



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(3): 2617-2620
© 2023 TPI
www.thepharmajournal.com
Received: 16-12-2022
Accepted: 24-01-2023

Niharika Ekka
Department of Vegetable
Science, Pt. KLS College of
Horticulture and Research
Station, Rajnandgaon,
Chhattisgarh, India

Bhagwat Saran Asati
Department of Vegetable
Science, RABL College of
Agriculture and Research
Station, Chhuikhadan,
Chhattisgarh, India

Jitendra Singh
Department of Vegetable
Science, Pt. KLS College of
Horticulture and Research
Station, Rajnandgaon
Chhattisgarh, India

Manoj Kumar Chandraker
Department of Entomology, Pt.
KLS College of Horticulture and
Research Station, Rajnandgaon,
Chhattisgarh, India

Dikeshwar Nishad
Department of Agriculture
Statistics and Social Science, Pt.
SKS College of Agriculture and
Research Station, Rajnandgaon,
Chhattisgarh, India

Corresponding Author:
Bhagwat Saran Asati
Department of Vegetable
Science, RABL College of
Agriculture and Research
Station, Chhuikhadan,
Chhattisgarh, India

Effect of different organic manures on growth, yield and quality of betelvine (*Piper betle* L.)

Niharika Ekka, Bhagwat Saran Asati, Jitendra Singh, Manoj Kumar Chandraker and Dikeshwar Nishad

Abstract

The present experiment has been carried out to know the effect of different organic manures on growth, yield and quality of betelvine and result revealed that treatment T₂ Neem oil cake (2.8t/ha) was found superior for most of the characters *i.e.* survival percentage, vine length, number of shoot/vine, no. of leaves /vine, basal girth of vine, no. of laterals /vine, leaf length, internodal distance, petiole length, leaf width, leaf area, fresh weight of 100 leaves and dry weight of 100 leaves, leaf yield / vine /year, leaf yield / ha /year, petiole diameter and L/B ratio under study. The cost of cultivation, gross returns, net returns and B: C ratio were found maximum in treatment T₁ Karanj oil cake (3.5 t/ha), T₂ Neem oil cake (2.8 t/ha), T₅ (Fresh Moringa leaf extract @ 25% dilution (3 spray) and T₂ Neem oil cake (2.8 t/ha) respectively.

Keywords: Organic manures, betel leaf, Neem oil cake

Introduction

Betel vine (*Piper betle* Linn.) is an evergreen, perennial, dioecious creeper cultivated mainly in South-East Asian countries, namely, India, Bangladesh, Sri Lanka, Malaysia, Singapore, Thailand, Philippines, Taiwan and Papua New Guinea for its leaves. In India, it is grown on a commercial scale as a cash crop in the states such as Assam, West Bengal, Bihar, Uttar Pradesh, Meghalaya, Orissa, Karnataka, Kerala, Andhra Pradesh, Madhya Pradesh, Tamil Nadu and Tripura. The cultivation of betel vine is known for its greater potential to generate income and employment. The importance of the leaves has been explained in relation to every sphere of human life, including social, cultural, religious, health and even day-to-day life, which is very much relevant even these days.

Organic farming avoids or largely excludes the use of synthetically produced fertilizer, pesticides, growth regulators and livestock feed additives to the maximum extent possible. Responses from betel vine growers and other studies have shown that organic manure in betel leaf is the best source of nutrients, quality and taste as compared to chemical fertilizers. Farmers are not aware of the nutritional management of betel leaves cultivation that's why betel vine planting is currently not profitable. It is essential to evaluate the various organic manures and select the best combination for proper growth, leaf quality and yield.

Materials and Methods

The experiment was carried out in Randomized Block Design with eight treatments and three replications under Bareja condition at College Farm-Rampur Nawagaon, RABL College of Agriculture and Research Station, Chhuikhadan, Dist- Khairagarh-Chhuikhadan-Gandai, Indira Gandhi Krishi Vishwavidyalaya during the year 2021-22. The treatments consist of various organic nutrient sources which were used in the present experiment. *i.e.* T₁ Karanj oil cake (3.5 t/ha), T₂ Neem oil cake (2.8 t/ha), T₃ Mustard oil cake (2.8 t/ha), T₄ Vermicompost (9.3 t/ha), T₅ Fresh Moringa leaf extract @ 25% dilution (3 spray), T₆ Poultry manure (2.3 t/ha), T₇ Vermi-wash @ 25% dilution (4 spray), and T₈ RDF (NPK::150:100:100 Kg/ha).

The experimental layout was made by preparation of ridges and furrow at a distance of 11m x 9 m by manually. Bareja structure was prepared by bamboo sticks, shade net, roop and khar. The cultivar of betelvine cv. Karapaku (Bangla paan) were used for planting. The total experiment area in Bareja was 99 sqm and the cuttings were planted at a distance of 1m between rows and 20 cm between the plants. FYM (20t/ha) was used as a basal dose in each treatment. Recommended dose of fertilizers through various organic nutrient sources and other cultural packages of practice were adopted for raising good crop.

The observations on growth, yield and quality parameters of the betelvine were recorded by tagging five randomly selected plants leaving the border rows from each treatment and their average values were worked out. The collected data on different growth parameters were statistically analysed by adopting the procedures suggested Panse and Sukhatme (1995)^[8].

Results and Discussion

Data regarding survival percentage has been presented in Table 1. The survival percentage ranged from 61.19-83.16% with an average of 73.24% and recorded significant maximum value (83.16%) in treatment T₂ Neem oil cake (2.8 t/ha) which was found statistically similar with treatment T₁ Karanj oil cake (3.5 t/ha) (80.08) and T₃ Mustard oil cake (2.8 t/ha) (78.03%). The maximum survival percentage might be due to neem oil cake and karanj oil cake etc. facilitates cell expansion and elongation, resulting in improved root and shoot development, which promotes and encourages betelvine survival. This has a positive impact on plant health and growth, as it increases the availability of nutrients and assimilates. Similar result obtained by Sivashankara *et al.* (2000)^[10]. Vine length affects the yield and other important yield contributing traits. The data recorded significant highest vine length (4.71m) in treatment T₂ Neem oil cake (2.8 t/ha), while significantly lowest vine length were found in treatment T₈ RDF (NPK::150:100:100 Kg/ha) of (3.60 m) (Table 1). The increased vine length might be due to enhanced uptake of nutrients from soil resulting in assimilation of carbohydrates and other metabolic activity which led to an increase in various plant metabolites responsible for vine length. Similar result was also reported by Preethy *et al.* (2016)^[9]. The highest number of leaves /vine (79.24) was noted in

treatment T₂ Neem oil cake (2.8 t/ha), while lowest number of leaves/ vine (55.61) was observed in treatment T₈ RDF (NPK::150:100:100 Kg/ha). The reason behind use of 100% organic manure are availability of nutrient elements such as NPK and Ca and Mg, and their interaction is helpful to increase the no. of leaves per vine by activating the enzymatic activities which promotes cell mitosis, division and elongation as also observed by Dasgupta and Sarkar (2017)^[2]. On other hand, the higher number of shoot/ vine (6.00) was also observed in treatment T₂ Neem oil cake (2.8 t/ha), which was statistically similar with treatment T₁ Karanj oil cake (3.5 t/ha) (5.70), (Table 1). Application of organic manure might increase the uptake of all the plant nutrients and micro nutrient enhance various mechanisms (photosynthesis, cell division) thus, consequently improve plant growth as described by Khattak *et al.* (2011)^[5].

Table 1 showed that the highest number of laterals /vine (12.30) was recorded in treatment T₂ Neem oil cake (2.8 t/ha), which was statistically similar with treatment T₁ Karanj oil cake (3.5 t/ha) (11.55), while significant minimum number of laterals/vine (6.45) was noted in treatment T₈ (RDF NPK::150:100:100 Kg/ha). The significant maximum value of leaf length (14.00 cm) was recorded in treatment T₂ Neem oil cake (2.8 t/ha) which was found at par with treatment T₁ Karanj oil cake (3.5 t/ha) (13.10 cm). The organic manure plays a predominant role on plant growth and development, as it is a constituent of all proteins and protoplasm of living cells. Organic manure application can stimulate plant vegetative and reproductive growth and cause increased in plant growth due to reasons such as having macro and micronutrients, protease, amylase, cytokinin and auxin as reported by Mahalakshmi *et al.*, (2019)^[6].

Table 1: Effect of different organic nutrient sources on various growth parameters.

Tr. No.	Treatments	Survival Percentage	Vine length (m)	No of leaves/vine	Number of shoot/vine	No. of laterals/vine	Leaf length(cm)
T ₁	Karanj oil cake (3.5 t/ha)	80.08	4.63	68.69	5.70	11.55	13.10
T ₂	Neem oil cake (2.8 t/ha)	83.16	4.71	79.24	6.00	12.30	14.00
T ₃	Mustard oil cake (2.8 t/ha)	78.03	4.52	57.66	5.15	10.75	11.50
T ₄	Vermicompost (9.3 t/ha)	75.12	4.34	67.77	4.40	9.85	10.45
T ₅	Fresh Moringa leaf extract @25% dilution (3 spray)	67.00	3.80	64.59	3.50	7.50	7.30
T ₆	Poultry manure (2.3 t/ha)	69.30	4.02	64.31	3.17	8.10	8.00
T ₇	Vermi-wash @ 25% dilution (4 spray)	72.07	4.20	60.26	4.02	9.08	9.10
T ₈	RDF (NPK::150:100:100 Kg/ha)	61.19	3.60	55.61	3.00	6.45	5.00
	S.Em (±)	2.52	0.24	2.34		0.24	0.60
	CD (5%) =	7.63	0.73	7.11		0.72	1.82
	CV (%) =	5.95	9.82	6.27		9.41	10.63

Table 2 exhibited that the maximum leaf width (9.08 cm) was recorded in treatment T₂ Neem oil cake (2.8 t/ha), which was non-significant with treatment T₁ Karanj oil cake (3.5 t/ha) (8.90 cm) and T₃ Mustard oil cake (2.8 t/ha) (8.45 cm), while the significant maximum leaf area (127.05 cm²) were recorded in treatment T₂ Neem oil cake (2.8 t/ha) which was found statistically similar with treatment T₁ Karanj oil cake (3.5 t/ha) (116.81 cm²). The reason behind the result must be due to the integration of organic manure having high C: N ratio with manure having low C: N ratio increase the mineralization and organic matter build up with efficient microbial activity. Which ultimately enhanced the leaf area of betelvine. The results obtained in the present study are supported by the works of Mahalakshmi *et al.* (2019)^[6].

The maximum petiole length (12.00 cm), petiole diameter (3.20 mm) and intermodal distance (6.50 cm) was observed in treatment T₂ Neem oil cake (2.8 t/ha). These might be due to effective utilization of growth resources, availability of major nutrients to plants further resulting in elevation of physiological and biochemical processes due to use of organic manure, which allowed the crop to grow to their higher in intermodal distance. Similar results in China aster were also observed by Bar and Pariari (2020)^[1]. The data on basal girth of vine were recorded and the average values are presented below in Table 2. The significantly highest basal girth of vine (3.40mm) were found in treatment T₂ Neem oil cake (2.8 t/ha), while significantly lowest basal girth of vine (2.70mm) was observed in treatment T₈ RDF (NPK::150:100:100

Kg/ha). Dutta *et al.*, (2020) ^[3] also observed that the higher basal girth of vine was better absorption of nutrient and micronutrient which ultimately increased the accumulation of

carbohydrate in the plant and provided better environment for growth and developmental processes of organic manure.

Table 2: Response of different organic manures on leaf and vine parameters.

Tr. No.	Treatments	Leaf width(cm)	Leaf area(cm ²)	Petiole length (cm)	Petiole diameter(mm)	Basal girth of vine(mm)	Internodal distance(cm)
T ₁	Karanj oil cake (3.5 t/ha)	8.90	116.81	11.45	3.15	3.32	6.35
T ₂	Neem oil cake (2.8 t/ha)	9.08	127.05	12.00	3.20	3.40	6.50
T ₃	Mustard oil cake (2.8 t/ha)	8.45	97.48	10.60	3.10	3.26	6.20
T ₄	Vermicompost (9.3 t/ha)	8.10	84.99	9.70	3.06	3.15	6.05
T ₅	Fresh Moringa leaf extract @ 25% dilution (3 spray)	7.40	54.31	8.00	2.90	2.85	5.00
T ₆	Poultry manure (2.3 t/ha)	7.65	61.50	8.40	2.96	2.93	5.30
T ₇	Vermi-wash @ 25% dilution (4spray)	7.90	71.77	9.00	3.00	3.04	5.80
T ₈	RDF (NPK::150:100:100 Kg/ha)	7.00	34.92	6.50	2.80	2.70	4.50
	S.Em (±)	0.30	6.88	0.37	0.08	0.15	0.19
	CD (5%) =	0.91	21.06	1.12	0.24	0.45	0.58
	CV (%) =	6.36	14.69	6.74	4.55	8.25	5.78

Table 3 expressed that the significantly higher value of L/B ratio (1.54) was observed in treatment T₂ Neem oil cake (2.8 t/ha), which was found non-significant with treatment T₁ Karanj oil cake (3.5 t/ha) (1.47) and T₃ Mustard oil cake (2.8 t/ha) (1.36), while the maximum fresh weight of 100 leaves (267.03 g) was noted in treatment T₁ Karanj oil cake (3.5 t/ha). The organic manure fertilizer of soil as evidenced from higher organic C status in organic plots in the present study might have resulted in the formation of stable soil aggregates with the resultant slight increase in fresh weight of 100 leaves in betelvine. Similar result was also reported by the Moutusi *et al.* (2003) ^[7].

Significant variation was recorded for higher dry weight of 100 leaves and leaf yield / vine /year and are presented below

in Table 3. In the study, the higher dry weight of 100 leaves (42.07 g), maximum leaf yield/vine/year (63.39) and leaf yield / ha /year (1584733.33) was recorded in treatment T₂ Neem oil cake (2.8 t/ha), while on the other hand significantly minimum leaf yield / vine /year (44.49) and minimum leaf yield / ha /year (1112133.33) was observed in treatment T₈ RDF (NPK::150:100:100 Kg/ha). Umeha *et al.* (2011) ^[11] and Hegde *et al.* (2012) ^[4] observed that the availability of primary and secondary plant nutrient elements such as NPK and Ca and Mg, and their interaction is helpful to increase leaf yield / vine of betelvine and enhanced uptake of nutrients from soil resulting in assimilation of carbohydrates and other metabolic activity which led to an increase in various plant metabolites responsible for leaf yield.

Table 3: Effect of different organic nutrient components on betel leaf yield components.

Tr. No.	Treatments	L/B ratio	Fresh weight of 100 leaves(g)	Dry weight of 100 leaves(g)	Leaf yield / vine /year (on number basis)	Leaf yield / ha /year (on number basis)
T ₁	Karanj oil cake (3.5 t/ha)	1.47	267.03	41.50	54.95	1373800.00
T ₂	Neem oil cake (2.8 t/ha)	1.54	255.00	42.07	63.39	1584733.33
T ₃	Mustard oil cake (2.8 t/ha)	1.36	250.00	40.80	46.13	1153200.00
T ₄	Vermicompost (9.3 t/ha)	1.29	248.10	40.05	54.22	1355400.00
T ₅	Fresh Moringa leaf extract @ 25% dilution (3 spray)	0.99	235.00	37.00	51.67	1291733.33
T ₆	Poultry manure (2.3 t/ha)	1.05	240.15	38.17	51.45	1286200.00
T ₇	Vermi-wash @ 25% dilution (4 spray)	1.16	242.00	39.30	48.21	1205200.00
T ₈	RDF (NPK::150:100:100 Kg/ha)	0.72	225.00	35.25	44.49	1112133.33
	SEm (±)	0.06	7.26	1.31	1.87	46882.26
	CD (5%) =	0.18	22.03	4.00	5.69	142202.64
	CV (%) =	8.69	5.13	5.81	6.27	6.27

Economics is the most important aspect of any research upon which the recommendation depends and tests the feasibility of the technology. Until and unless a farmer is well convinced about a purposeful gain from a particular package of practices, he would not be willing to adopt the same. The data pertaining to cost of cultivation (Rs. ha⁻¹), gross return (Rs. ha⁻¹), net return (Rs. ha⁻¹) and B: C ratio as affected by different treatments presented in Table 4. The maximum total cost of cultivation Rs 492991.60 ha⁻¹ were calculated for treatment T₁ Karanj oil cake (3.5 t/ha) followed by T₃ Mustard oil cake (2.8 t/ha) (464991.60) and highest gross return Rs

1584733.33 ha⁻¹ was obtained in treatment T₂ Neem oil cake (2.8 t/ha) followed by Rs 1373800.00ha⁻¹ obtained in T₁ Karanj oil cake (3.5 t/ha). On other hands, the highest net return Rs 923741.73 ha⁻¹ was obtained in treatment T₅ Fresh Moringa leaf extract at 25% dilution (3 spray) followed by Rs 910208.40 ha⁻¹ obtained in T₆ Poultry manure (2.3 t/ha). Data revealed that highest B:C Ratio 2.63 was obtained in treatment T₂ Neem oil cake (2.8 t/ha) followed by 2.51 obtained in T₅ Fresh Moringa leaf extract at 25% dilution (3 spray).

Table 4: Assessment of Benefit: Cost ratio among different organic manures

Tr. No.	Treatments	Cost of cultivation	Leaf yield / ha / year	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
T ₁	Karanj oil cake (3.5 t/ha)	492991.60	1373800.00	1373800.00	880808.40	1.79
T ₂	Neem oil cake (2.8 t/ha)	436991.60	1584733.33	1584733.33	1147741.73	2.63
T ₃	Mustard oil cake (2.8 t/ha)	464991.60	1153200.00	1153200.00	688208.40	1.48
T ₄	Vermicompost (9.3 t/ha)	445991.60	1355400.00	1355400.00	909408.40	2.04
T ₅	Fresh Moringa leaf extract @ 25% dilution (3 spray)	367991.60	1291733.33	1291733.33	923741.73	2.51
T ₆	Poultry manure (2.3 t/ha)	375991.60	1286200.00	1286200.00	910208.40	2.42
T ₇	Vermi-wash @ 25% dilution (4 spray)	392991.60	1205200.00	1205200.00	812208.40	2.07
T ₈	RDF(NPK::150:100:100 Kg/ha)	362576.60	1112133.33	1112133.33	749556.73	2.07

Selling Price = Rs. 1.00 /leaf

Conclusion

The growth and yield parameters were found significantly superior in treatment T₂ Neem oil cake (2.8t/ha) for most of the characters *i.e.* survival percentage, vine length, number of shoot/vine, no. of leaves /vine, basal girth of vine, no. of laterals /vine, leaf length, internodal distance, petiole length, leaf width, leaf area, fresh weight of 100 leaves and dry weight of 100leaves, leaf yield / vine /year, leaf yield / ha /year, petiole diameter and L/B ratio. The cost of cultivation, gross returns, net returns and B: C ratio were found maximum in treatment T₁ Karanj oil cake (3.5 t/ha), T₂ Neem oil cake (2.8 t/ha), T₅ (Fresh Moringa leaf extract @ 25% dilution (3 spray) and T₂ Neem oil cake (2.8 t/ha) respectively. On the basis of present investigation treatment T₂ Neem oil cake (2.8 t/ha) was found significantly superior for most of the growth and yield parameters.

Acknowledgement

The authors express his heartfelt gratitude to Dr. Jitendra Singh, Dean, Pt KLS College of Horticulture and Research Station, Rajnandgaon for giving me help and facility during the successful conduction of the experiment.

References

1. Bar A, Pariari A. Evaluation of integrated nitrogen management on vine and leaf characters of betel vine (*Piper betle* L.) cultivars in new alluvial zone of West Bengal. *Journal of Pharmacognosy and Phytochemistry*. 2020;9(3):2192-2196.
2. Dasgupta B, Sarkar S. Changes in crop canopy architecture on the incidence of major foliar diseases of betelvine (*Piper betle* L.). *Journal of Applied Horticulture*. 2017;19(2):135-138.
3. Dutta B, Bandyopadhyay AK, Sultana S, Mondal A, Rudra BC, Das G. The effects of biofertilizers, organic and inorganic nutrient sources on growth parameters and yield of *Piper betle* L. (Betlevine) under Gangetic alluvial soil of West Bengal. *International Journal of Plant & Soil Science*. 2020;32(6):90-95.
4. Hedge NK, Patil S, Shasidar VS. Effect of organic nutrition on the performance of Betel vine (*Piper betle* L.). *Indian Journal of Agricultural Sciences*. 2012;42:367-397.
5. Khattak A, Izahar A, NA Fazal W, Habib R. Effect of different amended organic media on the growth and development of *vanica rosea* 'victory'. *Sarhad Journal Agriculture*. 2011;27(2):201-205.
6. Mahalakshmi M, Chitra R, Jansi Rani P, Janaki D. Effect of organic manures and nutrients on growth and yield of betelvine (*Piper betle* L.). *International Journal of*

Chemical Studies. 2019;7(3):288-291.

7. Moutusi Dey, Pariari A, Sharangi AB, Chattejee R. Response of different nitrogen sources on growth and yield of betelvine (*Piper betle* L). *South Indian Horticulture*. 2003;51(1/6):244-248.
8. Panse VG, Sukhatme PV. *Statistical Methods for Agricultural Workers*. ICAR, New Delhi; c1995.
9. Preethy TT, Aswathi KK, Nisha Jayarajan Mannambeth, Asha V Pillai. Spectrum of variation in land races of different Morphological characters of betel vine. *International Journal of Current Research*. 2016;8(03):28164-208170.
10. Shivashankara KS, Mithila J, Satyabrata Maiti. A new method of vegetative propagation in betelvine. *Journal of Plantation Crops*. 2000;28:91-98.
11. Umesha K, Murthy G, Smita GR. Environmental conditions and type of cuttings on rooting and growth of vanilla (*Vanilla planifolia* Andrews). *Journal of Tropical Agriculture*. 2011;49(1-2):121-123.