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Trait Relatedness Studies For Stem Volume Production InTeak (*Tectona grandis* L.)

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Abstract

The investigation on "Trait relatedness studies for stem volume production in teak (*Tectona grandis* L.)" was undertaken on thirty clones of teak from Teak seed orchard, Mohghata District, Bhandara, (Maharashtra State). The experiment was conducted during the year 2011-12, using Randomized Block Design with three replications. The height exhibited highest positive direct effect (r=2.302) of on stem volume followed by leaf area (r=2.206), dry weight (r=0.995), girth (r=0.304) and negative direct effect was observed for number of branches (r=-3.373). The girth exhibited highest positive indirect effect (r=0.863) on volume was followed by plant height (r=0.654), leaf area (r=0.482), number of branches (r=0.553) and negative indirect effect was observed for dry weight (r=-0.054). Path analysis have indicated the importance of volume contributing characters like plant height followed by girth, leaf area, dry weight of leaf and number of branches, which have directly and indirectly influenced all the correlations of volume with its components. Thus, it is concluded that, selection pressure can be exercised on the genotypes possessing more plant height and more number of branches will be useful in identifying the genotypes as parents for further improvement in teak. Hence, these characters may be given consideration while making selections for the improvement of teak.

Keywords: trait relatedness, teak, direct effect, indirect effect

Introduction

Teak (*Tectona grandis* L.) belongs to the family Verbenaceae, having chromosome number 2n=36 (Kedarnath and Raizada 1961). The genus has three species namely *Tectona grandis* Linn. F. T. *hammiltoniana* Wall and T. *phillippinesis. Tectona grandis* differs morphologically from its allied species T. *hammiltoniana* by quadrangular young branchlets and inflated fruiting calyx. The trait relatedness analysis is simply a standardized partial regression coefficient which splits the correlation coefficient into the measure of direct and indirect effects. It specifies the causes and measures the relative importance of each casual factor. It is an effective means of analyzing direct and indirect causes of association and permits the critical examination of the specific factors that produces a given correlation. It provides information about both magnitude and direction of direct and indirect effects of the volume components which cannot be provided by correlation. In tree breeding, phenotypic and genotypic path are commonly estimated to determine volume contributing characters and is thus useful in direct selection. The overall correlation observed between two characters is a function of a series of direct and indirect relationship between those characters. In order to know specific forces in building up the total correlation, it is essential to work out path coefficient developed by Wright (1921).The objective of most breeding programs has been to increase stem volume through the selection for increased height and diameter growth. Despite being the most valuable timber species with large natural variation, efforts with regard to genetic improvement of the species have been insufficient. The technique of path analysis was first developed by Wright (1921) is simply a standardized partial regression coefficient and measures the direct influence of one variable upon another and also permits the separation of the correlation coefficient into components of direct and indirect effects. The nature of causal system is represented diagrammatically as shown in figure 1. The path coefficients were calculated as suggested by Dewey and Lu (1959).

Material and Methos

Site: The observations were taken from Teak seed Orchard, Mohghata, District-Bhandara and the analysis of data was done at Department of Forestry, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.). All thirty clones of teak (*Tectona grandis* L.) under study were originated from Allapalli Maharashtra established in 1977. The soil is sandy loam type and soil depth is up to 1 to 1.5 m. The teak seed Orchard, Mohghata research station is situated about 35 km from Bhandara in Eastern direction of Bombay-Kolkata National No. 6. The statistical analysis of quantitative data and qualitative characters was done using Randomized Block Design.

Details of Layout

1) Experimental design : Randomized Block Design
2) Number of replications : 03 (Three)
3) Number of treatments (clones) : 30 (Thirty)
4) Spacing : 8 m x 8 m
5) Number of plants per treatments : 01 (One)
6) Year of plantation : 1977

Characters Studied:-The observations were recorded on single tree of each clone randomly selected in each replication. The overall correlation observed between two attributes is a function of series of direct and indirect relationship between those attributes.

Residual effect was calculated by using the followings formula

$$\text{Residual effect} = \sqrt{1- (\Sigma P_i + 2\Sigma r_{ij} \cdot p_{ij})}$$

Results and Discussion

Table No. 1 Direct and Indirect effects of characters on stem volume production

Sr. No.	Characters	Plant Height (m)	Girth (m)	Leaf area (cm^2)	Dry weight (g)	Number of branches	Volume (m^3)
1	Plant Height (m)	2.302**	0.495	1.516**	1.307**	2.295**	0.654*
2	Girth (m)		0.304	0.052	-0.077	0.005	0.863**
3	Leaf area (cm^2)			2.206**	-01.047	1.661**	0.482*
4	Dry weight (g)				0.995**	0.328	-0.054
5	Number of branches					-3.737	0.553**

** Significant at 5% level*
*** Significant at 1% level*
Residual effect =0.537

Trait relatedness studies

i) Direct effect

It is revealed from Table 1 that the height exhibited highest positive direct effect (r=2.302) of on stem volume followed by leaf area (r=2.206), dry weight (r=0.995), girth (r=0.304) and negative direct effect was observed for number of branches (r=-3.373).

ii) Indirect effect

The girth exhibited highest positive indirect effect (r=0.863) on volume was followed

by plant height (r=0.654), leaf area (r=0.482), number of branches (r=0.553) and negative indirect effect was observed for dry weight (r=-0.054).

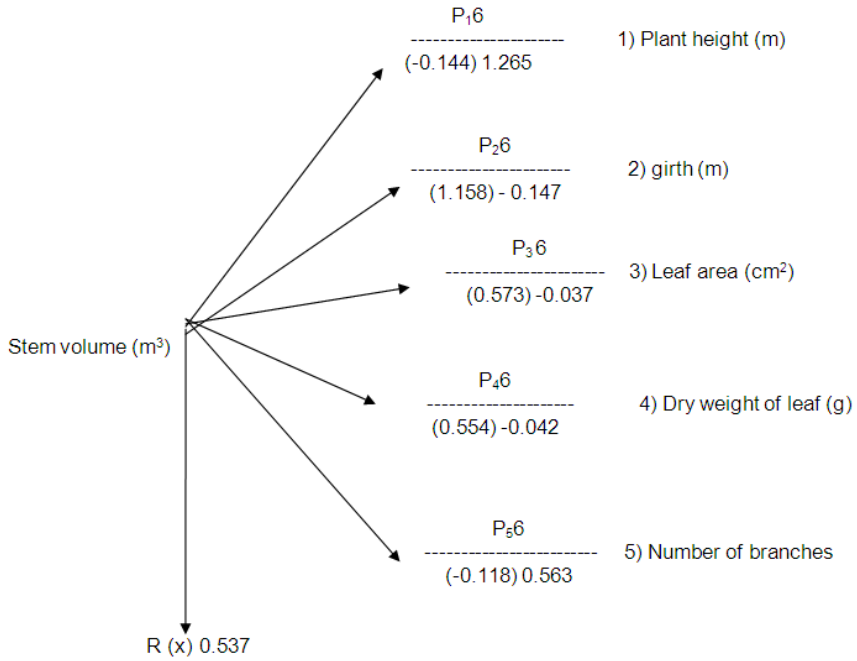

Figure. 1. Trait relatedness diagram and coefficient of factors influencing on stem volume

Conclusion

Path analysis have indicated the magnitude of importance of characters contributing to stem volume viz., plant height followed by girth, leaf area, dry weight of leaf and number of branches, which have directly and indirectly influenced all the correlations of volume with its components. Thus, it is concluded that, selection pressure can be exercised on the genotypes possessing more plant height and more number of branches will be useful in identifying the genotypes as parents for further improvement in teak. Hence, these characters may be given consideration while making selections for the improvement of teak in respect of stem volume.

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