

Suitability of Eucalyptus Clones in Terms of Yield in Tarai Region of Uttarakhand

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ABSTRACT

The Mass vegetative propagation of genetically improved clone has become important tool for increasing the competitiveness of the forestry based industry. This method reaches its highest potential when it is used to establish clonal forests of hybrids endowed with better wood quality and higher volumetric growth. The object of study is to find out the suitable plant spacing and evaluate the high yielding eucalyptus clones for tarai region.

Keywords:Eucalyptus Clones, CTA(Clonal Testing Area), Agro forestry, Production forestry, MAI.

INTRODUCTION

Eucalyptus is a versatile tree, adopted to a variety of edaphic and climatic conditions, over 4 million ha. Of eucalyptus plantations have been established throughout the world in more than 58 countries. (ICFRE, Dehradun, India)

Eucalyptus trees are planted for fuel wood, poles, timber, biomass, essential oil and nectar for honeybees. Eucalyptus trees are grown both by small farmers for profit and subsistence and by large conglomerates for industrial wood supply.

Sufficient spacing between plants is required to ensure adequate crown space when the plants grow up. Wider spacing not only gives equally good, if not better results, but also reduces the cost of formation considerably. closer spacing are necessary on poor soils for species which develop more slowly and tend to branch low. In parts of Gujarat, *Eucalyptus* is grown with 1x1 mt. spacing. The roots tend to go deeper and deeper as there is severe competition for soil moisture and mineral nutrients, and trees tend to grow taller at faster rate as there is competition for light. Closer spacing also help in conserving. Soil moisture & arresting soil erosion. (ICFRE, Dehradun, *Eucalyptus*)

Clone is a Propagation of genetical individual obtained by a sexual/ vegetative propagation.

STUDY AREA

Both the study areas are in tarai region. Tarai is a place in northern **India**, the Terai spreads eastward from the Yamuna River across Himachal Pradesh, Haryana, **Uttarakhand**, Uttar Pradesh and Bihar. The Terai is part the Terai - Duar savanna and grasslands ecoregion.(Terai - Wikipedia, the free encyclopedia).

The study area CTA (Clonal Testing Area) 2003 is located in latitude 29°03'N longitude 079°30'E and altitude 237.8 mt. with annual rain fall of about 1500 mm.

CTA (Clonal Testing Area) 2005 is located in latitude 29°02'N longitude 079°29'E and Altitude 230.00 mt. with annual rain fall of about 1800 mm.

METHODOLOGY

To find the Suitable & high yielding *Eucalyptus* Clones in Tarai Region, 2 CTAs (Clonal Testing Areas) were created in 2003 & 2005 in Tanda 20(near Lalkuan) and at dhimri 57(A), respectively. Descriptions of both CTA are as below.

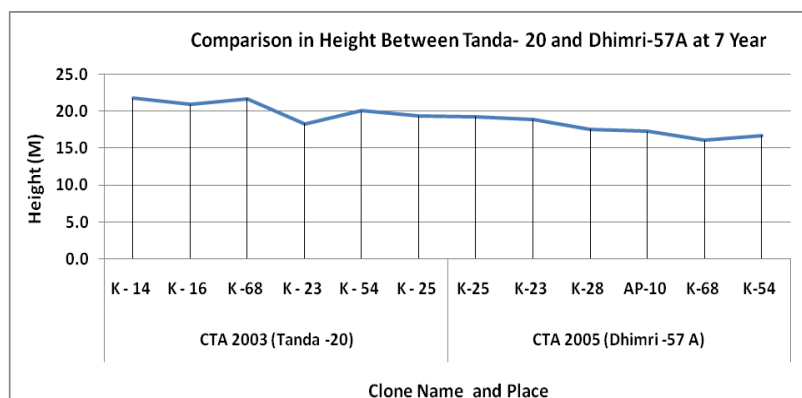
Particulars	CTA 2003	CTA 2005
Division name	Tarai Central Forest Division, Haldwani	-As-
Range name/ compartment	Tanda-20	Tanda/ Dhimri 57(A)

Design	RBD	RBD
Area	3.08Ha	5.80Ha
Spacing	4 x 3 mt.	4 x 1.50 mt.
Replication	03	05
Plant Unit	7x7 =49 plants per clone per replication	10 x10 =100 plants per clone per replication
Total no of Plant	2566	9500
Per hector Plant	833	1666
No of Clone	22	19
Clone name	G-1, G-2, G3, G5, G-6, G-22, G-23, G-24, G-31, G-32, G-8, G-50, G-60, K-14, K-16, K-23, K-25, K-28, K-43, K-55, K-54 & K-68	PH-7, K-55, K-54, G-29, K-28, K-25, G-1, K-68, AP-10, K-16, G-23, G-50, G-2, AP-7, K-23, P-55/57/96, P-29/1, RT-4 and one Seedling for control.

At Tanda20, CTA 2003 The first measurement was taken in the year 2005. Out of total 2566 plants, only 2200 plants were measured, in which 25 plants per replication were selected and outer 2 lines of every replication is left. Measurement is taken in every year in the winter season. The final measurement was taken in 2010. The felling operation was carried out in the year 2011-12.

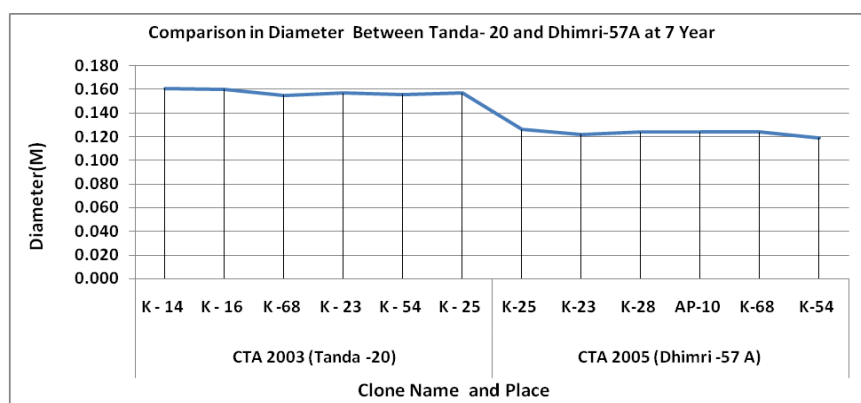
At Dhimri 57(A)- CTA 2005 The first measurement was taken in the year 2007, after that measurements were taken yearly till 2013, out of 9500 plants only 6080 plants were measured regularly in every winter season. 64 plants of each clone in every replication were measured. Final felling was done in the year 2013-14.

RESULT AND DISCUSSION



Using the standard Equation of FSI (Forest Survey of India) for *Eucalyptus* which is $(-0.00150+0.2401D_{ia}^2 h)$, it is clear that MAI of K-14, K-16, K-23, K-25, K-54, K-68 were best in wider spacing in CTA 2003, while on the other hand, MAI of K-25, K-23, K-28, AP-10, K-68 & K-54 clone have shown better results in close spacing in CTA 2005.

CTA- 2003-(Tanda-20) - Volume/hac/year (MAI) ranges from 13.42 M³ to 15.95 M³. Clones K-14, K16, K-68, K-23, K-54 and K-25 are found to be best out of 22 clones. In primary stage K-25, K-23 and K-68 clones were performing better in diameter. At age of seven year, K-14 and K-16 were performing well in diameter increment & Clone K-68, K-54 and K-14 were performing well in height.



CTA-2005-(Dhimri - 57 [A]) - Volume/hac/year (MAI) ranges from 13.15 M³ to 17.15 M³. Clones K-28, K25, K-68, AP-10, K-23, K-54 are found to be best out of 18 clones and one seedling. All the 6 clones showed better growth at age of 6th year compared from first to seven years.

Soil analysis was also carried out in both of CTAs. Tanda-20[C.T.A.-2003] has clay mold soil and Dhimri -57(A) [C.T.A.-2005] has Clay sandy loamy soil.

The chemical and physical Analysing of soil of both the CTAs, is as follows:

S.NO.	Site	pH	%p ₂ O ₅	%K ₂ O	%Organic matter
1.	C.T.A-2003,Tanda-20	6.4	100.8	217.93	4.01
2.	C.T.A-2005,Dhimri-57(A)	7.41	49.95	121.85	0.55

The above soil analysis report shows that C.T.A-2003 [Tanda 20] has rich amount of soil components (% organic matter and nutrients) and less pH for plants / trees than CTA -2005 Dhimri 57 (A).

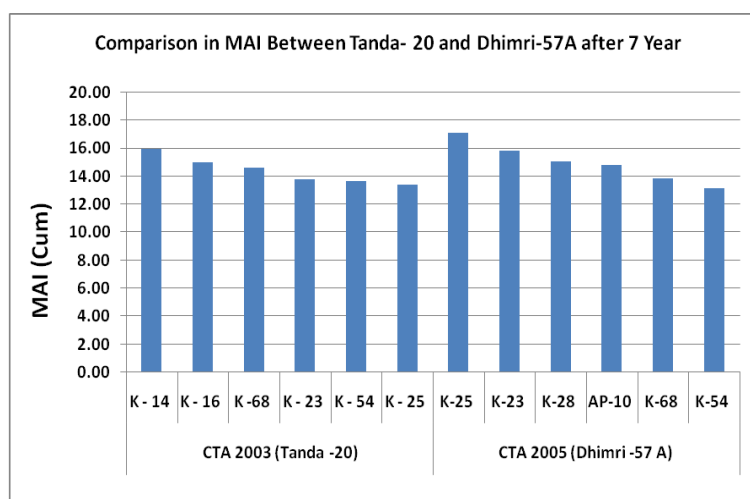
Comparison in Diameter and Height between Tanda- 20 and Dhimri-57(A) at 7th Year

Place	Clone Name	Avg. Dia	Avg. Ht.	Volume/Hac	MAI (7 Year)
CTA 2003 (Tanda -20)	K - 14	0.1610	21.8	111.61	15.95
	K - 16	0.1600	20.9	105.23	15.03
	K -68	0.1550	21.7	102.61	14.66
	K - 23	0.1570	18.3	96.56	13.79
	K - 54	0.1560	20.1	95.56	13.70
	K - 25	0.1570	19.3	93.95	13.42
CTA 2005 (Dhimri -57 A)	K-25	0.1260	19.3	146.98	17.15
	K-23	0.1220	18.9	132.40	15.84
	K-28	0.1240	17.6	123.26	15.10
	AP-10	0.1240	17.3	121.52	14.80
	K-68	0.1240	16.1	111.14	13.86
	K-54	0.1190	16.7	108.28	13.15

1. Comparative study shows that clones are giving different results in different spacings.
2. According to soil testing reports, soil of C.T.A. 2003 has high amount of organic carbon in comparison to C.T.A. 2005, also plant spacing provided in C.T.A. 2003 is wider (4X3mt) than C.T.A. 2005 (4X1.5mt). Plant do not face sever competition for soil moisture, mineral nutrients and sun light. Nevertheless, the best clone of C.T.A. 2003, i.e. K-14 which yielded only 111.61 M³ /ha.

On the contrary though the soil of C.T.A. 2005 had low nutrients level (less amount of organic carbon) and closer spacing of 4X1.5mt causing the plants to face sever competition for soil nutrients and sun light, nevertheless the best clone at C.T.A. -2005 is K-25 which yielded 146.98 M³ /ha. Which is more then K-14 of CTA 2003

CONCLUSION



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1. Analysis of both C.T.As. has shown that K series clones specially K-14, K-23, K-25, K-54, K-68 and AP-10 are the most suitable clones for TARAI REGION.
2. On the basis of above result it can be that some some clones of K series like K-25 can yield more despite having low soil nutrients and closer spacing.

On the other hand some clones like K-14 can yield good results even areas in having high soil nutrients and wider spacing, but here the space between the plants can be used for inter cropping of traditional crops, generating extra income.

" According to the book published by 'Uttarakhand Forest Research Institute, Haldwani on Agro forestry that inter cropping of wheat and sugar cane with Eucalyptus gives net profit of Rs. 55774/ha".

There is a need of establishing more CTAs or Clonal Testing Areas in Tarai region for these clones with different spacings to find out increase in productivity in different spacing setups.

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ABBREVIATE

- CTA- Clonal Testing Area
- CMA- Clonal Multiplication Area
- *(A.N.Chaturvedi, Eucalyptus for Farming)