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Evaluation of betel vine (*Piper betle* L.) genotypes for biochemical traits

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Abstract
Betel vine (*Piper betle* L) is valued for its masticatory health benefits. The cultivars in betel vine are mostly the land races which are cultivated locally. The present study was conducted to explore the variation based on biochemical attributes among thirty seven betel vine genotypes collected from different parts of Karnataka. Results revealed that the highest total chlorophyll content (1.88 mg/g), antioxidants (93.31 mg/g), total phenolics (131.80 mg/100 g), essential oil (0.65%) and eugenol (19.90%) content was recorded in genotype Mushigeri local followed by Ghaneghatta. The variations in biochemical traits observed among the genotypes may be due to their genetic makeup. Hence genotype Mushigeri local and Ghaneghatta can be recommended for quality breeding programmes.

Keywords: Betel vine, total chlorophyll content, genotypes

Introduction
Betel vine (*Piper betle* L.,) is an evergreen perennial, dioecious climber belongs to the family Piperaceae and it is known to have originated in Central and eastern Malaysia. Heart shaped glossy leaves are the economical part which are mainly used for masticatory purpose. The vine climbs on the standard trees using aerial roots and asexually propagated by cuttings.
The vernalcular names in Indian languages includes Tambool in Sanskrit, Pan in Hindi, Nagballi in Telugu, Vetrilai in Tamil and in Kannada it is known as Velleyada yele or Vilya.
In the countries like India, Bangladesh, Srilanka and Pakistan it is mainly cultivated as the commercial cash crop. In India, it is majorly cultivated in the states of West Bengal, Assam, Bihar, Andhra Pradesh, Tamil Nadu and Karnataka and more than 20 million small and marginal farmers across the country depend on this plant for their livelyhood with an estimated area of 53,539 ha and annual production worth Rs. 9,000 million (Ray, 2008) [17]. Hence, it is often known as the 'green gold of India'.
The betel leaf also used in variety of social, cultural and religious ceremonies in the hindu culture from the time immemorial and apart from the masticatory, socio-cultural uses it has also got many medicinal properties. The leaves exhibit antioxidant, anti-inflammatory, anticarcinogenic, antibacterial, antifungal and nematicidal properties and its essential oils known for biological activities (Kumar *et al*., 2010 and Rai *et al*., 2011) [10, 16]. Terpenes and phenols present in the essential oil are mainly responsible for the strong pungent aromatic flavour of leaves.
Leaves are rich source of phyto chemicals such as chavicol, carvicol, P- cymene and hydroxyl chavicol. Previous studies have reported wide range of variation for various biochemical characters mainly chlorophyll content, antioxidant, total phenolics, essential oil and eugenol content. Significant workers have also researched on these traits notably among them are Banerjee, (2012) [2]; Maheswarappa *et al*., (2012) [11]; Pariari and Imam (2012) [14]; Shivashankara *et al*., (2012) [22]; Tirkey *et al*. (2019) [26]; Manjesh *et al*., (2020) [12] in betel vine. The present entitled "Evaluation of betel vine (*Piper betle* L.) genotypes for Biochemical Traits" aimed to know the variability for biochemical traits among thirty seven genotypes of betel vine.

Material and Methods
Plant material
An experiment was carried out in the field of Irappa Hadimani during 2019-21 at Badami. during the year 2019-21 at and 37 genotypes of betel vine were used for various biochemical

parameters (Table 1). Analysis was carried out at the Department of Plantation, Spices, Medicinal and Aromatic crops, College of horticulture, Bagalkote, Karnataka. Various biochemical parameters were estimated according to the standard procedure.

Table 1: Different procedures followed for the analysis of biochemical parameters

Biochemical parameter	Calculation	Reference
Total chlorophyll content (mg/g)	Total Chlorophyll=[20.2(A645) + 8.02(A663)] V 1000×W×a A=Absorbance at specific wavelength, V=Final volume of chlorophyll in DMSO, W=Fresh weight of betel leaves used for extraction, a=path length=1	Hiscox and Israelstam, 1979 [8]
Antioxidant activity(mg/g)	Antioxidant activity(mg/g) = b × Total volume of extract × 100 Assay volume × Weight of the sample (g) ×1000	Benzie and Strain, 1996 [3].
Total phenolics (mg/g)	Total phenolics(mg/g) = Absorbance × Volume of extract×Dilution×100 Aliquot taken × Sample weight×1000	Sadasivam and Manickam, 1992 [18]
Essential oil (%)	Essential oil (v/w) = Volume of oil (ml) × 100 Weight of the sample (g)	Sadgrove and Jones, 2015 [19]
Eugenol (%)	GC-MS/MS method	

Results and Discussion

Thirty seven of betel vine genotypes were evaluated for different biochemical characters and presented in Table-2. Biochemical traits *viz.*, Total chlorophyll content (mg/g), Antioxidants (mg/g), Total phenolics (mg/g), Essential oil (%) and Eugenol content (%) were recorded. Different genotypes of betel vine showed significant variation for all the parameters studied. Analysis of various traits showed the positive mean square values for all the parameters studied.

Among the various genotypes, Mushigeri local recorded the maximum total chlorophyll content (1.88 mg/g). followed by Ghaneghatta (1.83 mg/g) and the minimum was recorded by Tellaku ponnuru (0.84 mg/g) with an average of 1.34 mg/g. Variation in the total chlorophyll content was reported by Pariari and Imam (2012) [14]; Pradhan *et al*. (2013) [15]; Bar and Pariari (2020) [14]; Manjesh *et al*. (2020) [12].

Antioxidants are substances which protect cells against free radicals and free radicals are molecules produced during food breakdown. It showed significant difference among the various genotypes. Maximum antioxidant content was recorded in genotype Mushigeri Local (93.31 mg/g) which was on par with Ghanegatta (91.65 mg/g) and Purtageri Local (90.13 mg/g), Badami Calcutta (88.62 mg/g) and Cholachagudda Kariyele (86.78 mg/g). Whereas, genotype Shirapurakata recorded lowest antioxidant content (35.10 mg/g). These results are in conformity with the findings of Shivashankara *et al*. (2012) [22]; Sundang *et al*. (2012) [25] and Bhuvaneswari *et al*. (2014) [4].

Total phenols are mainly responsible for anti-oxidant activity. The observations recorded for this trait showed significant differences among all the genotypes. Total phenolic content ranged from 90.30 to 131.80 mg/g with general mean 105.51 mg/g. Maximum total phenolics was observed in Mushigeri Local (131.80 mg/g). Minimum total phenolics was recorded in the genotype Shirapurakata 90.30 (mg/g). Similar findings were recorded by Sundang *et al*. (2012) [25]; Sazwi *et al*. (2013) [21] and Sruthi and Zachariah (2016) [23].

All the genotypes showed significant variations for the trait essential oil. It was varied from 0.17 to 0.65% with general mean 0.41%. Genotype Mushigeri Local recorded highest (0.65%) essential oil content and it was statistically on par with Ghaneghatta (0.63%), Purtgeri Local (0.62%) and Badami Calcutta (0.60%). Genotype Shirpurakata recorded the lowest (0.17%) for the trait essential oil. The results of the study were in harmony with the work of Caburian and Osi (2010) [5]; Usha *et al*. (2010) [27]; Sugumaran *et al*. (2011) [24] and Saxena *et al*. (2014) [20].

All the genotypes revealed significant variation for the character eugenol. It was ranged from 11.07 to 19.90%. General mean for this trait is 15.48%. Maximum eugenol was recorded in the genotype Mushigeri Local (19.90%) and statistically on par with Ghanegatta (19.43%), Purtageri Local (19.20%) and with other four genotypes. Minimum eugenol content was observed in genotype Shirapurakata (11.07%) These results are in conformity with the findings of Chitnis (2017) [6].

Table 2: Biochemical parameters of different betel vine germplasm

Germplasm	Total chlorophyll content (mg/g)	Antioxidants (mg/g)	Total phenolics (mg/g)	Essential oil (%)	Eugenol (%)
Tellaku Ponnuru	0.84	36.61	90.64	0.18	11.27
Tellaku Chintalpudi	1.33	64.22	104.86	0.42	15.70
Shirpurakata	0.85	35.10	90.30	0.17	11.07
Kapoori Doddipatla	1.26	59.33	102.89	0.36	14.43
Godi Bangla	1.56	75.50	110.25	0.48	17.00
Gangarampur Sanchi	1.57	77.11	111.29	0.52	17.50
Karapaku	1.73	85.41	115.20	0.55	18.70
Ghaneghatta	1.83	91.65	120.08	0.63	19.43
Maghai	1.62	78.83	111.62	0.51	17.53
Nov Bangla	1.69	83.60	114.26	0.56	18.37
Purtgeri Local	1.81	90.13	118.33	0.62	19.20
Mushigeri Local	1.88	93.31	131.80	0.65	19.90
Badami Culcutta	1.79	88.62	117.64	0.60	19.13
Cholachagudda Ambadi	0.96	41.03	94.12	0.21	12.27

Cholachagudda Kariyele	1.75	86.78	116.71	0.59	18.80
Saidapur Local	1.18	54.48	99.90	0.31	13.80
Neerbudihal Local	0.85	38.25	91.54	0.21	11.43
Jagadal Local	1.00	44.74	94.82	0.24	12.60
Mamatageri Local	1.02	46.38	95.62	0.26	12.82
Kudagi Local	0.90	39.82	92.44	0.19	11.85
Assangi Local	1.04	48.00	96.56	0.28	13.28
Kumbalavathi Local	1.67	81.66	113.49	0.58	18.21
Myageri Local	1.51	73.76	109.31	0.52	17.11
Gudur Local	1.50	78.57	108.44	0.46	16.70
Madnal Local	1.65	80.55	112.56	0.54	17.92
Jigeri Local	1.36	65.68	105.46	0.41	15.55
Gidnayakanal Local	1.47	70.61	107.15	0.45	16.42
Paramanatti Local	1.10	51.30	98.37	0.29	13.33
Ranebennur Local	1.45	69.11	107.15	0.48	16.66
Savanur Local	1.41	67.43	106.17	0.45	16.09
Harihar Local	1.27	60.64	103.72	0.40	14.93
Sirsi Local	1.31	62.60	102.92	0.37	15.26
Lakkuvalli Local	0.91	41.59	97.30	0.24	12.07
Shiggaon Local	1.08	49.61	93.41	0.30	13.50
Kadakalat Local	1.14	52.61	116.02	0.33	14.09
Jainapur Local	1.21	57.73	101.20	0.38	14.57
Karoshi Local	1.19	56.15	100.41	0.35	14.30
Mean	1.34	64.28	105.51	0.41	15.48
S.Em.±	0.04	2.36	3.10	0.02	0.59
CD at 5%	0.12	6.64	8.74	0.06	1.67

Conclusion

The present investigation thus, showed high variability and diversity among all the thirty seven genotypes. Biochemical parameters such as total chlorophyll, antioxidants, phenolics, essential oil and eugenol are the most important traits responsible for variation present in betel vine genotypes and the genotypes Mushigeri local and Ghaneghatta can be utilized for improving quality through breeding.

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