{cd}
S ₆ : 5 % NOLN	0.68	0.71	0.70 ^c	0.76	0.77	0.76 ^{cd}	0.91	0.95	0.93 ^{bc}
S.E.m.±	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01
CD at 5 %	0.04	0.04	0.03	0.04	0.06	0.04	0.04	0.04	0.03
Interaction effect (B x S)									
S.E.m.±	0.03	0.03	0.02	0.03	0.04	0.03	0.03	0.03	0.02
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interactions									
Source	Y x B	Y x S	Y x B x S	Y x B	Y x S	Y x B x S	Y x B	Y x S	Y x B x S
S.E.m.±	0.01	0.02	0.03	0.01	0.02	0.04	0.01	0.01	0.03
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV %	6.45	6.38	6.45	6.56	8.44	6.56	5.48	5.26	5.48

GLE = *Gliricidia* leaf extract; NOLN= Novel organic liquid nutrients**Table 3:** Interaction effect of organics on growth of dragon fruit

Treatment combination	Canopy volume (m ³)		
	2022-23	2023-24	Pooled
B ₁ S ₁	0.32 ^a	0.37 ^b	0.35 ^d
B ₁ S ₂	0.34 ^a	0.36 ^b	0.35 ^d
B ₁ S ₃	0.26 ^a	0.28 ^c	0.27 ⁱ
B ₁ S ₄	0.28 ^a	0.31 ^c	0.30 ^g
B ₁ S ₅	0.25 ^a	0.27 ^c	0.26 ^j
B ₁ S ₆	0.27 ^a	0.27 ^c	0.27 ⁱ
B ₂ S ₁	0.33 ^a	0.37 ^b	0.35 ^d
B ₂ S ₂	0.34 ^a	0.36 ^b	0.35 ^d
B ₂ S ₃	0.32 ^a	0.36 ^b	0.34 ^e
B ₂ S ₄	0.32 ^a	0.36 ^b	0.34 ^e
B ₂ S ₅	0.29 ^a	0.32 ^c	0.30 ^g
B ₂ S ₆	0.30 ^a	0.34 ^b	0.32 ^f
B ₃ S ₁	0.34 ^a	0.41 ^b	0.38 ^b
B ₃ S ₂	0.35 ^a	0.47 ^a	0.41 ^a
B ₃ S ₃	0.34 ^a	0.38 ^b	0.36 ^c
B ₃ S ₄	0.34 ^a	0.39 ^b	0.36 ^c
B ₃ S ₅	0.33 ^a	0.36 ^b	0.35 ^d
B ₃ S ₆	0.33 ^a	0.38 ^b	0.36 ^c
B ₄ S ₁	0.27 ^a	0.29 ^c	0.28 ^h
B ₄ S ₂	0.29 ^a	0.30 ^c	0.30 ^g
B ₄ S ₃	0.24 ^a	0.24 ^c	0.24 ^l
B ₄ S ₄	0.25 ^a	0.25 ^c	0.25 ^k
B ₄ S ₅	0.20 ^b	0.21 ^c	0.20 ⁿ
B ₄ S ₆	0.20 ^b	0.23 ^c	0.22 ^m
S.E.m.±	0.008	0.011	0.007
CD at 5%	0.022	0.032	0.019
CV%	4.55	5.99	5.40

References

- Bhoomika S, Age AB, Jadhaio SD, Bhoyar SM, Salunke PS, Shubhangi D. Effect of different compost on growth, yield and nutrient uptake by *Bt-cotton* in vertisols. International Journal of Advance Biochemistry Research. 2025;9(7):1507-1514.
- Champaneri DD. Novel organic liquid nutrients: An effectual tool for organic vegetable production. Just Agriculture. 2021;2(1):1-8.
- Chauhan P, Kumar A, Tripathi S, Katiyar H, Kumar A, Verma A, Singh S. Effect of organic manures and bio-fertilizers on growth, yield and quality of dragon fruit (*Hylocereus undatus* L.) under Western Uttar Pradesh conditions. Journal of Scientific Research and Reports. 2024;30(11):1106-1117.
- Dhara L, Zinjala VJ, Mital B, Dubey PK. Effect of organics on growth, yield, quality and economics of fenugreek (*Trigonella foenumgraecum* L.) grown under organic farming system. Journal of Pharmacognosy and Phytochemistry. 2018;7(3):2420-2424.
- Jackson ML. Soil Chemical Analysis. New Delhi: Prentice Hall of India Pvt. Ltd.; 1973. 183-192.
- Krutika P, Dubey PK, Kaswala AR, Italia AP, Neethu TM, Chaudhary NM. Impact of different nutrient sources on growth and yield attributes of black gram under organic farming. Agriculture Association of Textile Chemicals and Critical Reviews Journal. 2024;2024:7-11.
- Lalani S, Bhalu VB. Effect of various cow-based bio-enhancers and botanicals on yield, nutrient content, uptake and soil fertility after harvest in summer groundnut (*Arachis hypogaea* L.). The Pharma Innovation Journal. 2023;12(12):1949-1953.
- Mahimaraja S, Dooraisamy P, Lakshamanan A, Rajannan G, Udayasoorian C, Natarajan S. Composting technology and organic waste utilization in agriculture. TNAU Agritech Portal [Internet]. 2008 [cited 2022 Jul 15]. Available from: www.agritech.tnau.ac.in.
- Morales FP, Salgado JR, Lopez MD, Zapata N, Retamales RS, Poblete AP. The use of compost increases bioactive compounds and fruit yield in

- calafate grown in the central south of chile. Agriculture. 2022;12(98):1-12.
10. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. New Delhi: ICAR Publication; c1985, 167-174.
 11. Sharma SC, Mittal R, Sharma A, Verma V. Dragon fruit: A promising crop with a growing food market that can provide profitable returns to farmers. International Journal of Agricultural Sciences and Research. 2021;11(2):1-14.
 12. Tamanna P, Mandal KK, Hasan MA. Dragon fruit: An exotic super future fruit of India. Journal of Pharmacognosy and Phytochemistry. 2018;7(2):1022-1026.
 13. Wakchaure GC, Kumar S, Meena KK, Rane J, Pathak H. Dragon fruit cultivation in India: Scope, Marketing, Constrains and Policy Issues. Technical Bulletin No. 46. Baramati: ICAR-National Institute of Abiotic Stress Management; c2020, 54-54.