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FOR DEVELOPMENT OF DESIRABLE VARIETY**

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EVALUATION OF BAY LEAF (*Cinnamomum tamala*) CULTIVARS FOR QUALITY TRAITS FOR DEVELOPMENT OF DESIRABLE VARIETY

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ABSTRACT

Sarker MB, Sarkar MN, Hossain MM, Sarker MAI, Masud MZ (2023) Evaluation of bay leaf (*Cinnamomum tamala*) cultivars for quality traits for development of desirable variety. *Int. J. Sustain. Crop Prod.* 18(1), 29-34.

The study aimed to find out quality high leaf yielder varieties for cultivars in Bangladesh. The trial was conducted at Spices Research Centre, BARI Shibgonj, Bogra during the Kharif season of 2013. Four different bay leaf cultivars viz: CTB001, CTB002, CTB003 and CTB004 were evaluated in terms of their leaf yield and yield contributing characters. Among the lines CTB004 produced the highest leaf length (15.50 cm in 2013 and 15.75 cm in 2014), highest leaf breadth (5.75 cm in 2013 and 5.85 cm in 2014), lowest internodes distance (3.03 in 2013 and 3.31 cm in 2014), the highest leaf thickness (0.70 mm in 2013 and 0.71 mm in 2014), the highest dry matter (52.79% in 2013 and 54.16% in 2014), highest petiole length (1.32 cm in 2013 and 1.5 cm in 2014) and the lowest disease incidence (6.79% in 2013 and 7.44% in 2014) was recorded from CTB004 and the highest leaf yield (green) (35.2 kg/plant/year in 2013 and 38.18 kg/plant/year 2014 year) was also obtained from CTB 004.

Key words: cultivars, bay leaf, development, variety, yield

INTRODUCTION

Bay leaf (*Cinnamomum tamala*) (Fig. 1) is an evergreen perennial shrub that belongs to the laurel family (Lauraceae). It has been used as a cooking additive and in many traditional practices for thousands of years (Parthasarathy *et al.* 2008).



Fig. 1. Bay leaf plant sample

Bay leaves are used in various cuisines around the world including Indian, Filipino, European, and Caribbean. It can be used as either dried or fresh condition in cooking. The bay leaf not only imparts flavour to dishes but also has a subtle addition to dishes (FAO 1995). They are typically used in soups, stews, meat, seafood, and vegetable dishes. When the whole leaf is used, they should be removed from the cooked food before eating as it is abrasive for the digestive tract. It is the origin of the south slopes of the Himalayas and mountains of northeastern India, extending to Myanmar. There are five types of tejpat *Leaves* (Ravindran *et al.* 2003) in the world. About 900 tons of bay leaf are produced in Udaipur district, and 2100 tons are exported from Nepal to India (Choudhary *et al.* 2014). Aegean and Eastern Mediterranean regions are the biggest collection areas of bay leaf for export (Nurbas and Bal, 2005). Turkey exported 4869 tons of bay leaf to the United States in 2002 (Deniz 2012). The main production is recorded in Nepal and Sikkim but it is also cultivated in Bangladesh, it grows throughout the country but is cultivated more in the southern region as a spice as well as for medicinal value. The leaves give off a sweet aroma when broken and added to dishes. When slightly wilted and dried, they are strongly aromatic. It contains many notable derived compounds, minerals and vitamins that are essential for good health. The leaves are used as garam masala powder in every kitchen all over the country. Traditionally, it has been used for the treatment of gastrointestinal problems such as impaired digestion, flatulence, eructation, and epigastric bloating and used as a diuretic and has many analgesic effects (Elmastas *et al.* 2006). The leaves are carminative, stimulant, diuretic, diaphoretic, lactagogue, deobstruent and aromatic in nature. It was reported that bay leaf can also be used to treat diabetes and migraines (Fang *et al.* 2005). Bay leaves were used as a flavouring agent by the ancient Greeks. The acaricidal activity of bay leaf oil led to a mortality rate of 73% at a concentration of 10% and 5% concentration average mortality rate was considerably reduced to 51% (Macchioni *et al.* 2006). The plant parts have been also used as a traditional folk remedy for cold and cough, asthma, colic, blood dysentery, diarrhoea, constipation, flatulence, indigestion, jaundice, hyperacidity, anorexia, dysmenorrhoea, leucorrhoea, postpartum haemorrhage, high fever, skin diseases, sore throat, sexual weakness and also have the antimicrobial activity, antifungal, anticonvulsant and insecticidal activity (Parthasarathy *et al.* 2008, Palacios *et al.* 2009).

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Bay leaves contain a substantial amount of essential oils like Linalol as well as cinnamaldehyde-linalol (Choudhury *et al.* 2013). Leaves and bark are mixed with tea which is believed to cure coughs and colds and is a very popular stimulant and diuretic drink in the Indian subcontinent. Bangladesh produces a huge amount of bay leaf every year and most of that is produced in the southern region. Bangladeshi bay leaves also have demand in the market of Singapore and other Asian countries. This study aimed to assess the potential quality of leaf-producing bay leaf cultivars based on several key traits, including leaf length, leaf breadth, inter-node length, petiole length, leaf thickness, and dry matter content. to release a variety.

MATERIALS AND METHODS

Location: The study was conducted at Spices Research Center, BARI, Bogra during the kharif season, 2013. Medium-aged (about 9-11 years old) bay leaf plants were taken as test plants.

Materials: Four different Bay leaf cultivars *viz.*, CTB001, CTB002, CTB003, and CTB004 (Fig. 2) were evaluated to achieve identify the best cultivars of bay leaf with higher yield and other desirable characteristics.



Fig. 2. Leaf sample of different bay leaf cultivars

Design: The experiment was laid out in RCB design with four replications.

Management: After leaf harvest, the plants were applied with 25 kg cow dung /plant, 2 kg urea/plant, 1 kg TSP, 500 g MP, and 500 g gypsum/plant. Application of vertimec1.80EC@1.2ml/L water was done against gall, and application of Tilt 1 ml/liter water was sprayed against pestolasia leaf blight. Intercultural operations were done as per necessity.

Data Collection: Data on leaf length (cm), leaf breadth (cm), internodes length (cm), girth (cm), trunk height (cm), canopy/plant, dry matter(%), petiole length (cm), leaf thickness (mm), number of leaf/0.5m³ area, number of leaf/linear meter, yield/plant (kg) were recorded (Fig. 3 & 4).

The plant canopy was calculated following equation: $CV = \frac{2}{3} \pi H (A/2 \times B/2)$; where H-plant height (m), A-canopy diameter (m) in E-W, and B-canopy diameter (m) in N-S direction (Thorne *et al.* 2002).



Fig. 3. Data collection procedure



Fig. 4. Bay leaf sample after sundry

Statistical analysis: The collected data were analyzed statistically and mean values were separated by DMRT.

RESULTS AND DISCUSSION

From the study were observed variation in yield contributing parameters in different bay leaf cultivars. The yield and yield contributing characters of different bay leaf cultivars are presented in Tables 1, 2, 3, 4, & Figs. 5 & 6. Significant variations were observed among the lines with respect leaf length, leaf breadth, internode length, girth, trunk height, canopy/plant, dry matter(%), petiole length, leaf thickness, number of leaf/0.5 m³ area, number of leaf/linear meter and yield/plant. Significant differences were observed among the bay leaf cultivars with respect of leaf shape and size. The longest leaf 15.50 cm in 2013 (Table 1) and 15.75 cm in 2014 (Table 2) was recorded from CTB004 (Neelam *et al.* 2009) reported that the Indian bay leaf length varied from (16.20±2.23 cm) while the shortest length 10.29 cm in 2013 (Table 1) and 10.10 cm in 2014 (Table 2) was recorded from CTB 003. The highest leaf breadth (5.75 cm in 2013 (Table 1) and 5.85 cm (Table 2) in 2014 was recorded from CTB 004 while the lowest leaf breadth of 2.51 cm (Table 1) in 2013 and 2.61 cm (Table 2) in 2014 was recorded from CTB002. Variations in leaf thickness were observed among the cultivars. The highest thickness of 0.70 in 2013 (Table 1) and 0.71 mm in 2014 (Table 2) leaf was recorded from CTB004 while the lowest thickness of 0.49 mm in 2013 (Table1) and 0.51 mm in 2014 (Table 2) was recorded from CTB001. Significant variations in dry matter were found in different bay leaf cultivars. CTB002 The highest dry matter (52.79% in 2013 (Fig. 5) and 54.1% in 2014 (Fig. 6) was recorded from CTB004 while the lowest 44.30% in 2013 (Fig. 5) year and 43.30% in 2014 (Fig. 6) was recorded from CTB001. Variations in petiol length can be observed among different Bay leaf cultivars.

The longest petiole was 1.32 in 2013 (Table 1) and 1.50 cm in 2014 (Table 2) recorded from CTB004 (Neelam *et al.* 2009) reported that the Indian bay leaf petiole length, up to 1.00±0.19 cm long also similar to the existing cultivars) while the lowest (1.03 cm in 2013 and 1.07cm in year) was recorded from CTB002 (Table 1). Variations in leaf number within 0.5 cubic meters were observed in bay leaf cultivars. The highest number of leaf a 0.5 m³ area was recorded at 1588.25 in 2013 (Table 3) and 1770 in 2014 (Table 4) from CTB004 while the lowest number of leaves/0.5 m³ area was 1253.25 in 2013 (Table 3) and 1086 in 2014 (Table 4) was recorded from CTB002. Variations in number of leaves in linear meter were observed in different bay leaf cultivars. The highest number of leaf/linear meters 107.25 in 2013 (Table 3) and 115.3 in 2014 (Table 4) was recorded from CTB004 and the lowest was (81.25 in 2013 and 82.75 in 2014) recorded from CTB003. In the cultivars of bay leaf, the difference in the length of internodes can be observed. The lowest inter-node distance of 3.03 cm in (Table 1) 2013 year and 3.31 cm in 2014 (Table 2) was recorded from CTB004 while the longest 5.42 cm in 2013 (Table 1) and 4.25 cm in 2014 (Table 2) was recorded from CTB003.

Table 1. Leaf yield and yield contributing characteristics of bay leaf cultivars during 2013

Cultivars	Leaf length (cm)	Leaf breadth (cm)	Inter-node length(cm)	Petiole length (cm)	Leaf thickness (mm)
CTB001	12.25ab	3.80b	3.90b	1.07b	0.49b
CTB002	13.09ab	2.51c	3.51b	1.03b	0.49b
CTB003	10.29b	3.53bc	5.42a	1.05b	0.59ab
CTB004	15.50a	5.75a	3.03b	1.32a	0.70a
L. S.	**	**	**	**	**
CV (%)	11.79	13.00	10.63	8.05	11.59

L.S. = level of significance

Table 2. Leaf yield and yield contributing characteristics of bay leaf cultivars during 2014

Cultivars	Leaf length(cm)	Leaf breadth(cm)	Inter-node length(cm)	Petiole length (cm)	Leaf thickness (mm)
CTB001	13.20ab	3.90b	4.25ab	1.10b	0.51b
CTB002	13.15ab	2.61b	3.52b	1.07b	0.51b
CTB003	10.10b	3.63b	5.75b	1.07b	0.61ab
CTB004	15.75a	5.85a	3.31b	1.50a	0.71a
L. S.	*	*	*	*	*
CV (%)	13.27	18.83	19.19	12.26	9.87

L.S. = level of significance

Differences in the plant canopy can be observed between the bay leaf cultivars. The plant canopy was a maximum of 19.61 m³ in 2013 (Table 3) and 21.78 m³ in 2014 (Table 4) with CTB004 and it was a minimum (14.25 m³) with CTB001. Variation in plant girth has been found due to cultivars variation. The maximum plant girth of 50.43 cm in 2013 (Table 3) and 54.31 cm in 2014 (Table 4) was recorded from CTB004 while it was a minimum of 36.58 cm in 2013 (Table 3) and 38.49 cm in 2014 (Table 4) with CTB001. Differentiation of primary branches can be observed in different cultivars of bay leaf. The number of primary branches per plant was highest (29.75 in 2013 (Table 3) and 30.07 in 2014 (Table 4) from CTB004 but it was lowest at 20.25 in 2013 (Table 3) and 21.37 in 2014 (Table 4) from CTB001. Tree Trunk height variation can be observed in different cultivars of bay leaf. The trunk height was lowest (89.52 cm) with CTB004 but it was highest (104.25) with CTB003.

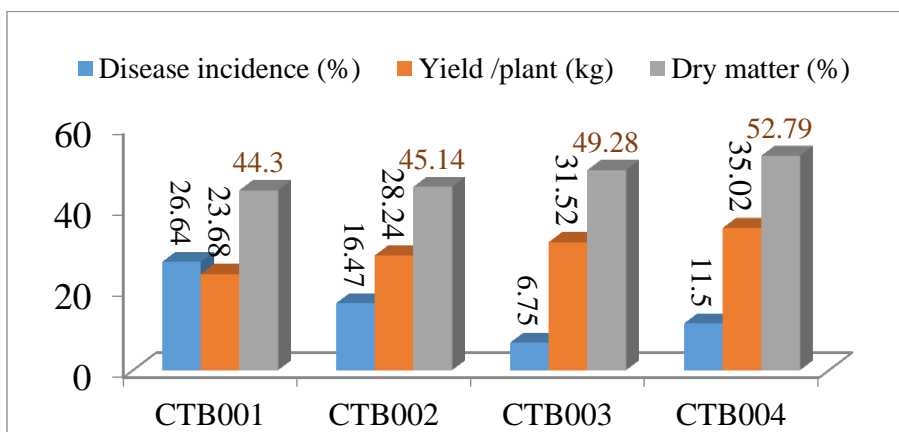


Fig. 5. Bay leaves (green) yield, dry matter % and disease incidence % characteristics of bay leaf cultivars during 2013-14

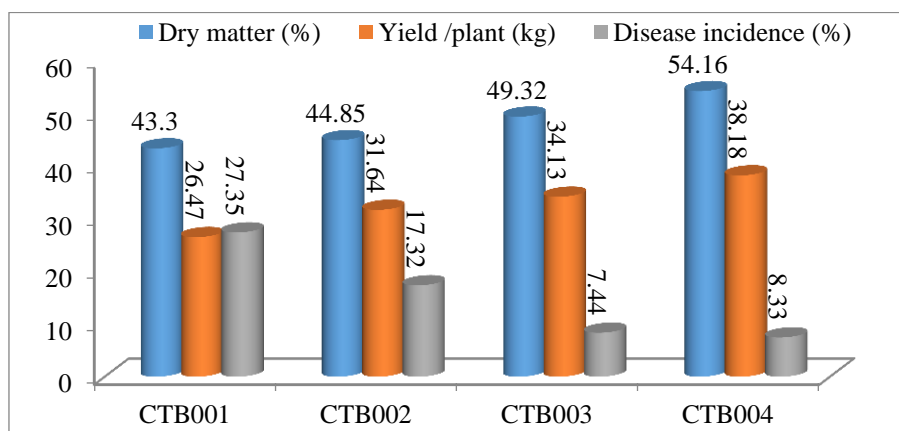


Fig. 6. Bay leaves (green) yield, Dry matter% and Disease incidence % characteristics of bay leaf cultivars during 2014-15

Different cultivars of bay leaf varied in green leaf yield. The highest leaf (green) yield was obtained from CTB004 (35.02 kg/plant in 2013 (Fig. 5) and 38.18 kg/plant in 2014 (Fig. 6) and the lowest was recorded from CTB001 (23.68 kg/plant in 2013 (Fig. 5) and 26.47 kg/green/plant in 2014 (Fig. 6). In Meghalaya, bay leaf unit production ranges from 30 to 70 kg per tree per year, but in Nepal, the average range is 13 kg of dry leaves. About 900 tons of bay leaf are produced in Udaipur district, and 2100 tons are exported by Nepal to India (Choudhary *et al.* 2014).

The highest disease incidence of 26.68% in 2013 (Fig. 5) and 27.35% in 2014 (Fig. 6) was recorded from CTB001 cultivars and the lowest disease incidence of 6.75 in 2013 (Fig. 5) and 7.44% in 2014 (Fig. 6) was recorded from CTB004 cultivar. The cultivar of bay leaf CTB001 is more susceptible to grey leaf spot disease.

Table 3. Yield and yield contributing characteristics of bay leaf cultivars during- 2013

Cultivars	No. of leaf (0.5 m ³)	No. of leaf /linear (m)	Plant canopy (m ³)	Girth (cm)	No. of primary branch	Trunk Height (cm)
CTB001	1577.75a	101.50a	13.03b	36.58b	20.25b	71.62b
CTB002	1253.25b	97.00ab	14.71b	43.44ab	26.25a	93.17a
CTB003	1581.25a	81.25b	18.76a	48.17a	28.00a	104.25a
CTB004	1588.25a	107.25a	19.61a	50.43a	29.75a	86.50ab
L.S.	**	*	**	**	*	*
CV (%)	6.29	10.20	8.44	7.52	13.78	14.35

L.S. = level of significance

Table 4. Yield and yield contributing characteristics of bay leaf cultivars during- 2014

Germplasm	No. of leaf (0.5 m ³)	No. of leaf /linear(m)	Plant canopy (m ³)	Girth (cm)	No. of primary branch	Trunk Height (cm)
CTB001	1560a	101.30ab	14.25b	38.49c	21.37b	72.75b
CTB002	1086b	98.00bc	16.05b	45.63bc	26.30a	95.48a
CTB003	1524ab	82.75bc	18.68ab	50.82ab	27.54a	104.3a
CTB004	1770a	115.3a	21.58a	54.31b	30.07a	89.52ab
L. S.	*	**	**	*	**	**
CV (%)	15.14	5.39	9.00	8.56	5.87	7.81

L.S. = level of significance

Tables 5 and 6 showed some morphological characters of the existing germplasm of bay leaf. CTB001 line was semi oval shape leaf but CTB002 and CTB004 were linear shape leaf whereas CTB003 was flat and oval shape leaf (Table 5). Leaf color dark green was found CTB001 line but the CTB002 line had a pale green leaf color whereas line CTB003 and CTB004 was green to deep green in leaf color (Table 5). Semi folding-type leaf was found in lines CTB001 and CTB002 line but flat type leaf was the line CTB003 and CTB004 (Table 5).

Table 5. Morphological characteristics of bay leaf cultivars

Cultivars	Leaf shape	Leaf color	Leaf type
CTB001	Semi-oval shape	Dark green	Semi folding type
CTB002	Linear shape	Pale green in color	Semi-folding type
CTB003	Flat and oval shape	Green to deep green	Flat type
CTB004	Linear shape	Green to deep green	Flat type

The flower colour yellow was found in lines CTB001 and CTB004 but in line CTB002 was yellow green flower (Table 6). In the case of the fruit colour, line CTB001 was dark green to purple and CTB002 was blackest fruit colour whereas CTB004 line was dark green to blackest fruit colour (Table 6). The maximum fruit length range was 8.91-9.9 mm. and the maximum fruit diameter range was 5.71 mm to 8.62 mm (Table 6).

Table 6. Flower and fruit characters of bay leaf cultivars

Cultivars	Flower color	Fruit color	Fruit length	Fruit diameter
CTB001	Yellow	Dark green to purple	9.90 mm	8.65 mm
CTB002	Yellow -green	Blackest	8.91 mm	5.71 mm
CTB003	-	-	-	-
CTB004	Yellow	Dark green to blackest	9.10 mm	8.52 mm

CONCLUSION

Among the cultivars, CTB003 and CTB004 showed better performance in both years in terms of all parameters. In view of quality leaf yield production, high dry matter and disease incidence Cultivars CTB003 and CTB004 may be selected as sustainable variety for cultivars.

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