Plant Archives Vol. 26, No. 2, 2026 pp. 1676-1680 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.no.2.227

EVALUATION OF BETELVINE (*Piper betle* L.) GENOTYPES FOR YIELD AND QUALITY PARAMETERS UNDER POLYHOUSE CONDITION

Sarika M.[1]*, Sadashiv Nadukeri[2], Ravi C.S.[3], Shashikala S. Kolakar[4] and Narasimhamurthy H.B.[5]

[1]Department of Plantation Spices Medicinal and Aromatic Crops, College of Horticulture Mudigere-577132, Karnataka, India

[2]Department of Plantation Spices Medicinal and Aromatic Crops, MAHRS, Iruvakki-577412, Karnataka, India

[3]Department of Plantation Spices Medicinal and Aromatic Crops, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences (KSNUAHS), Shivamogga, Karnataka, India

[4]Department of Genetics and Plant Breeding, College of Agriculture, Shivamogga-577204, Karnataka, India

[5]Department of Plant Pathology, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences (KSNUAHS), Shivamogga, Karnataka, India

*Corresponding author E-mail: sarikam@uahs.edu.in

(Date of Receiving-16-07-2026; Date of revision-12-09-2026; Date of Acceptance-22-09-2026)

ABSTRACT

The present investigation was undertaken to evaluate 25 betelvine (*Piper betle* L.) genotypes for yield and quality parameters under polyhouse conditions. The experiment was conducted at the Main Agricultural and Horticultural Research Station (MAHRS), Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences (KSNUAHS), Iruvakki, Shivamogga, Karnataka, during November 2025 to July 2026. The experiment was laid out in a Completely Randomized Design with three replications. Yield and quality parameters were recorded at seven months after planting. Significant variation was observed among the genotypes for all the traits studied. Gangarampur Sanchi recorded the earliest first picking (175.00 days), highest leaf yield per vine (75.00 leaves) and leaf yield per hectare (82.50 lakh leaves ha^{-1}). Betelvine White recorded the maximum number of leaves per lateral (12.67), whereas Ambadi Local and Dabaspet Ambadi recorded the highest number of laterals per m^2 (4.33 each). For quality attributes, Mohabha Bangla recorded the highest essential oil content (0.66%) and chlorophyll *b* (1.14 mg g^{-1} fresh weight), while Dabaspet Ambadi recorded the highest chlorophyll *a* (1.76 mg g^{-1} fresh weight) and total chlorophyll (2.83 mg g^{-1} fresh weight). The identified superior genotypes could serve as promising genetic material for further evaluation and utilization under polyhouse cultivation.

***Key words*:** Betelvine, genotypes, *Piper betle* L., polyhouse, quality parameters and yield.

Introduction

Betelvine (*Piper betle* L.) is a perennial, evergreen and dioecious climbing vine belonging to the family Piperaceae and is predominantly propagated through stem cuttings. It is an important commercial crop cultivated extensively in tropical and subtropical regions of South and South-East Asia for its valuable leaves. India is one of the major producers and consumers of betel leaves and possesses considerable genetic diversity in betelvine cultivars. More than 100 cultivars and landraces are cultivated under diverse agro-climatic conditions, exhibiting wide variability in leaf characteristics, aroma, pungency, quality and yield potential (Ravindran *et al*., 2004; Guha, 2006).

Betel leaves have considerable commercial, cultural and medicinal importance and are widely consumed as a masticatory product. In addition to their traditional use, the leaves possess several bioactive compounds and are reported to exhibit antimicrobial, antioxidant and other therapeutic properties (Prakash *et al*., 2010). The economic value of betelvine is largely determined by the quantity and quality of marketable leaves produced.

Hence, improvement in leaf yield along with desirable quality characteristics is essential for enhancing the profitability and market acceptance of the crop.

Considerable variation exists among betelvine genotypes for yield-contributing traits and quality attributes. Yield is influenced by traits such as the number of laterals, number of leaves produced and leaf yield per vine, which ultimately determine productivity on a unit-area basis. At the same time, consumer preference and market value are strongly influenced by quality characteristics such as aroma, pungency, tenderness, chlorophyll content, essential oil content, nutritional composition and keeping quality. The considerable variability observed among genotypes provides an opportunity for identifying superior genotypes possessing desirable combinations of high yield and better quality traits (Alam *et al*., 2023; Bar *et al*., 2020).

Karnataka is one of the important betelvine-growing states of southern India, with the crop cultivated in several regions of the state. Several local cultivars are grown under different agro-climatic conditions, reflecting the genetic diversity available for selection and evaluation. However, the performance of different genotypes may vary considerably depending on the growing environment and cultivation system. Therefore, systematic evaluation of available genotypes is important for identifying genotypes with superior yield and quality characteristics under specific production conditions (Shashidhar, 2006; Kirankumar, 2007).

Traditional cultivation of betelvine is generally carried out under shade structures or with live standards. However, crop performance can be influenced by environmental factors and disease incidence under conventional production conditions (Chakrabarty, 2018). Protected cultivation, particularly under different protected structures, provides an environment suitable for evaluating betelvine genotypes for growth, yield, quality and shelf-life attributes (Tirkey *et al*., 2019). Such conditions can facilitate better crop performance and provide an opportunity to identify genotypes with desirable characteristics under protected cultivation.

Evaluation of betelvine genotypes under polyhouse conditions is therefore important for identifying genotypes that combine higher leaf productivity with desirable quality characteristics. Such evaluation can provide useful information on genotype performance and help in the identification of promising genotypes suitable for protected cultivation. Although considerable genetic diversity exists in betelvine, further evaluation of diverse genotypes under polyhouse conditions is required to identify genotypes with superior yield and quality characteristics. Hence, the present investigation was undertaken to evaluate betelvine (*Piper betle* L.) genotypes for yield and quality parameters under polyhouse conditions.

Material and Methods:

The experimental material consisted of 25 diverse betelvine (*Piper betle* L.) genotypes collected from different sources. The experiment was conducted under polyhouse conditions at the Main Agricultural and Horticultural Research Station (MAHRS), Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences (KSNUAHS), Iruvakki, Shivamogga, Karnataka, during November 2025 to July 2026. The trial was laid out in a Completely Randomized Design (CRD) with three replications. Uniformly rooted vine cuttings were established and maintained in grow bags, with split arecanut (*Areca catechu* L.) sticks provided uniformly as support for proper vine climbing and growth. Twenty-one genotypes were collected from the Indian Institute of Horticultural Research (IIHR), Bengaluru, three from the University of Agricultural Sciences (UAS), Dharwad and one local landrace from Nichadi, Sagara, Shivamogga. Uniform cultural practices, including nutrient management, irrigation, weeding, vine training and need-based plant protection, were followed for all the genotypes throughout the experimental period.

Data were recorded for five yield parameters, namely days to first picking, number of leaves per lateral, number of laterals per m², leaf yield per vine and leaf yield per hectare at seven months after planting (MAP). Days to first picking were recorded by counting the number of days from planting to the day when the first marketable leaf was harvested from each vine. The number of fully expanded leaves borne on a selected lateral was recorded manually. The total number of lateral branches present within a 1 m² area was also counted. Leaf yield per vine

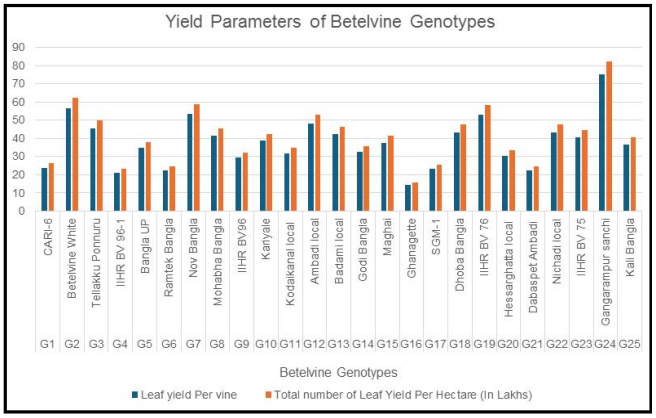

Fig.1: Performance of betelvine genotypes for leaf yield per vine, leaf yield per hectare under polyhouse condition.

Table 1: Performance of betelvine genotypes for yield and yield attributes under polyhouse condition.

GN	Genotypes	DFP	NLP	NLL
G_1	CARI-6	206.19	3.78	7.11
G_2	Betelvine White	180.07	2.33	12.67
G_3	Tellakku Ponnuru	189.07	2.78	10.78
G_4	IIHR BV 96-1	208.00	3.89	4.67
G_5	Bangla UP	200.00	2.89	8.22
G_6	Ramtek Bangla	208.28	2.33	6.89
G_7	Nov Bangla	188.07	2.33	11.11
G_8	Mohabha Bangla	183.00	2.67	8.78
G_9	IIHR BV96	204.00	2.78	6.33
G_{10}	Kariyale	197.00	2.44	10.78
G_{11}	Kodaikanal local	202.00	3.44	9.22
G_{12}	Ambadi local	188.00	4.33	5.89
G_{13}	Badami local	181.00	3.11	7.11
G_{14}	Godi Bangla	204.00	3.00	7.22
G_{15}	Maghai	199.00	3.00	8.44
G_{16}	Ghanagette	210.00	3.33	8.56
G_{17}	SGM-1	208.00	3.33	6.78
G_{18}	Dhoba Bangla	195.00	2.67	11.44
G_{19}	IIHR BV 76	185.00	2.67	10.89
G_{20}	Hessarghatta local	204.00	3.33	10.00
G_{21}	Dabaspet Ambadi	208.00	4.33	4.67
G_{22}	Nichadi local	191.00	2.89	8.22
G_{23}	IIHR BV 75	195.00	2.56	11.44
G_{24}	Gangarampur sanchi	175.00	3.00	7.11
G_{25}	Kali Bangla	200.00	2.89	9.33
	S. Em ±	**7.68**	**0.14**	**0.65**
	CD @ 5%	**21.81**	**0.39**	**1.85**

GN: Genotype No.; DFP: Days to first Picking; NLP: No. of laterals per m^2; NLL: No. of leaves per lateral

Table 2: Performance of betelvine genotypes for yield and yield attributes under polyhouse condition.

Genotype No.	Genotypes	LYV	TNLY
G_1	CARI-6	23.89	26.28
G_2	Betelvine White	56.53	62.19
G_3	Tellakku Ponnuru	45.30	49.83
G_4	IIHR BV 96-1	21.00	23.10
G_5	Bangla UP	34.68	38.15
G_6	Ramtek Bangla	22.48	24.73
G_7	Nov Bangla	53.55	58.90
G_8	Mohabha Bangla	41.29	45.42
G_9	IIHR BV96	29.40	32.34
G_{10}	Kariyale	38.65	42.52
G_{11}	Kodaikanal local	31.55	34.70
G_{12}	Ambadi local	48.29	53.12
G_{13}	Badami local	42.17	46.39
G_{14}	Godi Bangla	32.60	35.86
G_{15}	Maghai	37.57	41.32
G_{16}	Ghanagette	14.22	15.64
G_{17}	SGM-1	23.22	25.54
G_{18}	Dhoba Bangla	43.38	47.72
G_{19}	IIHR BV 76	53.20	58.52
G_{20}	Hessarghatta local	30.48	33.53
G_{21}	Dabaspet Ambadi	22.59	24.85
G_{22}	Nichadi local	43.19	47.51
G_{23}	IIHR BV 75	40.67	44.73
G_{24}	Gangarampur sanchi	75.00	82.50
G_{25}	Kali Bangla	36.80	40.48
	S. Em ±	**1.48**	**2.12**
	CD @ 5%	**4.19**	**6.03**

LYV: Leaf yield Per vine; TNLY: Total number of Leaf Yield Per Hectare (In Lakhs)

was recorded as the total number of leaves harvested from each vine during the harvesting period and expressed as number of leaves $vine^{-1}$. Leaf yield per hectare per year was estimated based on the leaf yield per vine and expressed as lakh leaves ha^{-1}.

Quality parameters, namely essential oil content and chlorophyll content, were recorded at seven months after planting. Essential oil content was estimated from fresh leaves by hydrodistillation using a Clevenger apparatus and expressed as percentage on a fresh weight basis. Chlorophyll content was estimated following the procedure of Shoaf and Lium (1976). Fresh leaf samples weighing 100 mg were incubated in 7 ml dimethyl sulphoxide (DMSO) at 65 °C for 120 minutes, and the extract was made up to 10 ml with DMSO. Absorbance was recorded at 645 and 663 nm using a spectrophotometer and total chlorophyll content was calculated using the respective formula.

The recorded data were subjected to analysis of variance (ANOVA), and standard error of the mean (SEm) and critical difference (CD) at the five per cent level of significance were calculated to compare the performance of the genotypes.

Results and Discussion

Significant variation was observed among the betelvine (*Piper betle* L.) genotypes for days to first picking and other yield attributes (Table 1). Gangarampur Sanchi recorded the earliest first picking (175.00 days), followed by Betelvine White (180.07 days), Badami Local (181.00 days) and Mohabha Bangla (183.00 days), whereas Ghanagette recorded the latest first picking (210.00 days). The highest number of leaves per lateral was recorded in Betelvine White (12.67), followed by Dhoba Bangla and IIHR BV 75 (11.44 each), whereas IIHR BV 96-1 and Dabaspet Ambadi recorded the lowest (4.67 each). The maximum number of laterals per m^2 was recorded in Ambadi Local and Dabaspet Ambadi (4.33 each), followed by IIHR BV 96-1 (3.89)

Table 3: Performance of betelvine genotypes for quality attributes under polyhouse condition.

GN	Genotypes	EOC	Ca	Cb	TC
G_1	CARI-6	0.33	0.32	0.25	0.57
G_2	Betelvine White	0.11	0.91	0.72	1.63
G_3	Tellakku Ponnuru	0.15	0.54	0.33	0.87
G_4	IIHR BV 96-1	0.08	1.28	0.75	2.03
G_5	Bangla UP	0.29	1.73	0.28	2.01
G_6	Ramtek Bangla	0.11	1.15	0.66	1.80
G_7	Nov Bangla	0.25	0.99	0.52	1.51
G_8	Mohabha Bangla	0.66	1.59	1.14	2.73
G_9	IIHR BV96	0.18	0.56	0.33	0.89
G_{10}	Kariyale	0.40	1.26	0.95	2.21
G_{11}	Kodaikanal local	0.24	0.47	0.21	0.67
G_{12}	Ambadi local	0.33	1.21	0.68	1.89
G_{13}	Badami local	0.26	0.62	0.42	1.04
G_{14}	Godi Bangla	0.23	1.01	0.61	1.62
G_{15}	Maghai	0.17	1.05	0.50	1.55
G_{16}	Ghanagette	0.23	0.62	0.39	1.01
G_{17}	SGM-1	0.15	0.52	0.33	0.85
G_{18}	Dhoba Bangla	0.30	1.07	0.61	1.68
G_{19}	IIHR BV 76	0.13	0.61	0.49	1.09
G_{20}	Hessarghatta local	0.27	1.17	0.64	1.81
G_{21}	Dabaspet Ambadi	0.47	1.76	1.08	2.83
G_{22}	Nichadi local	0.38	1.55	0.36	1.91
G_{23}	IIHR BV 75	0.10	0.87	0.39	1.26
G_{24}	Gangarampur sanchi	0.16	1.55	0.68	2.23
G_{25}	Kali Bangla	0.08	0.84	0.42	1.26
	S. Em ±	**0.01**	**0.04**	**0.02**	**0.07**
	CD @ 5%	**0.03**	**0.12**	**0.07**	**0.19**

GN: Genotype No.; EOC: Essential oil content (%);Ca: Chlorophyll a (mg g^{-1} fresh weight); Cb: Chlorophyll b (mg g^{-1} fresh weight); TC: Total Chlorophyll (mg g^{-1} fresh weight)

and CARI-6 (3.78), while Betelvine White, Ramtek Bangla and Nov Bangla recorded the minimum (2.33 each). Gangarampur Sanchi recorded the highest leaf Significant variation was observed among the betelvine (*Piper betle* L.) genotypes for days to first picking and other yield attributes (Table 1). Gangarampur Sanchi recorded the earliest first picking (175.00 days), followed by Betelvine White (180.07 days), Badami Local (181.00 days) and Mohabha Bangla (183.00 days), whereas Ghanagette recorded the latest first picking (210.00 days). The highest number of leaves per lateral was recorded in Betelvine White (12.67), followed by Dhoba Bangla and IIHR BV 75 (11.44 each), whereas IIHR BV 96-1 and Dabaspet Ambadi recorded the lowest (4.67 each). The maximum number of laterals per m^2 was recorded in Ambadi Local and Dabaspet Ambadi (4.33 each), followed by IIHR BV 96-1 (3.89) and CARI-6 (3.78), while Betelvine White, Ramtek Bangla and Nov Bangla recorded the minimum (2.33 each). Gangarampur Sanchi recorded the highest leaf yield per vine (75.00), followed by Betelvine White (56.53), Nov Bangla (53.55) and IIHR BV 76 (53.20), whereas Ghanagette recorded the lowest (14.22). Similarly, leaf yield per hectare was highest in Gangarampur Sanchi (82.50 lakh leaves ha^{-1}), followed by Betelvine White (62.19 lakh leaves ha^{-1}), Nov Bangla (58.90 lakh leaves ha^{-1}) and IIHR BV 76 (58.52 lakh leaves ha^{-1}), while Ghanagette recorded the lowest (15.64 lakh leaves ha^{-1}). The variation in yield and yield attributes among the genotypes may be attributed to inherent genetic differences, vegetative vigour, lateral development, leaf production potential and differences in leaf size and development. Similar variability in yield and yield attributes among betelvine genotypes was reported by Reddy *et al.*, (1996), Das *et al.*, (2000), Shashidhar (2006), Rahman *et al.*, (2020), Rana *et al.*, (2021), Aswathi *et al.*, (2022), Alam *et al.*, (2023), Gochhi and Dey (2024) and Sarker *et al.*, (2025).

Significant variation was also observed among the genotypes for quality attributes (Table 3). Mohabha Bangla recorded the highest essential oil content (0.66%), followed by Dabaspet Ambadi (0.47%), Kariyale (0.40%) and Nichadi Local (0.38%), whereas IIHR BV 96-1 and Kali Bangla recorded the lowest (0.08% each). The variation in essential oil content may be attributed to genetic differences and differential synthesis and accumulation of volatile compounds. Similar variation in essential oil content among betelvine genotypes was reported by Guha (2006) in betelvine.

Among the chlorophyll attributes, Dabaspet Ambadi recorded the highest chlorophyll *a* content (1.76 mg g^{-1} fresh weight) and total chlorophyll content (2.83 mg g^{-1} fresh weight), whereas Mohabha Bangla recorded the highest chlorophyll *b* content (1.14 mg g^{-1} fresh weight). The minimum chlorophyll *a* and total chlorophyll contents were recorded in CARI-6 (0.32 and 0.57 mg g^{-1} fresh weight, respectively), while Kodaikanal Local recorded the lowest chlorophyll *b* content (0.21 mg g^{-1} fresh weight). The observed variability in chlorophyll content may be attributed to genetic differences, variation in

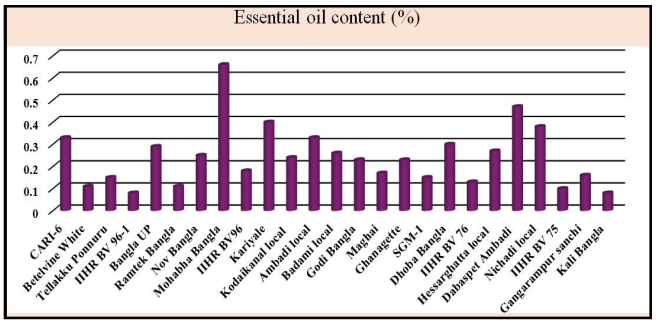

Fig. 2: Variations in Essential oil content among different betelvine genotype.

chlorophyll biosynthesis, leaf pigmentation and nutrient uptake. Similar variation in chlorophyll and biochemical attributes of betelvine was reported by Patra *et al.*, (2018) in betelvine.

Conclusion

The present investigation revealed significant variation among the 25 betelvine (*Piper betle* L.) genotypes for yield and quality parameters under polyhouse conditions, indicating considerable genetic variability among the genotypes. Gangarampur Sanchi recorded the earliest first picking and the highest leaf yield per vine and per hectare, while Betelvine White recorded the highest number of leaves per lateral. Ambadi Local and Dabaspet Ambadi recorded the highest number of laterals per m^2. Among the quality attributes, Mohabha Bangla recorded the highest essential oil content and chlorophyll *b*, whereas Dabaspet Ambadi recorded the highest chlorophyll *a* and total chlorophyll contents. Overall, the identified superior genotypes with desirable yield and quality characteristics could serve as promising material for further evaluation and utilization under polyhouse cultivation.

References

Alam, M.A., Rahman M.M., Hasan M.M. and Uddin M.N. (2023). Evaluation of betel vine genotypes based on morphological and yield contributing traits. *Bangladesh J. Agric. Res*. **48(2)**, 145-158.

Aswathi, P., Sivu A.R., Pradeep N.S. and Sathish D.K. (2022). Leaf morphological variations among betel vine (*Piper betle* L.) cultivars of Kerala. *Int. J. Bot. Stud*., **7(6)**, 62-68.

Bar, A., Pariari A., Biswas P., Karmakar M. and Saha G. (2020). Comparative studies on leaf yield, quality and economy of three cultivars of betelvine (*Piper betle* L.) as influenced by integrated nitrogen management. *Int. J. Curr. Microbiol. Appl. Sci*., **9(11)**, 3137-3147.

Chakrabarty, R. (2018). Effect of environmental factors on diseases of betelvine (*Piper betle* L.) in Assam. *Indian Phytopath*. **71**, 1-8.

Das, P.C., Das A., Pariari A. and Das S. (2000). Genetic divergence in betelvine (*Piper betle* L.) germplasm based on morphological characters. *Environ. Ecol*. **18(4)**, 915-919.

Gochhi, S.K. and Dey S.K. (2024). Assessment of morphological diversity and vegetative growth parameters of fifteen betel vine varieties cultivated along the Odisha coast. *Agric. Hort. Res*. **11(1)**, 58-67.

Guha, P. (2006). Betel leaf: The neglected green gold of India. *J. Hum. Ecol*. **19(2)**, 87-93.

Kirankumar, G.S. (2007). Evaluation of betelvine (*Piper betle* L.) cultivars and live standards. M.Sc. (Agri.) thesis, Univ. Agric. Sci., Dharwad, Karnataka (India). 98.

Patra, B., Pradhan S.N., Das M.T. and Dey S.K. (2018). Eco-physiological evaluation of the betel vine varieties cultivated in Bhogarai area of Balasore district, Odisha, India for disease management and increasing crop yield. *Int. J. Recent Sci. Res*., **9(4E)**, 25822-25828.

Prakash, B., Shukla R., Singh P., Kumar A., Mishra P.K. and Dubey N.K. (2010). Efficacy of chemically characterized *Piper betle* L. essential oil against fungal and aflatoxin contamination of some edible commodities and its antioxidant activity. *Int. J. Food Microbiol*. **142(1-2)**, 114-119.

Rahman, M.H., Islam M.R., Aminuzzaman F.M., Latif A. and Rahman H. (2020). Physio-morphological study of betel vine (*Piper betle* L.) cultivars available in Bangladesh. *Agriculturists*, **18(1)**, 56-65.

Rana, L., Tirkey A., Belsariya N. and Roy S. (2021). Genetic diversity analysis and variability estimation in betelvine (*Piper betle* L.). *Int. J. Curr. Microbiol. Appl. Sci*. **10(2)**, 3263-3269.

Ravindran, P.N., Nirmal Babu K. and Shiva K.N. (2004). Betel vine. In: *Handbook of Herbs and Spices*. **2**, 465-484.

Reddy, B.M.C., Reddy Y.N., Dorajeerao A.V.D. and Subramanyam K. (1996). Evaluation of betelvine (*Piper betle* L.) genotypes under Anantharajpet conditions of Andhra Pradesh. *South Indian Hort*. **44(1-2)**, 45-48.

Sarker, J.C., Ahmed F., Bhuyan M.H.M.B., Debnath S. and Rahman S.M.L. (2025). Physico-morphological characteristics of betel vine cv. Khasia pan genotypes grown in northeastern hilly region of Bangladesh. *Int. J. Biosci*. **27(1)**, 343-354.

Shashidhar, V.S. (2006). Evaluation of betelvine (*Piper betle* L.) cultivars under northern Karnataka conditions. M.Sc. (Agri.) thesis, Univ. Agric. Sci., Dharwad, Karnataka (India).

Shoaf, W.T. and Lium B.W. (1976). Improved extraction of chlorophyll a and b from algae using dimethyl sulfoxide. *Limnol. Oceanogr*. **21(6)**, 926-928.

Tirkey, A., Ramtake V., Porte S.S., Joshi P.K., Khare N., Tandon A. and Tirkey T. (2019). Evaluation of betelvine (*Piper betle* L.) genotypes under different protected structures for growth, yield, quality and shelf-life attributes. *J. Pharmacogn. Phytochem*., **8(4)**, 2405-2410.