



Betel leaf yield in relation to soil fertility in Guntur district (Andhra Pradesh)

B T Priya, P R Devi & K Sireesha¹

AICRP on MAP and Betelvine, Dr. Y.S.R. Horticultural University,
Venkataramannagudem-534 101, Andhra Pradesh, India.
E-mail: tpriyahort@gmail.com

Received 21 January 2012; Revised 16 July 2012; Accepted 9 January 2013

Abstract

An attempt was made to survey betelvine gardens in Guntur district of Andhra Pradesh to ascertain soil fertility status and its impact on growth and yield of betelvine. All the soils were clay loam in texture. The pH of the soil was alkaline (7.1 to 8.4) and EC ranged from 0.35 to 1.61 dSm⁻¹. The organic carbon (OC) content of the soil was in the range of 0.55 to 1.24%. The available nitrogen (N), phosphorus (P) and potassium (K) status ranged from 201 to 313, 10 to 60, 337 to 840 kg ha⁻¹, respectively. Correlation indicated that the growth parameters *viz.*, number of laterals, intermodal length, petiole length and soil parameter *viz.* pH, EC and P were positively correlated with betel leaf yield but relations were not significant, whereas, plant height and soil nutrients *viz.*, OC content, N and K were significantly and positively correlated with leaf yield.

Keywords: betelvine, leaf yield, soil status

Betelvine is an important cash crop of Andhra Pradesh occupying an area of 2843 ha with a production of 28430 MT and its cultivation has assumed great significance in the coastal regions of Andhra Pradesh. Betelvine is chiefly cultivated in Guntur district of Andhra Pradesh. However, this district has been experiencing decline in betel leaf production due to nutrient imbalance in soil. It is therefore, important to periodically assess the fertility status of soil. Hence, a systematic investigation was conducted on soil fertility status to ascertain its impact on growth and yield of betelvine.

A survey was conducted to study the fertility

status of betelvine gardens in Guntur district of Andhra Pradesh during the period 2006–09. Thirty soil samples were collected from different farmer's field. The samples were air dried and passed through a 2mm sieve. Particle size analysis was performed using Boyoucoucous hydrometric method (Boyoucoucous 1965). Chemical characteristics of soil *viz.*, pH, EC, OC content, available N, available P and available K were determined. Soil pH and EC were determined using pH meter and digital conductivity bridge, respectively. The organic carbon content was determined by Walkley and Black oxidation method (Walkley & Black, 1934). Available N of soil was determined by alkaline potassium permanganate distillation

¹AICRP on Vegetables, Dr. Y.S.R. Horticultural University, Hyderabad, India.

method (Olsen 1929) available P content by Olsen's method (Olsen *et al.* 1954) and available K was extracted with neutral normal ammonium acetate at 1:5 soil to extraction ratio. The content of K in the extract was estimated by flame photometer. The growth parameters *viz.*, plant height, number of laterals, internodal length and petiole length were recorded in thirty betelvine gardens. Correlation studies were carried out for soil chemical characteristics and plant growth parameters with yield. The values of correlation coefficient (r) were calculated and test of significance was applied as per the procedure outlined by Panse & Sukhatme (1967).

Across the farmer's field, clay content in the surface layer (0–10 cm depth) varied from 69.2 to 77.4%, while sand fractions ranged from 13.0

to 19.0% and silt content ranged from 7.0 to 15.0%. Particle size analysis revealed that the soils were clay loam. The pH of the soil ranged from 7.1 to 8.4 and EC ranged from 0.35 to 1.61 dSm⁻¹. The OC content of the soil was in the range of 0.55 to 1.24% (Table 1). Higher OC content might be due to intensive agriculture, decay of plant residues and application of high organic manures and also the cropping pattern followed (Wu *et al.* 2004). The available N, P and K contents ranged from 201 to 313, 10 to 60, 337 to 903 kg ha⁻¹, respectively (Table 1). Most of the soils of betelvine garden area of Guntur districts are low and medium in available N content. The available P content in the soils was medium to high and the available K was in the higher range (Table 1). Excess application of organic manures and inorganic

Table 1. Effect of fertilizers/inputs applied by farmers on soil, growth and yield parameters of betelvine gardens in Guntur district of Andhra Pradesh

Sl. No.	Parameters	Range	Mean	SD	CD (P=0.05)	CV%
I	Fertilizers/inputs applied by farmers					
	FYM (t ha ⁻¹)	1–6	2.76	1.22	0.44	44.20
	Castor cake (kg ha ⁻¹)	0–500	458.33	102.06	37.95	22.26
	Neem cake (kg ha ⁻¹)	0–500	365	36.36	13.57	9.96
	Urea (kg ha ⁻¹)	0–125	18.16	39.33	14.70	54.84
	Ammonium sulphate (kg ha ⁻¹)	0–250	190	82.15	30.71	43.42
	S.S.P. (kg ha ⁻¹)	0–250	212.5	77.32	28.89	36.38
	Muriate of potash (kg ha ⁻¹)	0–300	202.5	73.40	27.44	36.24
	20-20-15 (kg ha ⁻¹)	0–250	226.66	41.69	15.58	18.39
	17-17-17 (kg ha ⁻¹)	0–250	133.33	49.01	18.32	36.76
II	Soil parameters					
	pH	7.10–8.40	7.69	0.366	0.12	4.76
	EC (dSm ⁻¹)	0.35–1.61	0.73	0.274	0.10	37.53
	Organic carbon (%)	0.55–1.24	0.85	0.154	0.06	18.12
	Available N (kg ha ⁻¹)	201–313	250.23	23.21	8.67	9.27
	Available P (kg ha ⁻¹)	10–60	22.97	12.75	4.76	55.51
	Available K (kg ha ⁻¹)	337–903	570.77	130.01	48.58	22.77
III	Growth and yield parameters					
	Plant height (cm)	260–334	302.52	18.20	6.91	6.01
	No. of laterals	15–34	24.30	5.08	1.88	20.90
	Internodal size (cm)	6.10–10.50	7.96	1.26	0.47	15.82
	Petiole length (cm)	4.90–8.00	6.30	0.83	0.31	13.17
	Leaf yield (lakh leaves ha ⁻¹)	25.20–53.00	40.54	8.13	3.04	20.05

fertilizers by the farmers (Table 1) and lower relative consumption of P and K by the crop might be the cause for higher available P and K contents in the soil. This is in agreement with findings of Shivaprasad *et al.* (1998) who also reported high P and K contents in black soils.

The growth parameters *viz.*, plant height ranged from 260.5 to 334.0 cm, number of laterals from 15 to 34, internodal length from 6.1 to 10.0 cm and petiole length from 4.9 to 8.0 cm (Table 1). The growth parameters *viz.*, number of laterals, internodal length, petiole length and soil parameters *viz.*, pH, EC and available P were non significant and positively correlated with betel leaf yield, while plant height and soil nutrients *viz.*, OC content, N and K were significant and positively correlated with leaf yield (Table 2). The findings are in accordance with the findings of Das *et al.* (1999) in betelvine. His analysis of character association projected the existence of positive correlation between number of harvestable leaves per vine and number of laterals, vine length, 100 leaf weight and leaf area.

Table 2. Correlation analysis for soil and growth parameters with betel leaf yield

Various parameters	Correlation coefficient (r)
Soil parameters	
pH	0.143
EC	0.038
Organic carbon	0.424**
Nitrogen	0.804**
Phosphorus	0.220
Potassium	0.450**
Growth parameters	
Plant height	0.491**
No. of laterals	0.065
Internodal length	0.318
Petiole length	0.031

**=Significant

Leaf yield of betelvine gardens in Guntur district of Andhra Pradesh exhibited positive correlation with soil (pH, EC, OC, N, P and K) and growth (plant height, number of laterals, internodal length and petiole length) parameters and indicated that the leaf yield is directly dependent on soil fertility.

References

- Boyoucous G T 1965 A recalibration of hydrometer for mechanical analysis of soil part 1", Agr. J. 43: 234–253.
- Das R C, Das J N & Misra P K 1999 Variation and character association of leaf yield and its component characters in betelvine (*Piper betle* L.). Orissa J. Hort. 27: 66–71.
- Olsen C 1929 On the determination of nitrogen in soils: with special reference to the presence of nitrates and nitrites. *Comptes Rendus des Travaux du Laboratoire Carlsberg* 17 (3): 1–13.
- Olsen S R, Cole C V, Watanabe F S & Dean L A 1954 Estimation of available phosphorus in soils by extraction with sodium carbonate. US Department of Agriculture circular No. 939.
- Panase V G & Sukhatme V P 1967 Statistical methods for agricultural workers, ICAR Publications, New Delhi.
- Shivaprasad C R, Reddy R S, Seghal & Velayutham M M 1998 Interpretation for soil and land resource management Nation. Bureau of Soil Survey and Land Use Planning, Nagpur, 47: 65–68.
- Walkley A & Black I A 1934 An Examination of Degtiareff Method for determining soil organic matter and a proposed modification of the chromic acid titration method. *Soil Sci.* 37: 29–37
- Wu T, Schoenau J J, Li F, Qian P, Malhi S S, Shi Y & Xu F 2004 Influence of cultivation and fertilization on total organic carbon and carbon fractions in soils from the loess plateau of China. *Soil Till Res.* 77: 59–68.