SINCE 2010

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2017-2020: 3.98

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STUDIES ON DIRECT AND INDIRECT EFFECT ON MORPHOLOGICAL TRAITS OF *LANNEA COROMANDELICA* CLONES AT NURSERY EVALUATION

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ABSTRACT:

The present study was conducted with 30 clones of *Lannea coromandelica* at the Forest College and Research Institute, Mettupalayam. Path analysis is a special use of multiple regressions to help understand and parcel out the sources of variation. In the morphometric traits, the overall correlation observed between two variables will be a function of series of direct and indirect relationships between different variables. Path analysis was shows the direct and indirect effects of characters namely, shoot length, root length, collar diameter, biomass production, root shoot ratio, sturdiness quotient, and quality index on volume index. Root length, collar diameter, biomass production and sturdiness quotient are showed positive direct effect on volume index. Among these traits, biomass production registered the maximum indirect effect on shoot length. Biomass production also registered high values for broad-sense heritability, genetic gain and genotypic coefficient of variation and thus, emerged as an important parameter for selecting superior genotypes.

KEYWORDS: *Spiders, Predatory Activity, Pest control potentiality, Web builders, Hunters.*

INTRODUCTION:

Path analysis is a special use of multiple regressions to help understand and parcel out the sources of variation. In the integrated structure of the plant, the overall correlation observed between two variables will be a function of series of direct and indirect relationships between different variables. Though correlation analysis measures the relationship between dependent and independent characters, it does not provide information on how much a character contributes on its own and through other characters on the dependent variable. Path analysis (Wright, 1976) on the other hand, partitions correlation coefficients into direct and indirect effects and provides more realistic approach for understanding the interrelationship of characters and helps in identification of the effective components. Whenever it is suspected that there are casual, rather than spurious or coincidental correlations within the independent variables, path analysis can be applied that looks explicitly at the cause.

MATERIAL AND METHODS:

The basic experimental materials comprised of clones of *Lannea coromandelica* selected and assembled in Forest college and Research Institute, Mettupalayam (11º19'N, 76º56'E, 300 meters MSL, RF 800 mm, pH 7.1) from through Tamil Nadu, India. Thirty clones grown in nursery condition and a completely randomized design with three replications were used for the study.

Selection of superior genetic resources of *Lannea coromandelica*

The predominant *Lannea coromandelica* growing areas of Tamil Nadu(Coimbatore, Tirupur, Erode, Thanjavur, Trichchirappalli, Thiruvarur, Nagappattinam, Darmapuri, Madurai and Pudukkottai) were identified and candidate plus trees from base population were selected based on the morphological features *viz*., height, girth at breast height (GBH), basal girth, clear bole height and volume by using the method of Pitcher and Dorn (1967).

The phenotypical values were carried out following Cotteril and Dean (1990). The phenotypic selection was followed by the construction of selection index for each selected tree with the phenotypical values.

The volume index was considered as the principal trait for the construction of selection index and its correlation with shoot length, root length, collar diameter, biomass production, root shoot ratio, sturdiness quotient and quality index was estimated. The index of each character was calculated by multiplying the phenotypic value with the correlation coefficient of the trait with volume index, since the correlation coefficient of volume index with other traits was considered as the weightage for the index selection. The total selection index was calculated by adding all the eight values for each

selected clones. The correlation coefficients (weightage) shoot length, root length, collar diameter, biomass production, root shoot ratio, sturdiness quotient, quality index with the volume index, respectively. Thirty clones of *Lannea coromandelica* were used for the present study. Path analysis was performed to understand the direct and indirect effects of characters namely, shoot length, root length, collar diameter, biomass production, root shoot ratio, sturdiness quotient and quality index on volume index recorded at nursery condition. Path coefficients were obtained by setting simultaneous equations following Dewey and Lu (1959).

RESULT:

The genotypic correlation coefficients of volume index with shoot length, root length, collar diameter, biomass production, root shoot ratio, sturdiness quotient, and quality index were further divided into direct and indirect effects using path analysis. Table 1 explains the results obtained for path analysis in *Lannea coromandelica* clones.

Direct effect

Out of seven traits, four traits exercised positive direct effect on volume index. The highest positive direct effect on volume index was exerted by biomass production (2.148), collar diameter (1.583), sturdiness quotient (1.492) and root length (0.212). Shoot length (-2.767), quality index (-1.461) and root shoot ratio (-0.043) are recorded negative direct effect on volume index.

Indirect effect

Shoot length

Shoot length had a highest positive effect towards volume index via biomass production (1.672), sturdiness quotient (1.398), collar diameter (0.602), root length (0.161) and root shoot ratio (0.017). The highest negative indirect effect was recorded by quality index (-0.196).

Root length

Highest positive indirect effect was recorded by this trait through biomass production (1.642), sturdiness quotient (1.005) and collar diameter (0.526) on volume index. The highest negative indirect effect of this trait on volume index was through shoot length (-2.103), quality index (-0.554) and root shoot ratio (-0.012).

Collar diameter

Collar diameter exercised positive indirect effects on volume index through biomass production (0.789), root length (0.071), sturdiness quotient (0.062) and root shoot ratio (0.003), while highest negative indirect effect of this trait on volume index was through shoot length (-1.051) and quality index (-0.696) .

Biomass production

This trait expressed the highest positive indirect effect on volume index through sturdiness quotient (1.015), collar diameter (0.582), root length (0.162) and root shoot ratio (0.004) whereas the maximum negative indirect effect was experienced via shoot length (-2.153) followed by quality index (-0.997).

Root shoot ratio

Root shoot ratio registered the highest positive indirect effect on volume index *viz.*, shoot length (1.134) and root length (0.057). The greatest negative indirect effect was recorded through sturdiness quotient (-0.649), quality index (-0.516), biomass production (-0.154) and collar diameter (-0.135) on volume index.

Sturdiness quotient

This parameter exhibited positive indirect effect on volume index *viz.*, biomass production (1.462), root length (0.143), quality index (0.085), collar diameter (0.066) and root shoot ratio (0.018). The negative indirect effect was recorded through shoot length (-2.595).

Quality index

Quality index registered highest positive indirect effect on volume index through biomass production (1.467), collar diameter (0.754) and root length (0.081). Negative indirect effect was recorded shoot length (-0.371), sturdiness quotient (-0.087) and root shoot ratio (-0.015).

DISCUSSION:

Among nursery morphometric traits, biomass production (2.148) exerted maximum positive direct effect on volume index followed by collar diameter, sturdiness quotient and root length and the residual effect is recorded as 0.078 (Table 1 & Fig.1). These results were in confirmation with the report of Sekar (2003) in *Simarouba glauca* that highest positive direct effect on volume index was exerted by height followed by collar diameter and other four traits. Similarly plant height exercised

positive direct effect on volume index in *Tectona grandis* (Parthiban, 2001), Jatropha (Parthiban *et al*., 2011) and *Madhuca indica* (Wani and Wani, 2013). Similar results were reported by Kumaran *et al*., (2010) in *Simarouba glauca* that the height and collar diameter exhibited positive direct effect while number of branches direct effect on volume index.

The present investigation envisaged that high and positive association coupled with intensive direct effect of biomass production followed by collar diameter, sturdiness quotient and root length could be used as selection criteria in *Lannea coromandelica* tree improvement programme.

CONCLUSION:

A total thirty clones of *Lannea coromandelica* were collected from ten districts of Tamil Nadu by candidate plus tree selection method is evaluated under a nursery condition at Forest college and Research Institute, Mettupalayam. The variability study *indicated* that volume index, registered highest phenotypic coefficients of variances (PCV) and genotypic coefficients of variances (GCV). The Path analysis of morphometric traits, four characters *viz*., biomass production, collar diameter, sturdiness quotient and root length have exerted highest positive direct effect on volume index. Shoot length with biomass production had expressed maximum indirect effect on volume index

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Table 1. Path coefficient analysis of morphometric attributes of *Lannea coromandelica* clones on Volume index

Characters	Shoot length	Root length	Collar diameter	Biomass production	Root shoot ratio	Sturdiness quotient	Quality index	Volume index
Shoot length	**-2.767**	0.161	0.602	1.672	0.017	1.398	-0.196	0.764
Root length	-2.103	**0.212**	0.526	1.642	-0.012	1.005	-0.554	0.594
Collar diameter	-1.051	0.071	**1.583**	0.789	0.003	0.062	-0.696	0.779
Biomass production	-2.153	0.162	0.582	**2.148**	0.004	1.015	-0.997	0.611
Root shoot ratio	1.134	0.057	-0.135	-0.154	**-0.043**	-0.649	-0.516	-0.272
Sturdiness quotient	-2.595	0.143	0.066	1.462	0.018	**1.492**	0.085	0.340
Quality index	-0.371	0.081	0.754	1.467	-0.015	-0.087	**-1.461**	0.415

Residual effect = 0.078 **(Diagonal values are direct effect)**

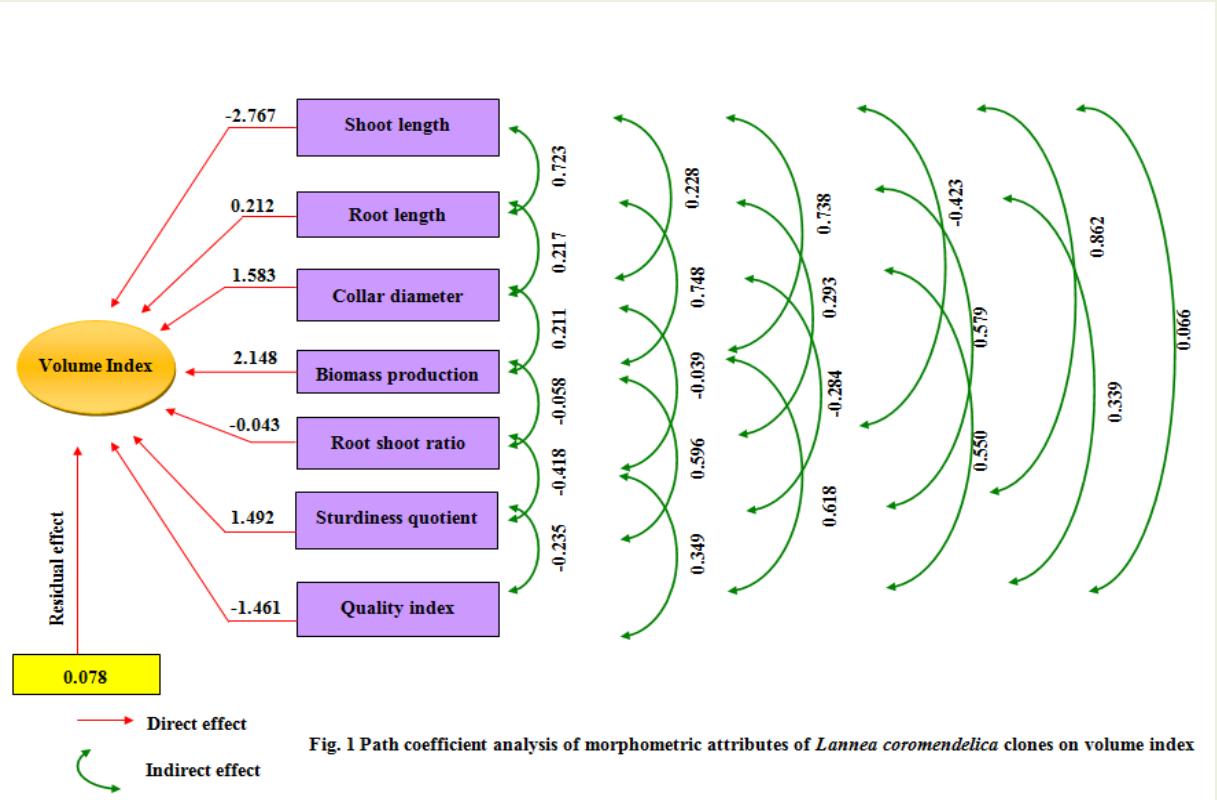

Fig. 1 Path coefficient analysis of morphometric attributes of *Lannea coromendelica* clones on volume index