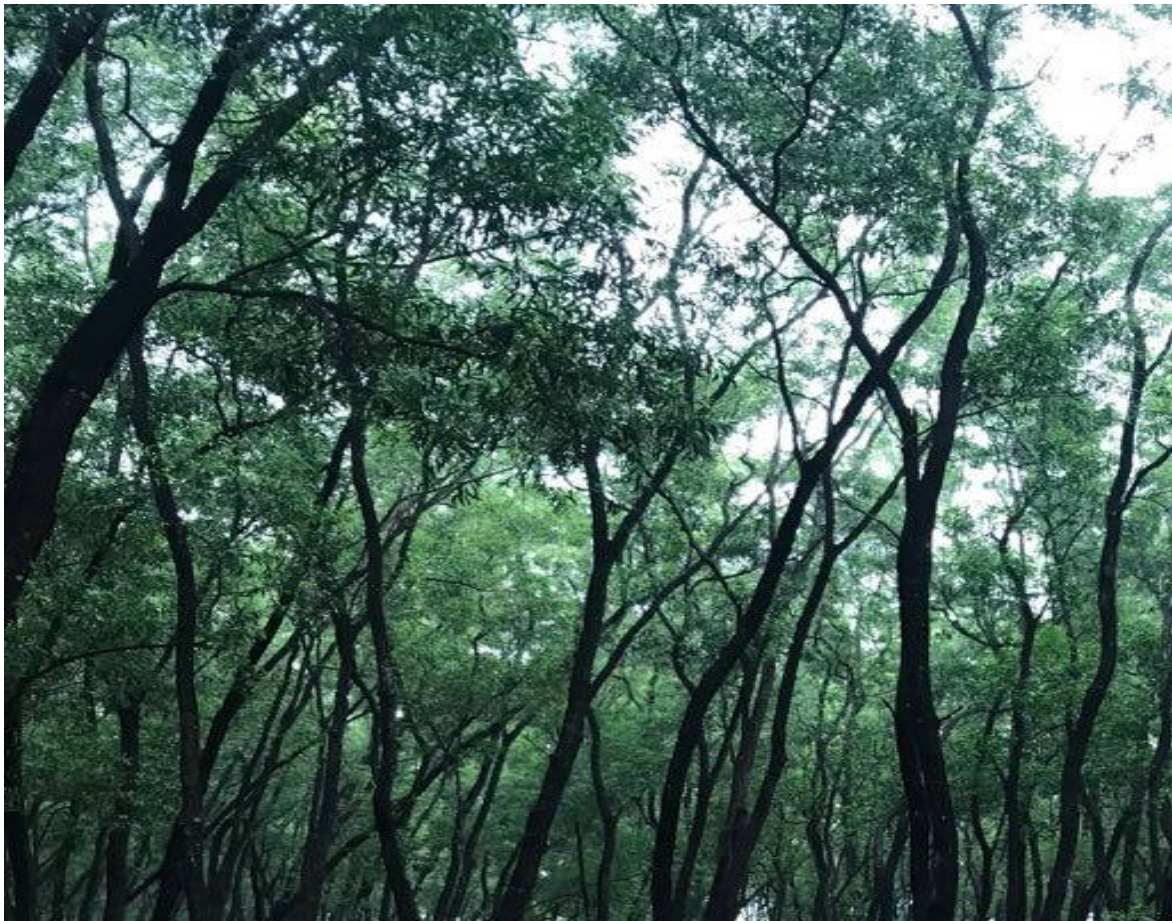


# Tree improvement programme in *Acacia auriculiformis*



## Project Title

### **Tree Improvement Programme in *Acacia auriculiformis* & *Acacia* hybrid for multi-location trial in West Bengal**

PROJECT REPORT SUBMITTED BY  
THE RESEARCH WING, FOREST DIRECTORATE,  
GOVT OF WEST BENGAL.

TO

THE WEST BENGAL FOREST AND BIODIVERSITY CONSERVATION  
SOCIETY



## PREFACE

*Acacia auriculiformis* Cunn. exBenth. introduced in India in 1946 and now it has naturalized in the sub -continent. It is a very useful species for reforesting the degraded lands and also lateritic, nutrient deficient soils and found to be resistant/tolerant to pest and diseases. The heart wood is strong; light yellow and suitable for furniture and construction uses. It is a major pulpwood species grown in Mysore Paper Mills plantations in Karnataka with a productivity of debarked pulpwood of 128m<sup>3</sup> per ha at 8 year rotation.

The form of the tree is crooked, thin crowned with small drooping branches whereas *Acacia hybrids* are tall trees with a long clear cylindrical bole with smooth grey or brownish grey bark. The pulping characteristics of *Acacia hybrid* are similar to *A. auriculiformis*. *A. hybrids* have intermediary parent species. In India these hybrids were identified in MPM, Bhadravathi, Karnataka and propagated and developed large scale clonal plantations. *Acacia hybrid* wood is found to be best pulpwood at the age of 5 to 8 years and after 15 years the wood is suitable for timber use. Some of the wood properties are at par with teak and a few are better than teak.

West Bengal Forest Department and the farmers have established *Acacia auriculiformis* plantations since many years. *Acacia auriculiformis* wood is widely used for timber and West Bengal Forest Research Division is taking up tree improvement works in *Acacia auriculiformis* by selection of plus trees from existing *Acacia auriculiformis* plantations and by introduction of promising seed lots from other source.

Since *Acacia hybrid* growth is faster than *Acacia auriculiformis*, some of the promising clones of *Acacia hybrid* from MPM are being introduced and tested for their growth and timber quality.

This tree improvement experiment on *Acacia* is very important in respect of productivity of quality and volume of timber of our forest plantations as well as to local farmers who raise this tree in their own land as a supplementary livelihood option.



Principal Chief Conservator of Forest  
Research, Monitoring and Development

## **ACKNOWLEDGEMENT**

*Acacia auriculiformis* is a very popular timber yielding tree species in South West Bengal as its faster growth, low cost, less rotation age and suitable in any unfavorable edaphic and climatic condition. Documentation on this tree species is also very important. Research Wing, West Bengal has taken an initiative for documentation on tree improvement experiment on Acacia.

The tree improvement project on *Acacia auriculiformis* was started on 2018 funded by JICA (WBFBCP). Firstly we thank to The Principal Chief Conservator of Forests (Research, Monitoring & Development) Dr. Jose T. Mathew, IFS who first gave the proposal for doing such type of Research Work. Thanks to the Chief Project Director of WBFBCP, Sri Debal Roy, IFS who approved the project. Thanks to The Principal Chief Conservator of Forests, RMD, Shri V.K. Yadav, IFS for his kind support and permission to compile the research finding and compilation of the report. Thanks to the Additional PCCF, R & M, Smt Pratibha Raj, IFS for going through the project document and getting it approved in the Committee for Scrutiny and Approval of the final project report. Thanks to the Chief Conservator of Forests, R&D Shri D. Mallick, IFS for guidance and support to compile the findings of the experimental work. Thanks to Shri B. Sarkar, IFS, Conservator of Forest, Research Circle, WB for guidance to the field work and data collection.

Sri T. T Bhutia, IFS successfully guided the experimental part and data collection at North Bengal which is acknowledged. Smt Nabanita Sanyal, WBFS, ADFO of this Division involved herself for editing this report. Thanks to the Forest Range Officer of AFR, Arabari Research Range and Purulia Research Range under Silviculture South Division and Salugara Soil Lab Range under Silviculture North Division, who executed, maintained and recorded growth data of the trial plots time to time. Lastly I extend my sincere thanks to all the staff of Silviculture (North) Division and Silviculture (South) Division specially Shri Sumit Chakraborty who worked hard for this project from the beginning to till end.



Divisional Forest Officer  
Silviculture South Division

## Project Profile

1. **Title of the Project:-Tree Improvement Programme of *Acacia auriculiformis***

2. **Implementing Team**

<b>Principal Investigator</b>	Manik Lal Sarkar, IFS Divisional Forest Officer Nabanita Sanyal, WBFS,ADFO	Silviculture South Division
	Koushik Sarkar, IFS Divisional Forest Officer	Silviculture North Division
<b>Co-Principal Investigator</b>	Niladri Shakha, FR	Arabari Range,
	Nibedita Majhi, FR	AFR
	Subrata Basu, FR	Purulia Range,
<b>Support Staff</b>	Sumit Chakraborty	Ganapati Sar
	Basudev Majhi	Joydev Choulia
	Subir Sarkar, DRFr	Amulya Roy

3. **Project Location**

Division	Range	Location
Silviculture South Division	Arabari Range	Chandmura
	AFR	DakshinKadua
	Purulia Range	Laxmanpur
Silviculture North Division	Salugara Soil Lab Range	Dabgram 9

4. **Project Commencement Date – August, 2018**

5. **Project Completion Date – November, 2021**

6. **Project Cost – 32,37,000.00**

7. **Funding Agency – West Bengal Forest and Biodiversity Conservation Project**

## **1. Introduction:-**

The *Acacia auriculiformis* (*Akashmoni* in local parlance), often referred to as poor man's teak owing to its impressive grains, relatively low cost, faster growth, less rotation age, edaphic and climatic versatility. Hence it became one of the economically important 'naturalized exotic' species in the State. It has been widely adopted in the forest fringe plantations of South west Bengal as a quick growing species (QGS) and in North Bengal as strip plantation along the road sides, being a non-grazing species. Now, the tree became immensely popular among general public. They are planting it on their own lands owing to its timber value, low investment and high return but are in the high risk of obtaining less than expected returns due to the genetically inferior planting materials. The species was introduced in South West Bengal during the 80's from Australia along with its various allied species such as *A. mangium*, *A. springvale* etc. although those allied species could not gain popularity due to its inherent shortcomings and gradually vanished.

Gradually, due to out-breeding with inferior lines and raising of plantations with seeds obtained from poor stands, the quality of *Acacia auriculiformis* plantation has largely deteriorated and we see them growing mostly branchy and crooked. Superior provenances with clean bole are seldom seen. But there are locations in West Bengal where we can still find a few superior trees growing along with inferior ones. Similarly some superior provenances have been developed in states like Karnataka, mainly by private firms. It has been observed that species cross pollinates with allied species producing natural hybrids. The Mysore paper mills has developed some promising clones through Hybridization and selection process (hybrid derivatives) with *A. mangium* that has combined faster growth and better timber quality with respect to their parental lines.

Tree improvement in *Acacia* is a necessity to improve the productivity of our forest plantations as well as to render a timely service to our tree growers who raise these trees in their homestead lands as a supplementary livelihood option.

## **2. Objective of the Project**

- a. To release adaptable clones and provenances after multi-location trials suitable for the State.
- b. To develop superior clones through progeny testing of superior lines obtained from the State as well as from Karnataka.

- c. Mass multiplication of the desirable clones for the forest plantations and to the general public

### **3. Duration of the Project :Three years**

Measurement of height and CD was taken at 6 month interval to study the growth characteristics of the provenances. Data taken after two and half year was analysed and growth trend was observed for the better performing regeneration material. After three years, trees shall be allowed to grow till ten to twelve years to ascertain timber qualities etc. if required. Bringing out superior lines from progeny testing is a continuous process in which rouging out starts from the nursery itself. But by three to four years extrapolative selection could be made based on the observation of growth parameters.

### **4. Works in West Bengal and elsewhere**

Australia, being its native country and some South East Asian nations like Vietnam has accomplished considerable research in developing superior provenances. The Mysore paper Mills Bhadravati has undertaken research in developing hybrids suitable for pulp making as well as for timber. The timber quality has been tested by the Institute of Wood Science and Technology(IWST) and certified that on many aspect, timber of these hybrids match with that of teak.

Some multi-location trials for introducing several Acacia species was undertaken during Nineties when the West Bengal Forestry Project was implemented but conclusive results could not come although a few allied species were introduced from Australia. No further tree improvement works on Acacia were undertaken afterwards, may be, due to paucity of funding.

### **5. Methodology**

Since provenances and progenies of selected plus trees are used, tree improvement works involves following two distinct activities:

- A. **Provenance Trials** – Using Acacia hybrid and *Acacia auriculiformis* clones (vegetative cuttings) brought from Mysore Paper Mills, Bhadrabati.
- B. **Progeny Trials** – Using *Acacia auriculiformis* seedlings (seed origin) from Karnataka and from selected Plus Trees of West Bengal.

Multi-location trial has been done with Randomized Block Design with four replication for each treatment.

#### **A. Multi-location Provenance Trials:**

**Location** - Four distinct agro-climatic zones were selected to study the true genetic traits. The following agro climatic locations were selected for the trial-

Sl. No.	Place	Agro-climatic zone	Rainfall (cm)
1.	Salugara	Teraialluvium	300-400
2.	DakshinKadua	Coastal alluvium	160-200
3.	Arabari	Red and lateritic	140-160
4.	Laxmanpur	Red and lateritic	<140

#### **Material used for the trial - Clones and Provenances :**

1. *Acacia hybrid clones*: 6 promising clones from Karnataka were brought for the study.

SI No	Clone Name	SI No	Clone Name
1	Acacia hybrid (B2S)	2	Acacia hybrid (69K)
3	Acacia hybrid (47K)	4	Acacia hybrid clone (K47)
5	Acacia hybrid clone (86K)	6	Acacia hybrid clone (H10)

2. *Acacia auriculiformis clones*: Four clones procured from Karnataka and tested in the field.

SI No	Clone Name	SI No	Clone Name
1	Acacia auriculiformis Clone -MA6	2	Acacia auriculiformis Clone -AS1
3	Acacia auriculiformis Clone -M7	4	Acacia auriculiformis Clone -M8

3. *Acacia auriculiformis* seedlings from selected Plus Trees of West Bengal

1	Khisma Mixed, Bulk		
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#### **Treatment:- denoted as T1, T2, T3 ....**

For multi location provenance trial with Acacia hybrid clone and *Acacia auriculiformis* clone, 11 treatment was designed with 6 no hybrid clone, 4 no *A. auriculiformis* clone and 1 no as control for each location. Each Treatment includes 4 replication & per replication 25 nos of seedling/ramet was planted following random block design. Transplantation of the seedling were done after normal soil work and in 3m x 2.5 m spacing.

## Block design for the provenance trial with Acacia hybrid clone & Acacia auriculiformis clone

	10	6	4	2	1	3	5	9	8	7	11
R1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
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R4	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

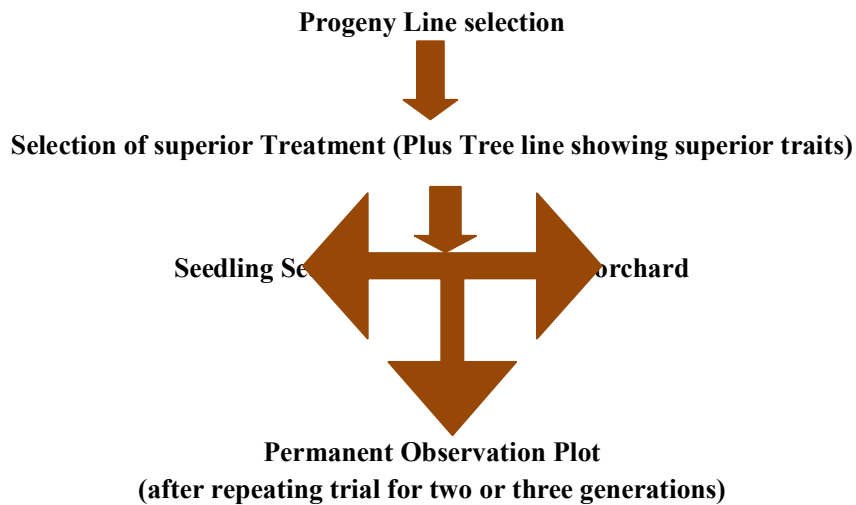
### Colour references

1	2	3	4	5	6	7	8	9	10	11

### B. Multi location Progeny (half-sib) trials:

It is done to select superior lines from the seed obtained from the candidate plus trees and plus trees. This trial is done in all the four locations.

A schematic representation of half -sib progeny selection is given below:



Location of the trial –Location selected as it was done for the provenance trial i.e Salugara, DakshinKadua, Arabari and Laxmanpur.



**Material used** – Seedlings rose from four plus trees of Karnataka and selected 10 plus trees from West Bengal was tried for the half sib progeny test. Materials from 14 Plus trees were used as 14 different treatment and 1 is as control collected from Khisma.

Treatment ID	Seed Name	Treatment ID	Seed Name
A	Karnataka BalmukhSI1	B	Karnataka, Beede (R) , SI-3
C	Karnataka, 1993 Research, SI-4	D	Karnataka, Mumbar, SI-5
E	Sitarampur, Tree no-44	F	Bhedua, Tree no-5
G	Khisma, Tree no-2	H	Khisma, Tree no-4
I	Khisma, Tree no-8	J	Khadalgobra, Tree no-12
K	Khadalgobra, Tree no-13)	L	Gangrachar, Tree no-21
M	Gobindapur, Tree no-4	N	Khisma mixed, Bulk
O	Lataguri PT		

**Treatment:-**

For multi location progeny trial with *Acacia auriculiformis* seedlings, 15 treatment was designed with seedlings from 4 plus trees of Karnataka, 10 plus trees/CPTs from West Bengal 1 no as control for each location. Each Treatment include 4 replication & per replication 25 nos of seedling was planted following random block design. Transplantation of the seedlings were done after normal soil work and in 3 mt x 2 mt spacing.

**Layout of Random Blocks for planting *Acacia auriculiformis* seedlings (Seed origin)**

Clones	F	E	D	J	O	N	H	A	B	C	M	L	I	G	K
R1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
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R3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
R4	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

A	Karnatak, Balmukh, SI. No. 1	D	Karnataka (Mumbar) SI. No. 5	G	Khisma, Tree No. 2	J	Khadalgobra, Tree No. 12	M	Gobindapur, Tree No. 4
B	Karnatak, Beede (R), SI. No. 3	E	Sitarampur, Tree No. 44	H	Khisma, Tree No. 4	K	Khadalgobra, Tree No. 13	N	Khisma, Mixed Bulk
C	Karnatak (1993 Research), SI. No. 4	F	Bhedua, Tree No. 5	I	Khisma, Tree No. 8	L	Gangrachar, Tree No. 21	O	Lataguri

**Maintenance of the trial plots and data collection**– Measurement of height and CD was taken at 6 month interval to study the growth characteristics of the provenances. Data taken after two and half year was analyzed and growth trend was observed for the better

performing regeneration material. After three to four years of study, promising clones could be short listed for mass multiplication. The trees will be retained for about ten to fifteen years for further observations on timber quality and production.

### **Analysis of Data for provenance trial and Progeny trial**

The height and DBH was collected during third year was analyzed by calculating its volume. The mean volume for every treatment was calculated using statistical tables and compare it for each treatment with groups and within the groups.

### **Interpretation of Statistical Analysis:-**

#### **For Descriptive Analysis:-**

**1st Column** - Number of Treatment.

**2nd Column** - No of individual observed irrespective of replications for each treatment.

**3rd Column** – Mean- Average of individuals within group or within each treatment.

**4<sup>th</sup> column** - Standard deviation is a measure of dispersion of data from it's mean. For normally distributed population - Mean  $\pm$ 1SD = 68%, Mean  $\pm$  2SD = 95% & Mean  $\pm$  3SD = 99.7%

**5th Column-** Standard error is a measure of accuracy of a mean of any given sample from its population. SE increase means more spread, means inaccurate representation from true population.

**6th Column-** Confidence interval is a display the probability that a parameter will fall between a pair of value around mean, mostly measured at 95% or 99% probability level.

**Minimum & Maximum** - As data are recorded.

**Anova-** Analysis of variance.

**1<sup>st</sup> column- Between Group** - No. of Treatment

**1<sup>st</sup> column- Within Group-** No. of individual recorded. Or the replication value as recorded.

**2<sup>nd</sup> column - Sum of Square** - Function that fits the data in best way for Anova Test.

**Sum of Square**  $= \sum_0^n (X_1 - \bar{x})^2$  - Higher SS mean higher variability.

**3<sup>rd</sup> column - D.f.** = Degree of freedom =(N-1)

**4<sup>th</sup> column - Mean Square** - Estimates the population variance, calculated by dividing the corresponding SS by the df, useful in Anova Test.

**5<sup>th</sup> column -F- Value:-** 
$$\frac{\text{Variations between sample mean}}{\text{Variation within the sample mean}}$$

**6<sup>th</sup> column - Sig:-** Significance, if the value is less than 0.01, then difference between group (Treatment) are statistically significant at 99% probability level, if the value is less than 0.05, then

difference between groups (Treatment) are statistically significant at 95% probability level, and if the value is more than 0.05 then between groups difference is not significant statistically.

**Post Hoc:- Duncan homogenous test :-**

1<sup>st</sup> column - Treatment no.

2<sup>nd</sup> column - N- No. of individual observed with a single treatment.

3<sup>rd</sup> column- Subset for alpha=.05 or .01- When the difference between treatment is significant at 99% or 95% probability level, then further testing can be done by using different Posthoc test by choosing Duncan homogeneous subsets, which is more efficient is comparison to LSD.

**Consultant:**

Consultant: Dr. B.K. Mohammed Amanulla, a retired Scientist from Mysore Paper mill, Bhadravathi, Karnataka has been working on *Acacia auriculiformis* since 1990s and has developed clones in *Acacia auriculiformis* and *Acacia hybrid* and has fourteen research papers on this topic. He was consulted during designing the trial and during execution in the field.

**Outcome**

After the completion of 3 year, as it was expected, some promising clones of provenances were identified which is suitable for our conditions and a few improved clones from progeny lines. Multiplication of the clones so selected was started initially for making clonal hedge and for planting in the field and distribution to the general public.



Typical Acacia Plantation in SW Bengal.



A candidate plus tree in SW Bengal

**Acacia auriculiformis seed origin volume analysis  
for 4 location under Silviculture (South) & Silviculture (North) Division viz. (1)  
DakshinKadua-Junput (2) Arabari, (3) Laxmanpur- Purulia (4) Salugara-**

Location ID	Location Name
1	DakshinKadua
2	Arabari
3	Purulia
4	Salugara
Treatment ID	Seed Name
1	T1 A (Karnataka Balmukh)
2	T2 B (Karnataka, Beede (R) , Sl-3)
3	T3 C (Karnataka, 1993 Research, Sl-4)
4	T4 D (Karnataka, Mumbar, Sl-5)
5	T5 E (Sitarampur, Tree no-44)
6	T6 F (Bhedua, Tree no-5)
7	T7 G (khisma, Tree no-2)
8	T8 H (khisma, Tree no-4)
9	T9 I (khisma, Tree no-8)
10	T10 J Khadalgobra, Tree no-12)
11	T 11 K Khadalgobra, Tree no-13)
12	T 12 L Gangrachar, Tree no-21)
13	T 13 M Gobindapur, Tree no-4)
14	T 14 N (Khisma mixed, Bulk)
15	T 15 O (Lataguri)

**Acacia auriculiformis seed origin volume analysis of DakshinKadua under  
Attached Forest Range, Silviculture (South) Division.**

Case Processing Summary						
	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
cm_3 * Treat	1304	86.9%	196	13.1%	1500	100.0%

Report						
Cm <sup>3</sup>						
Treat	Mean	N	Std. Deviation	Minimum	Maximum	% of Total N
1	43.94	97	30.364	1	162	7.4%
2	63.20	69	91.061	1	736	5.3%
3	50.13	90	30.412	8	158	6.9%
4	24.78	87	20.042	0	74	6.7%
5	35.94	79	29.580	1	132	6.1%
6	41.82	92	37.069	0	145	7.1%
7	32.12	93	24.334	2	127	7.1%
8	45.97	84	32.875	0	132	6.4%
9	25.17	89	24.159	1	110	6.8%
10	38.25	91	21.314	5	117	7.0%
11	36.41	85	26.262	2	115	6.5%
12	29.40	92	21.634	1	117	7.1%
13	36.78	79	26.080	1	116	6.1%
14	57.88	88	121.582	0	1149	6.7%
15	36.08	89	22.937	2	116	6.8%
Total	39.54	1304	46.559	0	1149	100.0%

### One way

Descriptives								
Cm <sup>3</sup>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	97	43.94	30.364	3.083	37.83	50.06	1	162
2	69	63.20	91.061	10.962	41.32	85.07	1	736
3	90	50.13	30.412	3.206	43.76	56.49	8	158
4	87	24.78	20.042	2.149	20.51	29.05	0	74
5	79	35.94	29.580	3.328	29.31	42.56	1	132
6	92	41.82	37.069	3.865	34.14	49.50	0	145
7	93	32.12	24.334	2.523	27.11	37.13	2	127
8	84	45.97	32.875	3.587	38.83	53.10	0	132
9	89	25.17	24.159	2.561	20.08	30.26	1	110
10	91	38.25	21.314	2.234	33.81	42.69	5	117
11	85	36.41	26.262	2.849	30.75	42.08	2	115
12	92	29.40	21.634	2.255	24.92	33.88	1	117
13	79	36.78	26.080	2.934	30.94	42.62	1	116
14	88	57.88	121.582	12.961	32.12	83.64	0	1149
15	89	36.08	22.937	2.431	31.24	40.91	2	116

Descriptives								
Cm <sup>3</sup>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	97	43.94	30.364	3.083	37.83	50.06	1	162
2	69	63.20	91.061	10.962	41.32	85.07	1	736
3	90	50.13	30.412	3.206	43.76	56.49	8	158
4	87	24.78	20.042	2.149	20.51	29.05	0	74
5	79	35.94	29.580	3.328	29.31	42.56	1	132
6	92	41.82	37.069	3.865	34.14	49.50	0	145
7	93	32.12	24.334	2.523	27.11	37.13	2	127
8	84	45.97	32.875	3.587	38.83	53.10	0	132
9	89	25.17	24.159	2.561	20.08	30.26	1	110
10	91	38.25	21.314	2.234	33.81	42.69	5	117
11	85	36.41	26.262	2.849	30.75	42.08	2	115
12	92	29.40	21.634	2.255	24.92	33.88	1	117
13	79	36.78	26.080	2.934	30.94	42.62	1	116
14	88	57.88	121.582	12.961	32.12	83.64	0	1149
15	89	36.08	22.937	2.431	31.24	40.91	2	116
Total	1304	39.54	46.559	1.289	37.01	42.06	0	1149

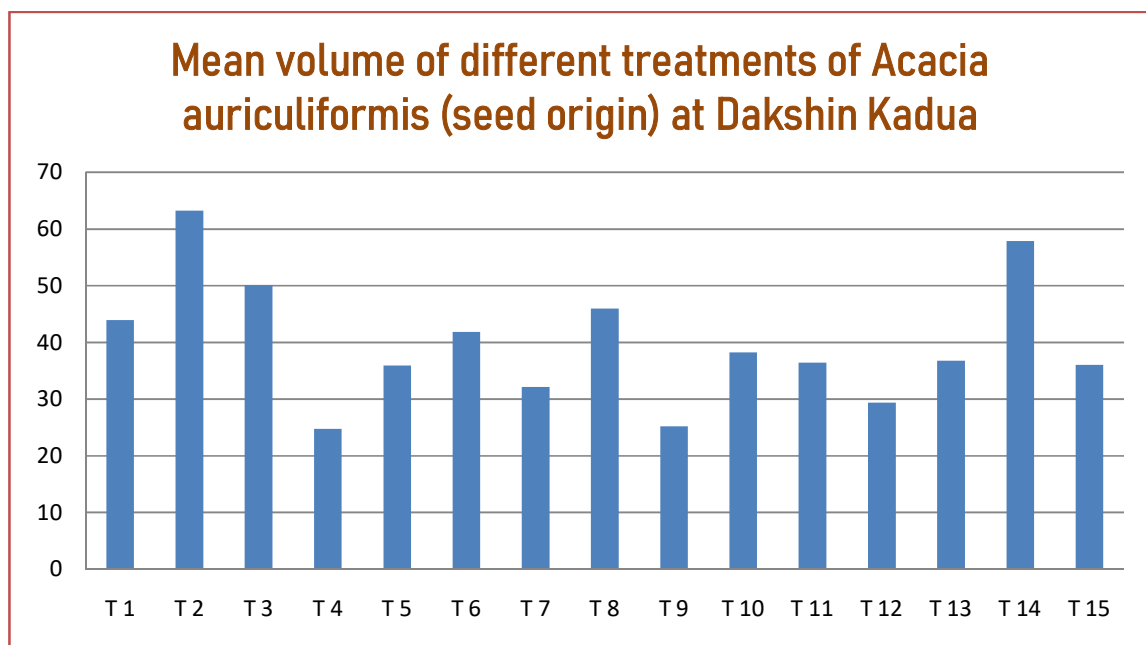
ANOVA					
Cm <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	139720.071	14	9980.005	4.791	.000
Within Groups	2684874.001	1289	2082.912		
Total	2824594.072	1303			

**Post Hoc Tests**  
**Homogeneous Subsets**

Cm <sup>3</sup>							
Duncan							
Treat	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
4	87	24.78					
9	89	25.17					
12	92	29.40	29.40				
7	93	32.12	32.12	32.12			
5	79	35.94	35.94	35.94	35.94		

15	89	36.08	36.08	36.08	36.08		
11	85	36.41	36.41	36.41	36.41		
13	79	36.78	36.78	36.78	36.78		
10	91	38.25	38.25	38.25	38.25		
6	92		41.82	41.82	41.82		
1	97		43.94	43.94	43.94	43.94	
8	84			45.97	45.97	45.97	
3	90				50.13	50.13	50.13
14	88					57.88	57.88
2	69						63.20
Sig.		.104	.078	.094	.086	.066	.075

### Means Plot



### Interpretation of results of Progeny Trial of Acacia auriculiformis at Dakshinkadua location:-

There is a significant difference in term of volume of Acacia Seed Origin seedlings in DakshinKadua location, based on data obtained after 2.5 years of growth. It has been found that only **T2** (Karnataka, Beede (R) Sl.-3) is showing better growth than **T14** (Khisma Mixed Bulk), consider as control. Taking the growth of **T14**the other treatments may be categorized as

**Best performer are clone no.** - Karnataka, Beede (R) Sl-3 (T2), Khisma Mixed Bulk (T14), Karnataka-1993 Research, Sl. No. 4 (T3)

**Medium Performers are clone no.** - Khisma Tree No. 4 (T8) & Karnataka Balmukh (T1)

Bhedua Tree No. 5 (T6), Khadalgobra Tree No. 12 (T10), Gobindapur Tree No. 4 (T13),  
Khadalgobra Tree No. 13 (T11), Lataguri (T15) & Sitarampur Tree No. 44 (T5),

**Worst performers are clone no.** Khisma Tree No. 2 (T7), Gangachar Tree No. 21 (T12),  
Khisma Tree No. 8 (T9) & Karnataka Mumber Sl. 5 (T4)

### ***Acacia auriculiformis* seed origin volume analysis of Chandmura, Arabari under Silviculture (South) Division.**

#### Means

<b>Case Processing Summary</b>						
	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
<b>cm<sup>3</sup> * Treat</b>	1414	94.3%	86	5.7%	1500	100.0%

<b>Report</b>						
<b>Cm<sup>3</sup></b>						
Treat	Mean	N	Std. Deviation	Minimum	Maximum	% of Total N
1	620.92	98	329.396	21	1352	6.9%
2	782.34	98	360.776	55	1864	6.9%
3	673.73	94	350.736	82	1701	6.6%
4	711.90	99	364.285	49	1593	7.0%
5	745.02	92	428.964	38	1756	6.5%
6	805.07	94	443.117	59	2293	6.6%
7	772.33	90	372.683	64	2207	6.4%
8	660.29	98	354.022	0	2543	6.9%
9	646.51	92	322.422	31	1464	6.5%
10	626.70	91	350.611	49	1744	6.4%
11	608.76	89	384.411	69	2006	6.3%
12	613.09	92	349.471	58	1456	6.5%
13	718.07	91	405.843	40	2036	6.4%
14	705.94	98	407.152	36	2110	6.9%
15	707.34	98	325.939	0	1413	6.9%
Total	693.57	1414	374.661	0	2543	100.0%

#### One way

<b>Descriptives</b>								
<b>Cm<sup>3</sup></b>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	98	620.92	329.396	33.274	554.88	686.96	21	1352
2	98	782.34	360.776	36.444	710.01	854.68	55	1864



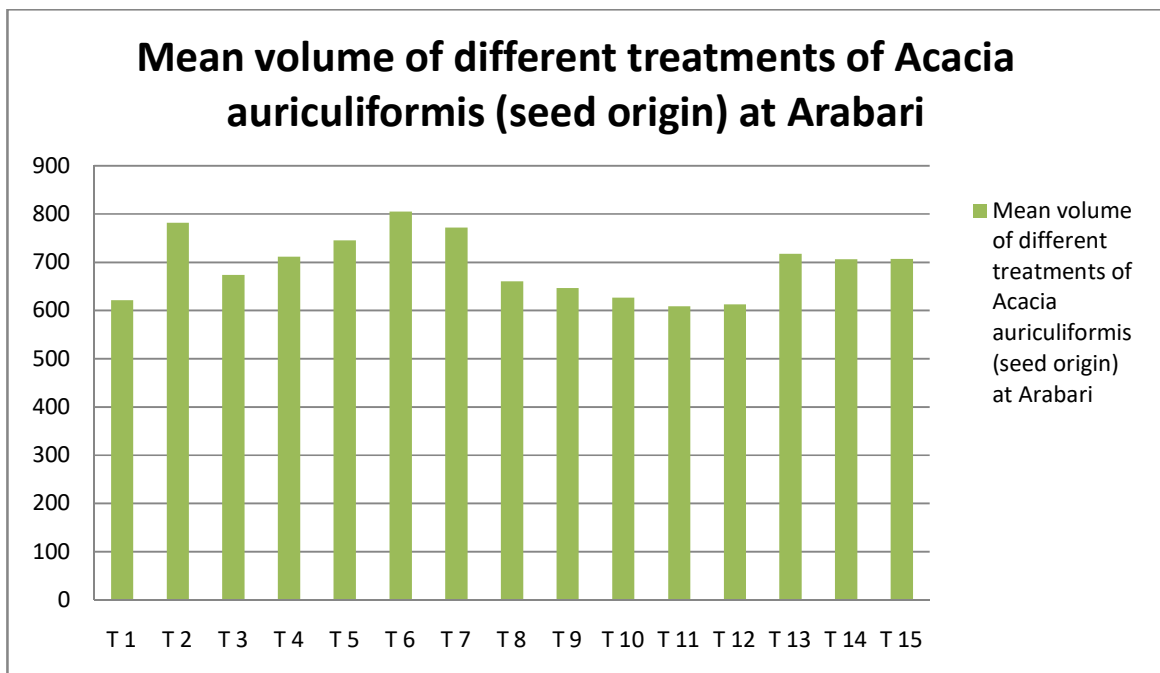
3	94	673.73	350.736	36.176	601.90	745.57	82	1701
4	99	711.90	364.285	36.612	639.25	784.56	49	1593
5	92	745.02	428.964	44.723	656.18	833.85	38	1756
6	94	805.07	443.117	45.704	714.31	895.82	59	2293
7	90	772.33	372.683	39.284	694.28	850.39	64	2207
8	98	660.29	354.022	35.762	589.32	731.27	0	2543
9	92	646.51	322.422	33.615	579.73	713.28	31	1464
10	91	626.70	350.611	36.754	553.68	699.71	49	1744
11	89	608.76	384.411	40.748	527.78	689.74	69	2006
12	92	613.09	349.471	36.435	540.71	685.46	58	1456
13	91	718.07	405.843	42.544	633.55	802.59	40	2036
14	98	705.94	407.152	41.129	624.31	787.57	36	2110
15	98	707.34	325.939	32.925	641.99	772.69	0	1413
Total	1414	693.57	374.661	9.964	674.02	713.11	0	2543

<b>ANOVA</b>					
<b>Cm<sup>3</sup></b>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5373805.160	14	383843.226	2.783	.000
Within Groups	1.9308	1399	137934.085		
Total	1.9838	1413			

**Post Hoc Tests  
Homogeneous Subsets**

<b>Cm<sup>3</sup></b>					
<b>Duncan</b>					
Treat	N	Subset for alpha = 0.05			
		1	2	3	4
11	89	608.76			
12	92	613.09			
1	98	620.92	620.92		
10	91	626.70	626.70		
9	92	646.51	646.51		
8	98	660.29	660.29	660.29	
3	94	673.73	673.73	673.73	
14	98	705.94	705.94	705.94	705.94
15	98	707.34	707.34	707.34	707.34
4	99	711.90	711.90	711.90	711.90
13	91	718.07	718.07	718.07	718.07
5	92		745.02	745.02	745.02
7	90			772.33	772.33
2	98			782.34	782.34
6	94				805.07
Sig.		.096	.054	.056	.122

## Means Plots



### Interpretation of results of Progeny Trial of Acacia auriculiformis at Chandmura Arabari location:-

There is a significant difference in term of volume of Acacia Seed Origin seedlings at Arabari location, based on data obtained after 2.5 years of growth. It has been found that only **T2** (Karnataka, Beede (R) Sl.-3), **T4, T5, T6, T7, T13** and **T15** are showing better growth than **T14** (Khisma Mixed Bulk), consider as control. Considering the growth of **T14** the other treatments may be categorized as

**Best performer are clone no. - (T6)**Bhedua Tree No. 5, **(T2)**Karnataka, Beede (R) Sl-3, **(T7)**Khisma Tree No. 2and **(T5)**Sitarampur Tree No. 44

**Medium Performers are clone no. -** Gobindapur Tree No. 4 **(T13)** Karnataka Mumber Sl. 5 **(T4)**, Lataguri **(T15)**,Khisma Mixed Bulk **(T14)**, Karnataka-1993 Research, Sl. No. 4 **(T3)**,Khisma Tree No. 4 **(T8)**Khisma Tree No. 8 **(T9)**,Khadalgobra Tree No. 12 **(T10)**, Karnataka Balmukh**(T1)**

**Worst performers are clone no. -** Gangachar Tree No. 21**(T12)**,Khadalgobra Tree No. 13 **(T11)**,

**Acacia auriculiformis seed origin volume analysis of Laxmanpur-Purulia  
under Silviculture (South) Division.**

<b>Case Processing Summary</b>						
	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Cm <sup>3</sup> * Treat	1396	91.2%	134	8.8%	1530	100.0%

<b>Report</b>						
<b>Cm<sup>3</sup></b>						
Treat	Mean	N	Std. Deviation	Minimum	Maximum	% of Total N
31	16.89	90	5.656	3	33	6.4%
32	24.41	96	14.712	2	71	6.9%
33	17.72	96	10.377	3	56	6.9%
34	19.18	91	6.975	1	35	6.5%
35	17.43	93	9.083	1	45	6.7%
36	17.00	90	8.502	2	38	6.4%
37	18.37	94	6.447	4	41	6.7%
38	18.86	90	8.300	3	46	6.4%
39	17.05	94	7.142	1	40	6.7%
40	16.48	89	8.468	2	41	6.4%
41	18.50	96	9.093	4	50	6.9%
42	20.34	89	8.647	2	44	6.4%
43	18.58	95	8.572	3	38	6.8%
44	17.85	95	6.404	4	36	6.8%
45	19.83	98	7.682	4	43	7.0%
Total	18.58	1396	8.843	1	71	100.0%

<b>One way Descriptives</b>								
<b>Cm<sup>3</sup></b>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
31	90	16.89	5.656	.596	15.71	18.08	3	33
32	96	24.41	14.712	1.502	21.42	27.39	2	71
33	96	17.72	10.377	1.059	15.62	19.82	3	56
34	91	19.18	6.975	.731	17.73	20.64	1	35
35	93	17.43	9.083	.942	15.56	19.30	1	45
36	90	17.00	8.502	.896	15.22	18.78	2	38
37	94	18.37	6.447	.665	17.05	19.69	4	41
38	90	18.86	8.300	.875	17.12	20.60	3	46
39	94	17.05	7.142	.737	15.58	18.51	1	40

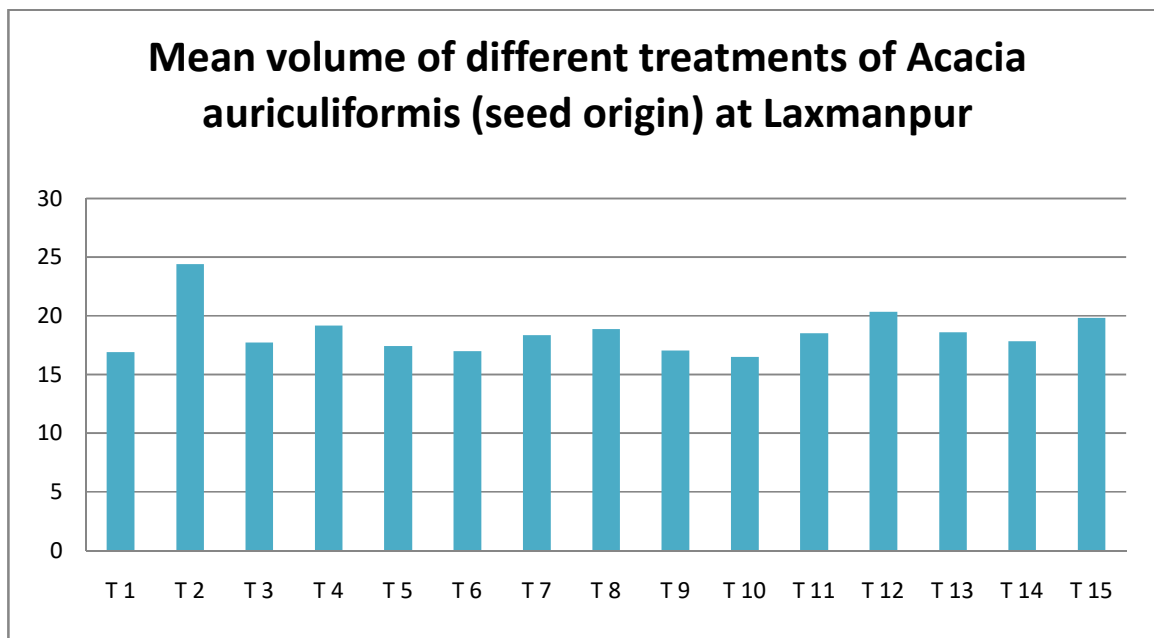
40	89	16.48	8.468	.898	14.69	18.26	2	41
41	96	18.50	9.093	.928	16.66	20.34	4	50
42	89	20.34	8.647	.917	18.52	22.16	2	44
43	95	18.58	8.572	.880	16.83	20.32	3	38
44	95	17.85	6.404	.657	16.55	19.16	4	36
45	98	19.83	7.682	.776	18.29	21.37	4	43
Total	1396	18.58	8.843	.237	18.12	19.05	1	71

ANOVA					
Cm <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5070.750	14	362.196	4.809	.000
Within Groups	104012.802	1381	75.317		
Total	109083.553	1395			

**Post Hoc Tests  
Homogeneous Subsets**

Cm <sup>3</sup>					
Duncan					
Treat	N	Subset for alpha = 0.05			
		1	2	3	4
40	89	16.48			
31	90	16.89	16.89		
36	90	17.00	17.00		
39	94	17.05	17.05		
35	93	17.43	17.43	17.43	
33	96	17.72	17.72	17.72	
44	95	17.85	17.85	17.85	
37	94	18.37	18.37	18.37	
41	96	18.50	18.50	18.50	
43	95	18.58	18.58	18.58	
38	90	18.86	18.86	18.86	
34	91	19.18	19.18	19.18	
45	98		19.83	19.83	
42	89			20.34	
32	96				24.41
Sig.		.081	.057	.055	1.000

## Means Plots



### **Interpretation of results of Progeny Trial of *Acacia auriculiformis* at Laxmanpur-Purulia location:-**

There is a significant difference in term of volume of *Acacia* Seed Origin seedlings at Laxmanpur location, based on data obtained after 2.5 years of growth. It has been found that **T2** (Karnataka, Beede (R) Sl.-3), **T4**, **T7**, **T8**, **T11**, **T12**, **T13**, and **T15** are showing better growth than **T14** (Khisma Mixed Bulk), which is the control. Considering the growth of **T14** the other treatments may be categorized as

**Best performer are clone no.** - Karnataka, Beede (R) Sl-3 (T2), Gangachar Tree No. 21 (T12), Lataguri (T15),

**Medium Performers are clone no.** - Karnataka Mumber Sl. 5 (T4), Khisma Tree No. 4 (T8) Gobindapur Tree No. 4 (T13), Khadalgobra Tree No. 13 (T11), Khisma Tree No. 2 (T7), Khisma Mixed Bulk (T14), Karnataka-1993 Reseach Sl. 4 (T3), Sitarampur Tree No. 44 (T5),

**Worst performers are clone no.**-Khisma Tree No. 8(T9), Bhedua Tree No. 5 (T6), Karnataka Balmukh (T1), Khadalgobra Tree No. 12 (T10)

**Data Analysis report based on volume (Cm<sup>3</sup>) of Acacia hybrid for Salugara  
research Range under Silviculture (North) Division**

**Means**

<b>Case Processing Summary</b>						
	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
cm_3 * Treat	718	47.9%	782	52.1%	1500	100.0%

<b>Report</b>						
<b>Cm<sup>3</sup></b>						
Treat	Mean	N	Std. Deviation	Minimum	Maximum	% of Total N
1	93.63	30	77.794	16	404	4.2%
2	397.83	80	2282.449	0	20538	11.1%
3	140.51	62	99.337	21	388	8.6%
4	150.53	53	85.197	25	366	7.4%
5	148.93	66	90.058	17	397	9.2%
6	150.81	31	125.553	16	405	4.3%
7	102.84	42	70.689	12	318	5.8%
8	135.85	53	78.547	16	424	7.4%
9	148.51	59	100.394	17	393	8.2%
10	164.15	45	124.862	0	447	6.3%
11	128.28	36	104.702	18	631	5.0%
12	165.67	40	85.357	7	326	5.6%
13	153.00	49	82.558	30	393	6.8%
14	162.35	43	100.720	18	365	6.0%
15	175.04	29	101.393	0	492	4.0%
<b>Total</b>	<b>173.11</b>	<b>718</b>	<b>767.190</b>	<b>0</b>	<b>20538</b>	<b>100.0%</b>

**One way**

<b>Descriptives</b>								
<b>Cm<sup>3</sup></b>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	30	93.63	77.794	14.203	64.58	122.68	16	404
2	80	397.83	2282.449	255.186	-110.11	905.76	0	20538
3	62	140.51	99.337	12.616	115.29	165.74	21	388
4	53	150.53	85.197	11.703	127.05	174.01	25	366
5	66	148.93	90.058	11.085	126.79	171.06	17	397
6	31	150.81	125.553	22.550	104.76	196.86	16	405
7	42	102.84	70.689	10.908	80.82	124.87	12	318

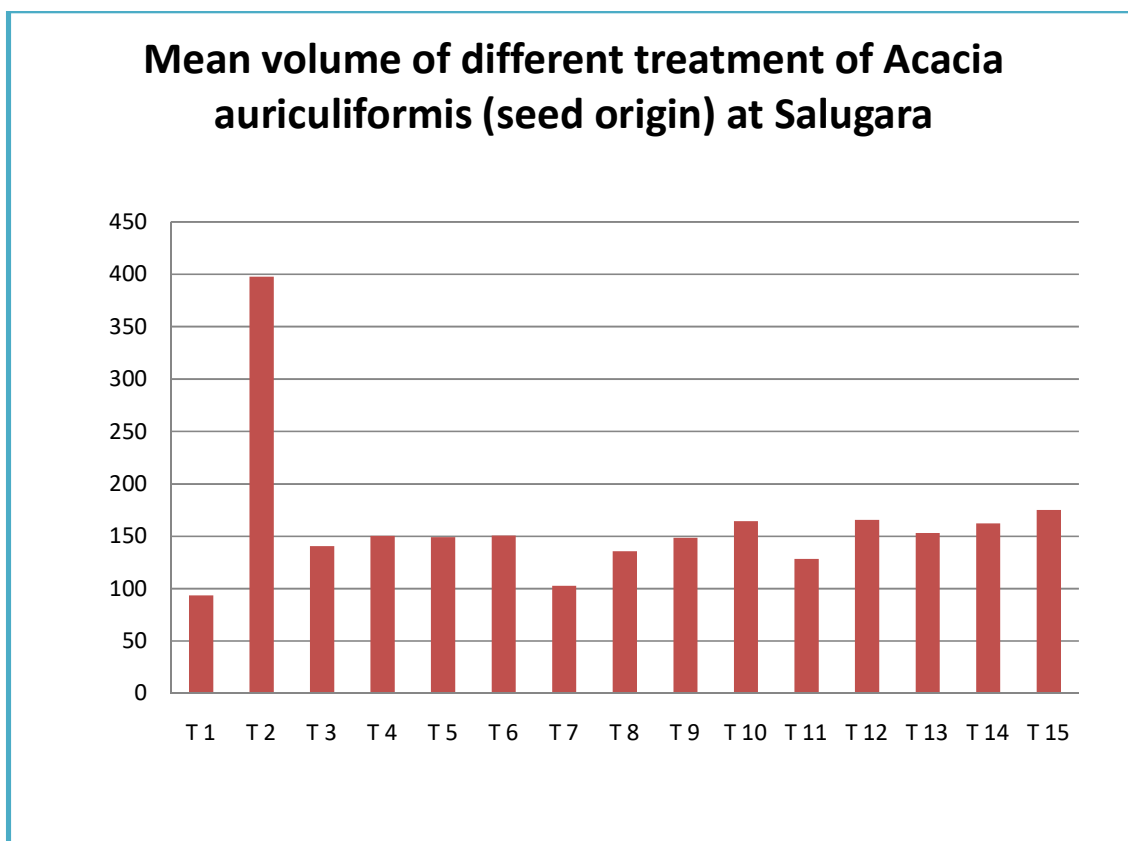
8	53	135.85	78.547	10.789	114.20	157.50	16	424
9	59	148.51	100.394	13.070	122.35	174.67	17	393
10	45	164.15	124.862	18.613	126.64	201.66	0	447
11	36	128.28	104.702	17.450	92.85	163.71	18	631
12	40	165.67	85.357	13.496	138.37	192.97	7	326
13	49	153.00	82.558	11.794	129.29	176.71	30	393
14	43	162.35	100.720	15.360	131.35	193.34	18	365
15	29	175.04	101.393	18.828	136.47	213.60	0	492
Total	718	173.11	767.190	28.631	116.90	229.33	0	20538

<b>ANOVA</b>					
<b>Cm<sup>3</sup></b>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4795906.519	14	342564.751	.577	.884
Within Groups	4.1728	703	593480.048		
Total	4.2208	717			

**Post Hoc Tests  
Homogeneous Subsets**

<b>Cm<sup>3</sup></b>		
Duncan		
Treat	N	Subset for alpha = 0.05
		1
1	30	93.63
7	42	102.84
11	36	128.28
8	53	135.85
3	62	140.51
9	59	148.51
5	66	148.93
4	53	150.53
6	31	150.81
13	49	153.00
14	43	162.35
10	45	164.15
12	40	165.67
15	29	175.04
2	80	397.83
Sig.		.138

## Means Plots



### **Interpretation of results of Progeny Trial of *Acacia auriculiformis* at Laxmanpur-Purulia location:-**

There is a significant difference in term of volume of *Acacia* Seed Origin seedlings at **Salugara** location, based on data obtained after 2.5 years of growth. It has been found that **T2** (Karnataka, Beede (R) Sl.-3), T10, T12, and T15 are showing better growth than **T14** (Khisma Mixed Bulk), which is the control. Considering the growth of **T14** the other treatments may be categorized as

**Best performer are clone no.** Karnataka, Beede (R) Sl-3 (T2),

**Medium Performers are clone no.** - Lataguri (**T15**),Gangachar Tree No. 21 (**T12**),Khadalgobra Tree No. 12 (**T10**),Khisma Mixed Bulk (T14),Gobindapur Tree No. 4 (T13), Bhedua Tree No. 5 (T6), Karnataka Mumber Sl. 5 (T4), Sitarampur Tree No. 44 (T5), Khisma Tree No. 8 (T9) Karnataka-1993 Reseach Sl. 4 (T3), Khisma Tree No. 4(T8), Khadalgobra Tree No. 13 (T11),

**Worst performers are clone no.**-Khisma Tree No. 2 (T7) & Karnataka Balmukh (T1)



**Acacia auriculiformis seed origin volume analysis for 4 location under  
Silviculture (South) & Silviculture (North) Division viz. (1)  
DakshinKadua-Junput (2) Chandmura-Arabari, (3) Laxmanpur- Purulia  
(4) Salugara-**

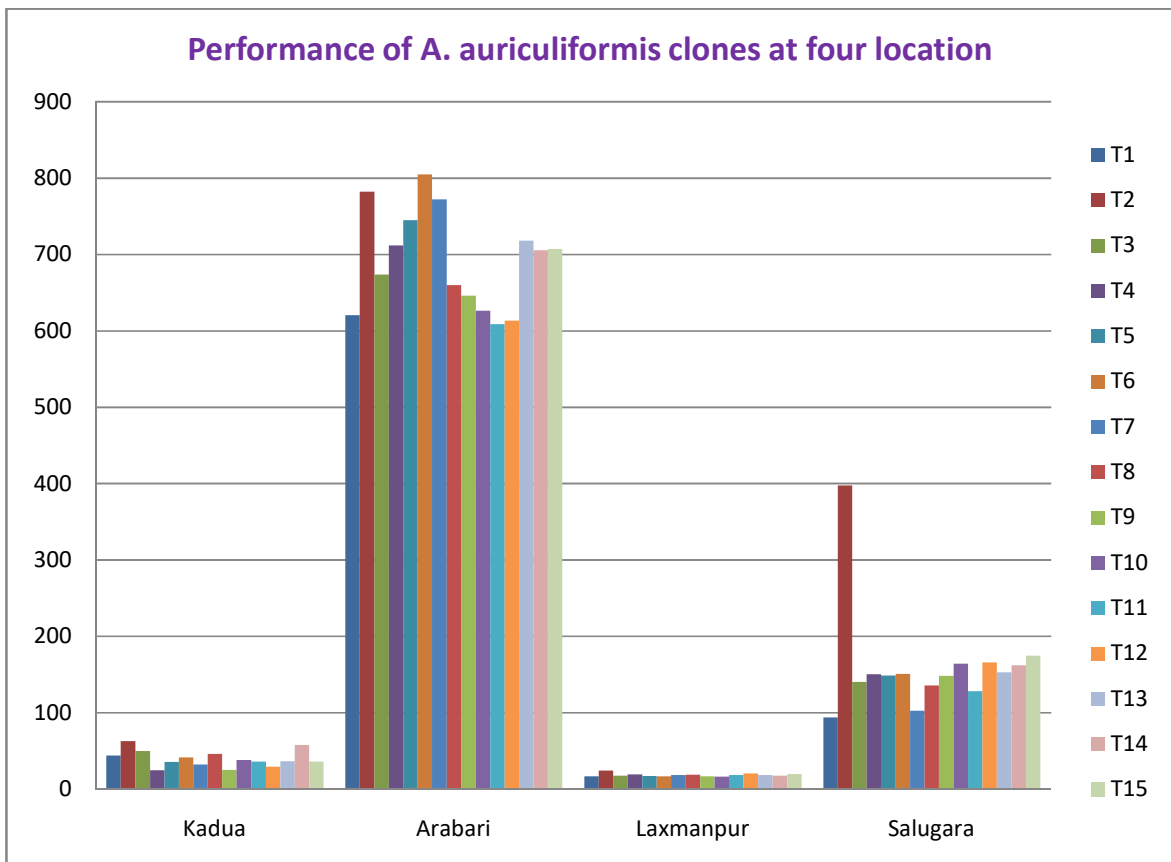
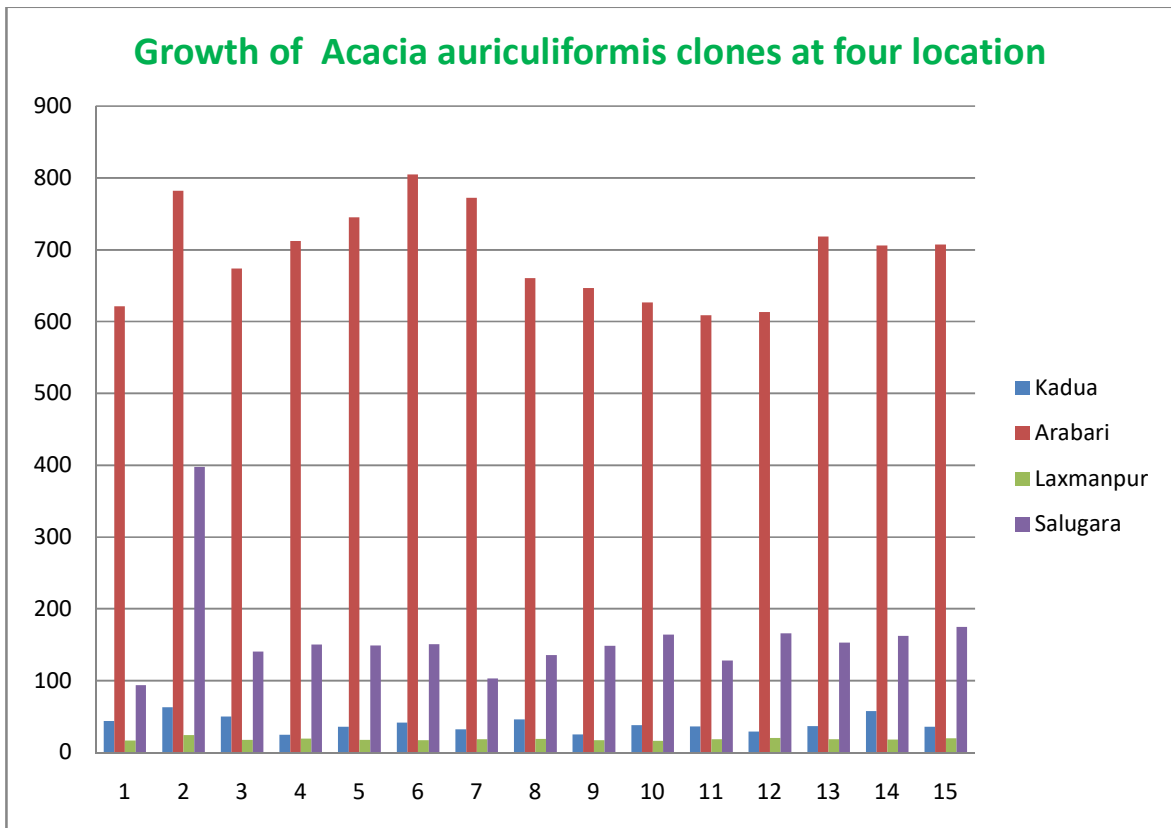
**One way**

Descriptives								
Cm <sup>3</sup>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	97	43.94	30.364	3.083	37.83	50.06	1	162
2	69	63.20	91.061	10.962	41.32	85.07	1	736
3	90	50.13	30.412	3.206	43.76	56.49	8	158
4	87	24.78	20.042	2.149	20.51	29.05	0	74
5	79	35.94	29.580	3.328	29.31	42.56	1	132
6	92	41.82	37.069	3.865	34.14	49.50	0	145
7	93	32.12	24.334	2.523	27.11	37.13	2	127
8	84	45.97	32.875	3.587	38.83	53.10	0	132
9	89	25.17	24.159	2.561	20.08	30.26	1	110
10	91	38.25	21.314	2.234	33.81	42.69	5	117
11	85	36.41	26.262	2.849	30.75	42.08	2	115
12	92	29.40	21.634	2.255	24.92	33.88	1	117
13	79	36.78	26.080	2.934	30.94	42.62	1	116
14	88	57.88	121.582	12.961	32.12	83.64	0	1149
15	89	36.08	22.937	2.431	31.24	40.91	2	116
16	98	620.92	329.396	33.274	554.88	686.96	21	1352
17	98	782.34	360.776	36.444	710.01	854.68	55	1864
18	94	673.73	350.736	36.176	601.90	745.57	82	1701
19	99	711.90	364.285	36.612	639.25	784.56	49	1593
20	92	745.02	428.964	44.723	656.18	833.85	38	1756
21	94	805.07	443.117	45.704	714.31	895.82	59	2293
22	90	772.33	372.683	39.284	694.28	850.39	64	2207
23	96	674.05	344.384	35.149	604.27	743.83	43	2543
24	91	646.22	324.196	33.985	578.71	713.74	31	1464
25	91	626.70	350.611	36.754	553.68	699.71	49	1744
26	89	608.76	384.411	40.748	527.78	689.74	69	2006
27	92	613.09	349.471	36.435	540.71	685.46	58	1456
28	91	718.07	405.843	42.544	633.55	802.59	40	2036
29	98	705.94	407.152	41.129	624.31	787.57	36	2110
30	97	714.63	319.496	32.440	650.24	779.03	100	1413
31	90	16.89	5.656	.596	15.71	18.08	3	33
32	96	24.41	14.712	1.502	21.42	27.39	2	71
33	96	17.72	10.377	1.059	15.62	19.82	3	56
34	91	19.18	6.975	.731	17.73	20.64	1	35
35	93	17.43	9.083	.942	15.56	19.30	1	45

36	90	17.00	8.502	.896	15.22	18.78	2	38
37	94	18.37	6.447	.665	17.05	19.69	4	41
38	90	18.86	8.300	.875	17.12	20.60	3	46
39	94	17.05	7.142	.737	15.58	18.51	1	40
40	89	16.48	8.468	.898	14.69	18.26	2	41
41	96	18.50	9.093	.928	16.66	20.34	4	50
42	89	20.34	8.647	.917	18.52	22.16	2	44
43	95	18.58	8.572	.880	16.83	20.32	3	38
44	95	17.85	6.404	.657	16.55	19.16	4	36
45	98	19.83	7.682	.776	18.29	21.37	4	43
46	30	93.63	77.794	14.203	64.58	122.68	16	404
47	79	402.86	2296.586	258.386	-111.55	917.27	10	20538
48	62	140.51	99.337	12.616	115.29	165.74	21	388
49	53	150.53	85.197	11.703	127.05	174.01	25	366
50	66	148.93	90.058	11.085	126.79	171.06	17	397
51	31	150.81	125.553	22.550	104.76	196.86	16	405
52	42	102.84	70.689	10.908	80.82	124.87	12	318
53	53	135.85	78.547	10.789	114.20	157.50	16	424
54	59	148.51	100.394	13.070	122.35	174.67	17	393
55	43	171.79	122.434	18.671	134.11	209.46	21	447
56	36	128.28	104.702	17.450	92.85	163.71	18	631
57	40	165.67	85.357	13.496	138.37	192.97	7	326
58	49	153.00	82.558	11.794	129.29	176.71	30	393
59	43	162.35	100.720	15.360	131.35	193.34	18	365
60	28	181.29	97.396	18.406	143.52	219.05	43	492
Total	4824	244.99	463.810	6.678	231.90	258.08	0	20538

ANOVA					
Cm <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.2628	59	7223627.274	56.293	.000
Within Groups	6.1138	4764	128322.933		
Total	1.0389	4823			

## Means Plots



**One way**

Descriptives								
Cm <sup>3</sup>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	1304	39.54	46.559	1.289	37.01	42.06	0	1149
2	1410	695.06	373.821	9.955	675.53	714.59	21	2543
3	1396	18.58	8.843	.237	18.12	19.05	1	71
4	714	174.08	769.229	28.788	117.57	230.60	7	20538
Total	4824	244.99	463.810	6.678	231.90	258.08	0	20538

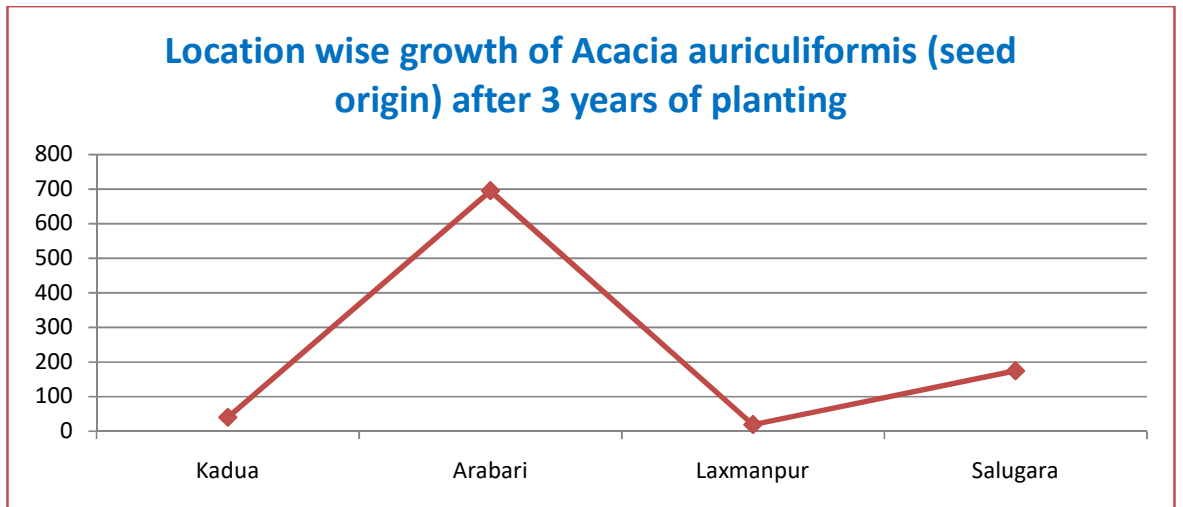
ANOVA					
Cm <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.1588	3	1.3868	1.0753	.000
Within Groups	6.2178	4820	128988.051		
Total	1.0389	4823			

**Post Hoc Tests**

**Homogeneous Subsets**

Cm <sup>3</sup>				
Duncan				
Loc_ID	N	Subset for alpha = 0.05		
		1	2	3
3	1396	18.58		
1	1304	39.54		
4	714		174.08	
2	1410			695.06
Sig.		.169	1.000	1.000

**Means Plots**



**Inference:-**

There is a significant difference in term of height and CD and valid number of plants of *Acacia auriculiformis* seed origin in 4 locations, based on data obtained after 2.5 years of growth. It has been found that the volume (CM<sup>3</sup>) of Arabari Location is better other than 3 locations. And based on valid number of tree in Salugara location is poor, but in term of height and CD the volume of trees at Salugara location, it is better than other 2 location viz. DakshinKadua and Laxmanpur-Purulia.

## Data Analysis report based on volume (Cm<sup>3</sup>) of *Acacia* hybrid clone and *Acacia auriculiformis* clone for 4 location under Silviculture (South) & Silviculture (North) Division

A. For *Acacia* hybrid- Clones- 1) B2S, 2) 69K 3) 47K 4) K47 5) 86K 6) H10 For *Acacia auriculiformis* clones 1) MA6 2) AS1 3) M7 4) M8 5) Khishma bulk seed origin

B. Location of Experiment & Area of Plantation under each range:

Name of Range	Mouza	Area in ha.	Name of species
Arabari	Chandmura	1	<i>Acacia</i> hybrid & <i>Acacia auriculiformis</i> Clone brought from Karnataka
AFR	DakshinKadua	1	<i>Acacia</i> hybrid & <i>Acacia auriculiformis</i> Clone brought from Karnataka
Purulia	Laxmanpur	1	<i>Acacia</i> hybrid & <i>Acacia auriculiformis</i> Clone brought from Karnataka
Salugara	Salugara	1	<i>Acacia</i> hybrid & <i>Acacia auriculiformis</i> Clone brought from Karnataka

C. Year of Plantation:- 2018-19

D. Data recording status:- Height and collar diameter of all core plants data were being recorded and subsequently phase wise analysis were being carried out and result is given below.

### E. Location wise Experiment Result & Inference:

Location ID	Range	Location
1	Arabari Research Range	Chandmura, Arabari
2	Attached Forest Range	DakshinKadua
3	Purulia Research Range	Laxmanpur
4	Salugara Research Range	Dabgram 9

TREATMENT	Clone Name
T1	<i>Acacia</i> hybrid (B2S)
T2	<i>Acacia</i> hybrid (69K)
T3	<i>Acacia</i> hybrid (47K)
T4	<i>Acacia</i> hybrid clone (K47)
T5	<i>Acacia</i> hybrid clone (86K)
T6	<i>Acacia</i> hybrid clone (H10)
T7	<i>Acacia auriculiformis</i> Clone -MA6
T8	<i>Acacia auriculiformis</i> Clone -AS1
T9	<i>Acacia auriculiformis</i> Clone -M7
T10	<i>Acacia auriculiformis</i> Clone -M8
T11	Khisma mixed, Bulk

Each Treatment 4 replication & per replication 25 nos trees

**Acacia hybrid and *Acacia auriculiformis* clone volume analysis of Arabari Plot under Silviculture (South) Division.**

**Oneway**

<b>Descriptives</b>								
<b>cm<sup>3</sup></b>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	91	1251.25	558.202	58.515	1135.00	1367.50	101	2849
2	93	1252.81	544.555	56.468	1140.66	1364.96	0	2728
3	95	1150.29	531.023	54.482	1042.12	1258.47	197	2464
4	89	1214.44	537.342	56.958	1101.25	1327.64	104	3081
5	99	1339.21	492.101	49.458	1241.06	1437.35	243	2401
6	94	1127.83	530.984	54.767	1019.08	1236.59	221	2414
7	96	1103.82	549.693	56.103	992.45	1215.20	24	2766
8	87	586.74	381.203	40.869	505.50	667.99	36	1780
9	94	1111.31	474.502	48.941	1014.12	1208.50	103	2247
10	92	986.02	480.509	50.097	886.51	1085.53	158	2413
11	97	762.36	379.918	38.575	685.79	838.93	31	2220
Total	1027	1083.23	541.184	16.887	1050.09	1116.37	0	3081

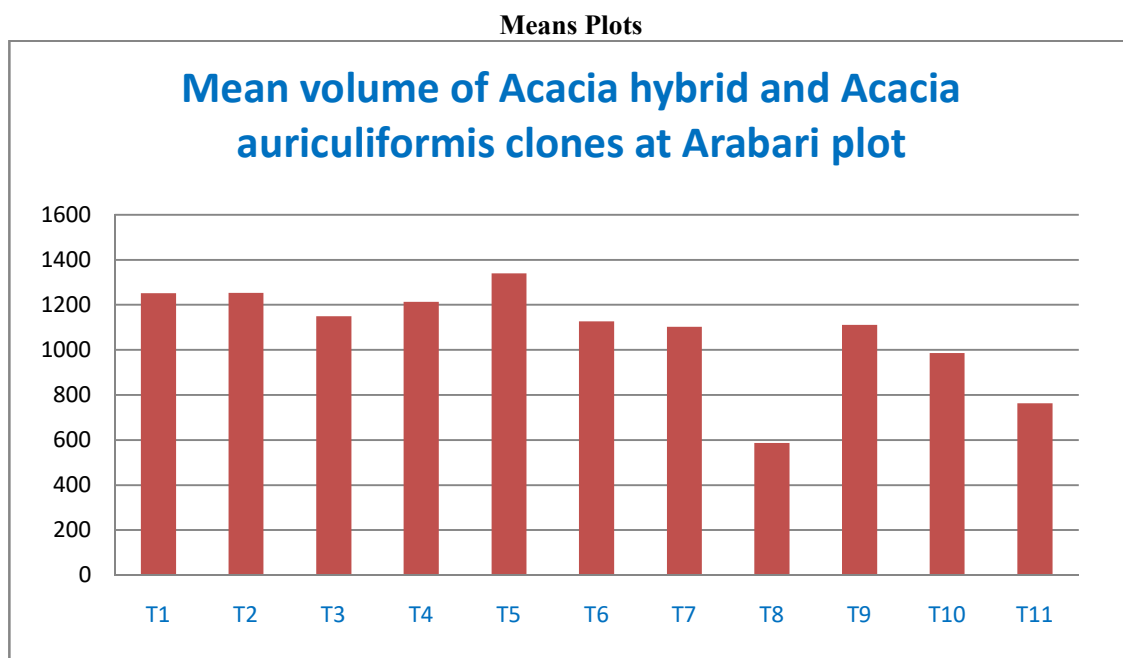
<b>ANOVA</b>					
<b>cm<sup>3</sup></b>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.6297	10	4629334.762	18.503	.000
Within Groups	2.5428	1016	250198.914		
Total	3.0058	1026			

**Post Hoc Tests**

**Homogeneous Subsets**

<b>cm<sup>3</sup></b>						
Duncan						
Treat	N	Subset for alpha = 0.05				
		1	2	3	4	5
8	87	586.74				
11	97		762.36			
10	92			986.02		
7	96			1103.82	1103.82	
9	94			1111.31	1111.31	
6	94			1127.83	1127.83	
3	95				1150.29	

4	89				1214.44	1214.44
1	91				1251.25	1251.25
2	93				1252.81	1252.81
5	99					1339.21
Sig.		1.000	1.000	.077	.080	.122



**Inference:-**

In terms of volume calculated after 2.5 years of growth, there is a significant difference at Arabari locations. It has been found that, all the hybrid clones are giving better performance than **T11** and among Acacia auriculiformis clone **T7** (Acacia auriculiformis Clone MA6) and **T9** (Acacia hybrid clone-86K) are performing well. Based on the growth of T 11, the performance of the clones may be grouped as

**Best Performer are clone no.**

- Acacia hybrid clone-86K (T5),
- Acacia hybrid 69K (T2),
- Acacia hybrid B2S (T1),
- Acacia hybrid clone - K47 (T4),

**Medium Performers are clone no.**

- Acacia hybrid - 47K (T3),
- Acacia hybrid clone-H10 (T6),
- Acacia auriculiformis Clone- M7 (T9),
- Acacia auriculiformis Clone MA-6 (T7)

**Worst performers are clone no.**

- Acacia auriculiformis Clone M8 (T10),
- Khisma mixed Bulk (T11) &
- Acacia auriculiformis Clone AS-1(T8)



**Acacia hybrid clone volume analysis of DakshinKadua-Junput  
under Silviculture (South) Division.**

**One way**

**Descriptives**

cm_3								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	28	85.43	66.219	12.514	59.75	111.11	1	247
2	35	67.19	61.978	10.476	45.90	88.48	1	252
3	35	71.82	68.648	11.604	48.24	95.40	1	239
4	30	65.03	66.986	12.230	40.01	90.04	1	260
5	23	59.82	58.285	12.153	34.61	85.02	2	193
6	35	80.19	64.169	10.847	58.15	102.23	0	235
7	29	44.71	54.859	10.187	23.84	65.58	0	207
8	35	60.35	47.863	8.090	43.91	76.79	4	209
9	40	82.92	58.974	9.325	64.06	101.78	1	231
10	50	60.84	44.767	6.331	48.12	73.56	0	176
11	64	38.11	32.142	4.018	30.09	46.14	1	138
Total	404	63.36	56.991	2.835	57.79	68.93	0	260

**ANOVA**

cm_3					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	93759.105	10	9375.910	3.032	.001
Within Groups	1215163.003	393	3092.018		
Total	1308922.108	403			

**Post Hoc Tests**

**Homogeneous Subsets**

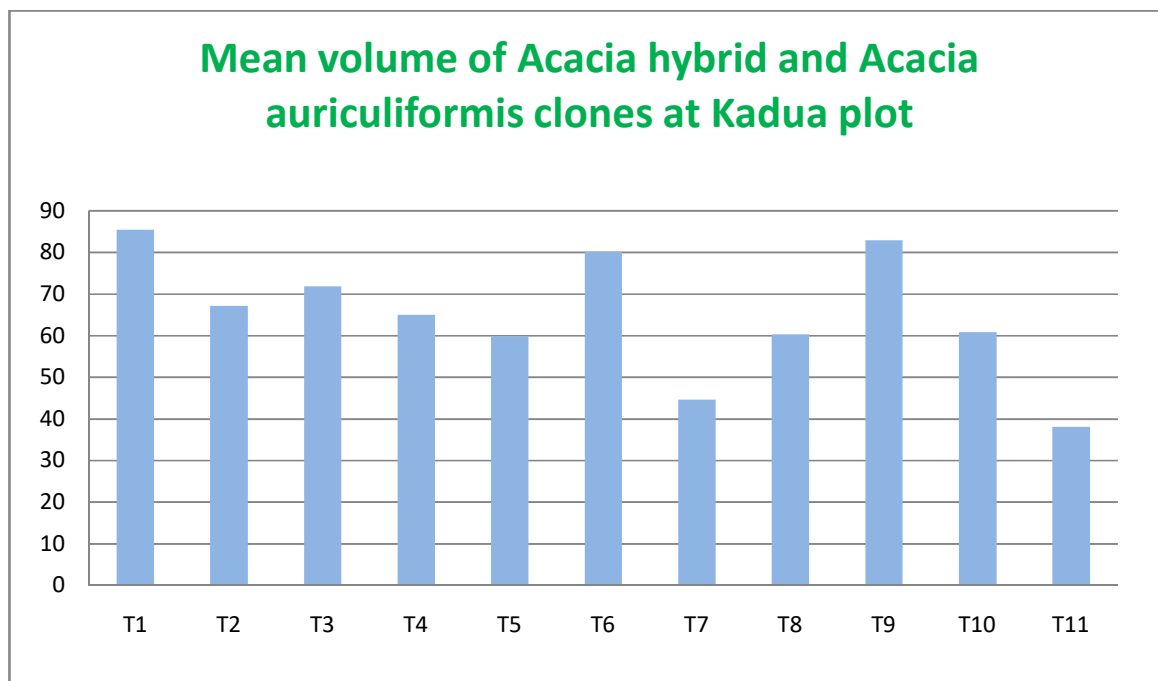
**Cm<sup>3</sup>**

**Duncan**

Treat	N	Subset for alpha = 0.05		
		1	2	3
11	64	38.11		
7	29	44.71	44.71	
5	23	59.82	59.82	59.82
8	35	60.35	60.35	60.35
10	50	60.84	60.84	60.84
4	30	65.03	65.03	65.03
2	35	67.19	67.19	67.19
3	35		71.82	71.82
6	35			80.19
9	40			82.92

1	28			85.43
Sig.		.062	.083	.111

### Means Plots



### Inference:-

In terms of volume calculated after 2.5 years of growth, there is a significant difference at DakshinKadua location. It has been found that, all the hybrid clones and *Acacia auriculiformis* clone are giving better performance than **T11**. Performance of **T1**, **T6** of hybrid and **T9** of *Acaciaauriculiformis* clone are very good. Based on the growth of **T 11**, the performance of the clones may be grouped as

### Best Performer are clone no.

Acacia hybrid B2S (T1),  
*Acacia auriculiformis* Clone- M7 (T9),  
 Acacia hybrid clone-H10 (T6),  
 Acacia hybrid - 47K (T3)

### Medium Performers are clone no.

Acacia hybrid 69K (T2),  
 Acacia hybrid clone - K47 (T4),  
*Acacia auriculiformis* Clone M8 (T10),  
*Acacia auriculiformis* Clone AS-1(T8)  
 Acacia hybrid clone-86K (T5),

### Worst performers are clone no.

*Acacia auriculiformis* Clone MA-6 (T7),  
 Khisma mixed Bulk (T11)

## Acacia hybrid clone volume analysis of Laxmanpur-Purulia under Silviculture (South) Division.

### One way

#### Descriptives

Cm <sup>3</sup>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	96	2.5553061	8.2140226	.8383402	23.888746	27.217378	13.7125	65.7253
2	96	2.4630241	4.8722640	.4972734	23.643023	25.617448	13.1445	41.1908
3	94	2.7016601	7.3681991	.7599717	25.507447	28.525754	10.3858	47.6693
4	94	2.4888051	5.7964918	.5978625	23.700809	26.075282	10.9538	39.3601
5	94	2.5513801	6.1432754	.6336305	24.255534	26.772063	9.8178	37.7906
6	97	2.3341401	6.0899563	.6183414	22.114001	24.568797	9.8888	43.0215
7	79	1.5787981	8.3157691	.9355971	13.925346	17.650607	2.4342	40.5696
8	78	1.1521931	4.0575690	.4594292	10.607088	12.436769	.9128	22.8204
9	86	2.3865291	6.2337899	.6722069	22.528759	25.201814	7.9770	41.0767
10	84	2.4940251	8.2852320	.9039929	23.142245	26.738256	9.2042	60.3600
11	96	3.7766601	237.8418443	2.42746321	-10.424640	85.957834	2.0285	2.34333
Total	994	2.4424541	74.0880858	2.34993140	19.813141	29.035944	.9128	2.34333

#### ANOVA

Cm <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	37019.523	10	3701.952	.672	.751
Within Groups	5413601.618	983	5507.224		
Total	5450621.141	993			

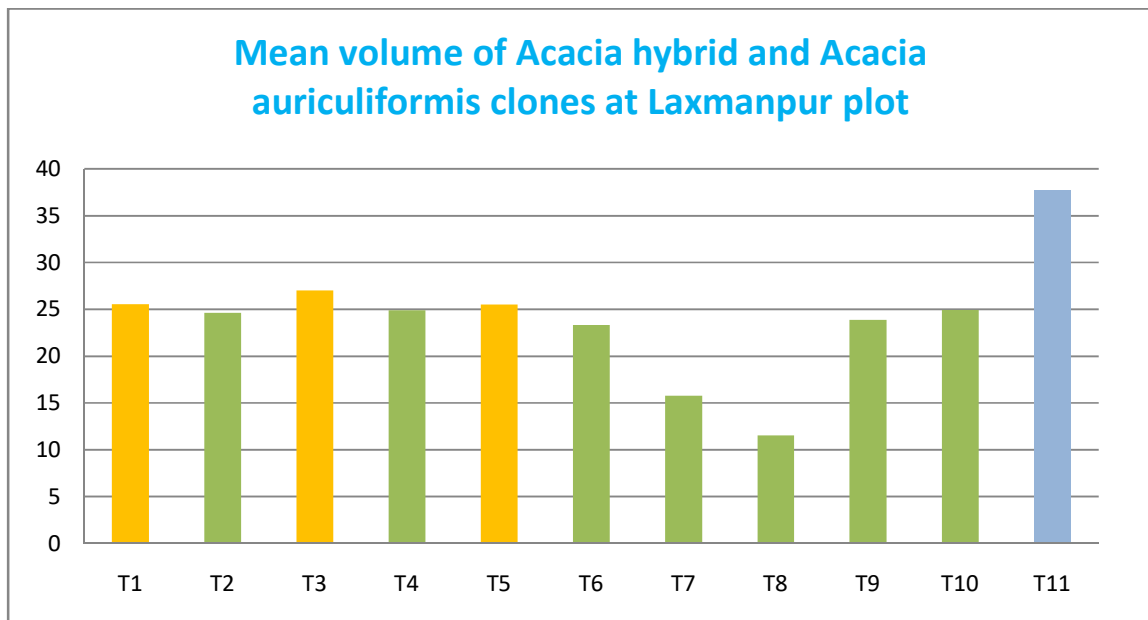
#### Post Hoc Tests

##### Homogeneous Subsets

Cm <sup>3</sup>			
Duncan			
Treat	N	Subset for alpha = 0.05	
		1	2
8	78	1.1521931	
7	79	1.5787981	1.5787981
6	97	2.3341401	2.3341401
9	86	2.3865291	2.3865291
2	96	2.4630241	2.4630241
4	94	2.4888051	2.4888051
10	84	2.4940251	2.4940251
5	94	2.5513801	2.5513801
1	96	2.5553061	2.5553061
3	94	2.7016601	2.7016601

11	96		3.7766601
Sig.		.253	.099

### Means Plots



### Inference:-

In terms of volume calculated after 2.5 years of growth, there is a significant difference at Laxmanpur location. It has been found that, all the hybrid clones and *Acacia auriculiformis* clone are not giving better performance than **T11**. No hybrid clone as well as *Aauculiformis* clone are performing well than the local seedlings planted here as control.

## Data Analysis report based on volume (Cm<sup>3</sup>) of Acacia hybrid at Salugara under Silviculture (North) Division

### One way

#### Descriptives

Cm <sup>3</sup>								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	30	857.33	512.747	93.614	665.87	1048.80	84	1802
2	17	921.34	586.579	142.266	619.75	1222.93	162	2003
3	15	678.83	274.927	70.986	526.58	831.08	164	1088
4	51	256.78	247.822	34.702	187.08	326.48	26	986
5	22	656.63	529.640	112.920	421.80	891.46	11	1764
6	20	483.78	352.797	78.888	318.67	648.90	15	1159
7	33	289.76	335.282	58.365	170.87	408.65	22	1750
8	12	202.23	252.878	73.000	41.56	362.90	15	721
9	10	386.55	337.671	106.781	145.00	628.11	62	1144
10	14	597.28	326.393	87.232	408.82	785.73	108	1087
11	22	332.48	335.837	71.601	183.58	481.39	39	1228
Total	246	489.08	446.559	28.472	433.00	545.16	11	2003

#### ANOVA

Cm <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.4267	10	1426208.702	9.688	.000
Within Groups	3.4597	235	147211.123		
Total	4.8867	245			

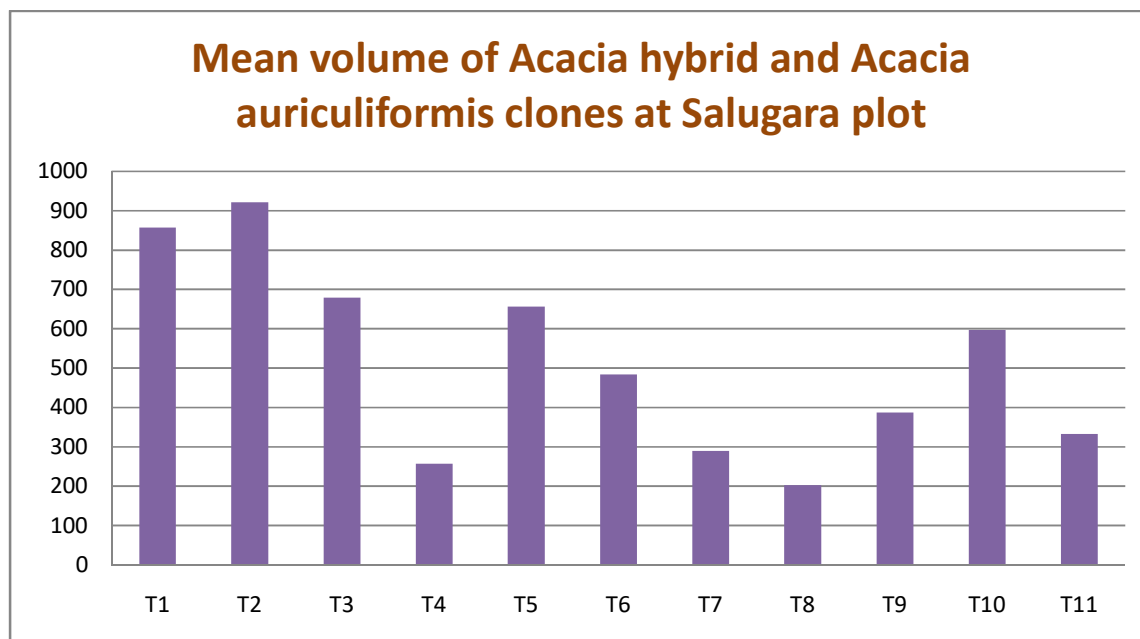
#### Post Hoc Tests

##### Homogeneous Subsets

Cm <sup>3</sup>							
Duncan							
Treat	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
8	12	202.23					
4	51	256.78					
7	33	289.76					
11	22	332.48	332.48				
9	10	386.55	386.55	386.55			
6	20	483.78	483.78	483.78	483.78		
10	14		597.28	597.28	597.28	597.28	
5	22			656.63	656.63	656.63	656.63
3	15				678.83	678.83	678.83
1	30					857.33	857.33

2	17						921.34
Sig.		.052	.057	.052	.166	.062	.057

## Means Plots



### Inference:-

In terms of volume calculated after 2.5 years of growth, there is a significant difference at Salugara location. It has been found that, except **T4** all the hybrid clones and **T9, T10** of *Acacia auriculiformis* clone are giving better performance than **T11**. Performance of **T2, T1** of hybrid and **T10** of *Acacia auriculiformis* clone are very good. Based on the growth of **T11**, the performance of the clones may be grouped as

### Best Performer are clone no.-

Acacia hybrid 69K (T2),  
Acacia hybrid B2S (T1),

### Medium Performers are clone no.-

Acacia hybrid - 47K (T3),  
Acacia hybrid clone-86K (T5)  
Acacia auriculiformis Clone M8 (T10),  
Acacia hybrid clone-H10 (T6),  
Acacia auriculiformis Clone- M7 (T9),

### Worst performers are clone no.

Acacia auriculiformis Clone MA-6 (T7),  
Acacia hybrid clone - K47 (T4),  
Acacia auriculiformis Clone AS-1(T8)  
Khisma mixed Bulk (T11)

**Acacia hybrid volume analysis for 4 location under Silviculture (South)  
& Silviculture (North) Division viz. (1) Arabari, (2) DakshinKadua-  
Junput, (3) Laxmanpur- Purulia (4) Salugara-**

Treatment	Clone Name	Treatment	Clone Name
T1	Acacia hybrid (B2S) Arabari	T23	Acacia hybrid (B2S) Hura
T2	Acacia hybrid (69K) Arabari	T24	Acacia hybrid (69K) Hura
T3	Acacia hybrid (47K) Arabari	T25	Acacia hybrid (47K) Hura
T4	Acacia hybrid clone (K47) Arabari	T26	Acacia hybrid clone (K47) Hura
T5	Acacia hybrid clone (86K) Arabari	T27	Acacia hybrid clone (86K) Hura
T6	Acacia hybrid clone (H10) Arabari	T28	Acacia hybrid clone (H10) Hura
T7	Acacia auriculiformis Clone -MA6 Arabari	T29	Acacia auriculiformis Clone -MA6 Hura
T8	Acacia auriculiformis Clone -AS1 Arabari	T30	Acacia auriculiformis Clone -AS1 Hura
T9	Acacia auriculiformis Clone -M7 Arabari	T31	Acacia auriculiformis Clone -M7 Hura
T10	Acacia auriculiformis Clone -M8 Arabari	T32	Acacia auriculiformis Clone -M8 Hura
T11	Khisma mixed, Bulk Arabari	T33	Khisma mixed, Bulk Hura
T12	Acacia hybrid (B2S) DakshinKadua	T34	Acacia hybrid (B2S) Salugara
T13	Acacia hybrid (69K) DakshinKadua	T35	Acacia hybrid (69K) Salugara
T14	Acacia hybrid (47K) DakshinKadua	T36	Acacia hybrid (47K) Salugara
T15	Acacia hybrid clone (K47) DakshinKadua	T37	Acacia hybrid clone (K47) Salugara
T16	Acacia hybrid clone (86K) DakshinKadua	T38	Acacia hybrid clone (86K) Salugara
T17	Acacia hybrid clone (H10) DakshinKadua	T39	Acacia hybrid clone (H10) Salugara
T18	Acacia auriculiformis Clone -MA6 DakshinKadua	T40	Acacia auriculiformis Clone -MA6 Salugara
T19	Acacia auriculiformis Clone -AS1 DakshinKadua	T41	Acacia auriculiformis Clone -AS1 Salugara
T20	Acacia auriculiformis Clone -M7 DakshinKadua	T42	Acacia auriculiformis Clone -M7 Salugara
T21	Acacia auriculiformis Clone -M8 DakshinKadua	T43	Acacia auriculiformis Clone -M8 Salugara
T22	Khisma mixed, Bulk DakshinKadua	T44	Khisma mixed, Bulk Salugara

**One way**

**Descriptives**

CM <sup>3</sup>								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1	91	1251.25	558.202	58.515	1135.00	1367.50	101	2849
2	92	1266.42	531.379	55.400	1156.38	1376.47	159	2728
3	95	1150.29	531.023	54.482	1042.12	1258.47	197	2464
4	89	1214.44	537.342	56.958	1101.25	1327.64	104	3081

5	99	1339.21	492.101	49.458	1241.06	1437.35	243	2401
6	96	1104.33	549.754	56.109	992.94	1215.73	0	2414
7	96	1103.82	549.693	56.103	992.45	1215.20	24	2766
8	87	586.74	381.203	40.869	505.50	667.99	36	1780
9	94	1111.31	474.502	48.941	1014.12	1208.50	103	2247
10	92	986.02	480.509	50.097	886.51	1085.53	158	2413
11	97	762.36	379.918	38.575	685.79	838.93	31	2220
12	28	85.43	66.219	12.514	59.75	111.11	1	247
13	35	67.19	61.978	10.476	45.90	88.48	1	252
14	35	71.82	68.648	11.604	48.24	95.40	1	239
15	31	62.94	66.878	12.012	38.41	87.47	0	260
16	23	59.82	58.285	12.153	34.61	85.02	2	193
17	35	80.19	64.169	10.847	58.15	102.23	0	235
18	28	46.31	55.175	10.427	24.91	67.70	2	207
19	35	60.35	47.863	8.090	43.91	76.79	4	209
20	40	82.92	58.974	9.325	64.06	101.78	1	231
21	50	60.84	44.767	6.331	48.12	73.56	0	176
22	64	38.11	32.142	4.018	30.09	46.14	1	138
23	96	25.55	8.214	.838	23.89	27.22	14	66
24	96	24.63	4.872	.497	23.64	25.62	13	41
25	94	27.02	7.368	.760	25.51	28.53	10	48
26	94	24.89	5.796	.598	23.70	26.08	11	39
27	94	25.51	6.143	.634	24.26	26.77	10	38
28	97	23.34	6.090	.618	22.11	24.57	10	43
29	79	15.79	8.316	.936	13.93	17.65	2	41
30	78	11.52	4.058	.459	10.61	12.44	1	23
31	86	23.87	6.234	.672	22.53	25.20	8	41
32	84	24.94	8.285	.904	23.14	26.74	9	60
33	96	37.77	237.842	24.275	-10.42	85.96	2	2343
34	30	857.33	512.747	93.614	665.87	1048.80	84	1802
35	17	921.34	586.579	142.266	619.75	1222.93	162	2003
36	15	678.83	274.927	70.986	526.58	831.08	164	1088
37	51	256.78	247.822	34.702	187.08	326.48	26	986
38	22	656.63	529.640	112.920	421.80	891.46	11	1764
39	20	483.78	352.797	78.888	318.67	648.90	15	1159
40	33	289.76	335.282	58.365	170.87	408.65	22	1750
41	12	202.23	252.878	73.000	41.56	362.90	15	721
42	10	386.55	337.671	106.781	145.00	628.11	62	1144
43	16	547.54	333.961	83.490	369.59	725.50	108	1087
44	22	332.48	335.837	71.601	183.58	481.39	39	1228
Total	2674	479.83	613.684	11.868	456.56	503.10	0	3081



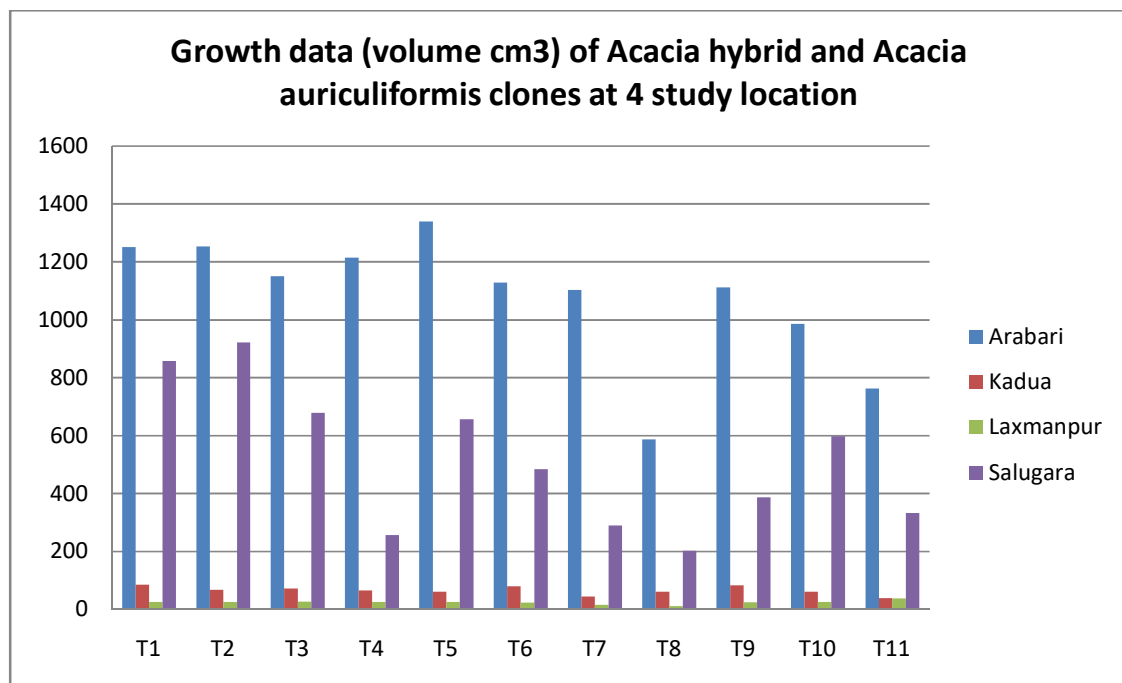
ANOVA					
CM <sup>3</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.1018	43	1.6517	146.412	.000
Within Groups	2.9668	2630	112783.236		
Total	1.0079	2673			

**Post Hoc Tests**  
**Homogeneous Subsets**

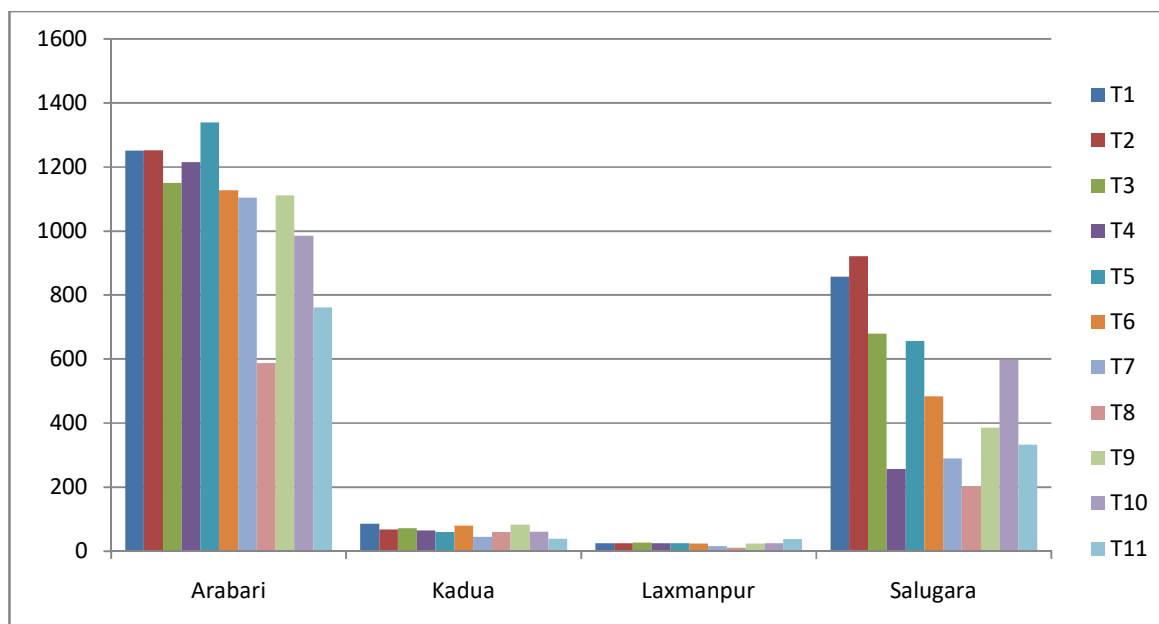
CM <sup>3</sup>														
Duncan														
Treat	N	Subset for alpha = 0.05												
		1	2	3	4	5	6	7	8	9	10	11	12	13
30	78	11.52												
29	79	15.79	15.79											
28	97	23.34	23.34											
31	86	23.87	23.87											
24	96	24.63	24.63											
26	94	24.89	24.89											
32	84	24.94	24.94											
27	94	25.51	25.51											
23	96	25.55	25.55											
25	94	27.02	27.02											
33	96	37.77	37.77											
22	64	38.11	38.11											
18	28	46.31	46.31											
16	23	59.82	59.82											
19	35	60.35	60.35											
21	50	60.84	60.84											
15	31	62.94	62.94											
13	35	67.19	67.19											
14	35	71.82	71.82											
17	35	80.19	80.19											
20	40	82.92	82.92											
12	28	85.43	85.43											
41	12		202.23	202.23										
37	51			256.78	256.78									
40	33			289.76	289.76									
44	22			332.48	332.48	332.48								
42	10				386.55	386.55								
39	20					483.78	483.78							
43	16						547.54	547.54						
8	87							586.74	586.74					

38	22							656.63	656.63					
36	15							678.83	678.83					
11	97								762.36	762.36				
34	30									857.33	857.33			
35	17									921.34	921.34			
10	92										986.02	986.02		
7	96											1103.82	1103.82	
6	96											1104.33	1104.33	
9	94											1111.31	1111.31	
3	95											1150.29	1150.29	
4	89												1214.44	1214.44
1	91												1251.25	1251.25
2	92												1266.42	1266.42
5	99													1339.21
Sig.		.462	.055	.124	.126	.063	.209	.121	.197	.050	.115	.056	.068	.142

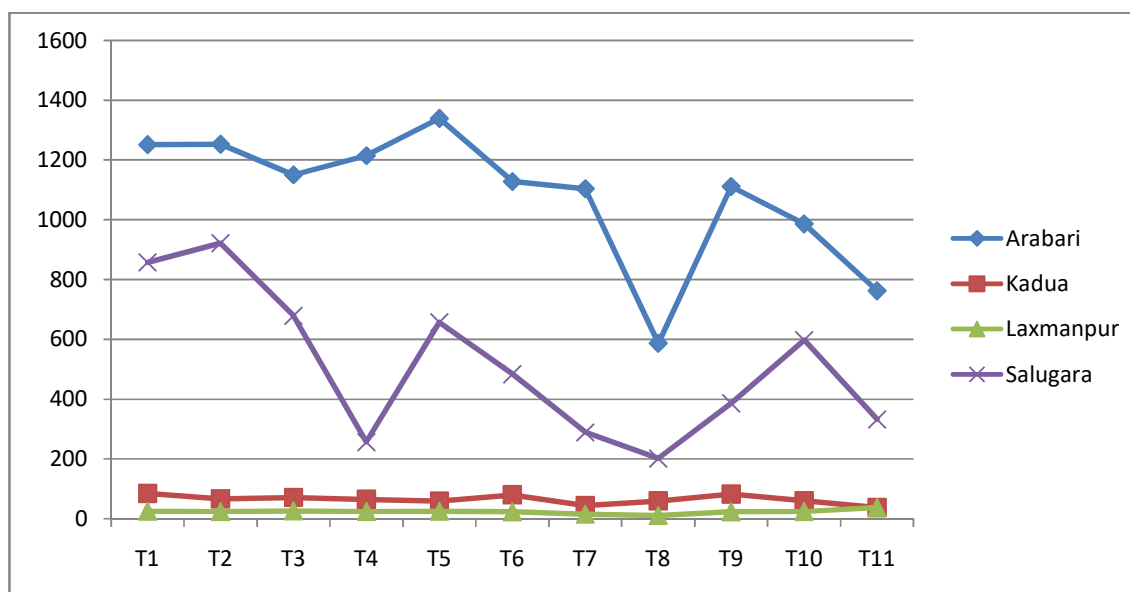
### Means Plots



## Growth of Acacia Hybrid Clones and Acacia auriculiformis Clones at 4 location



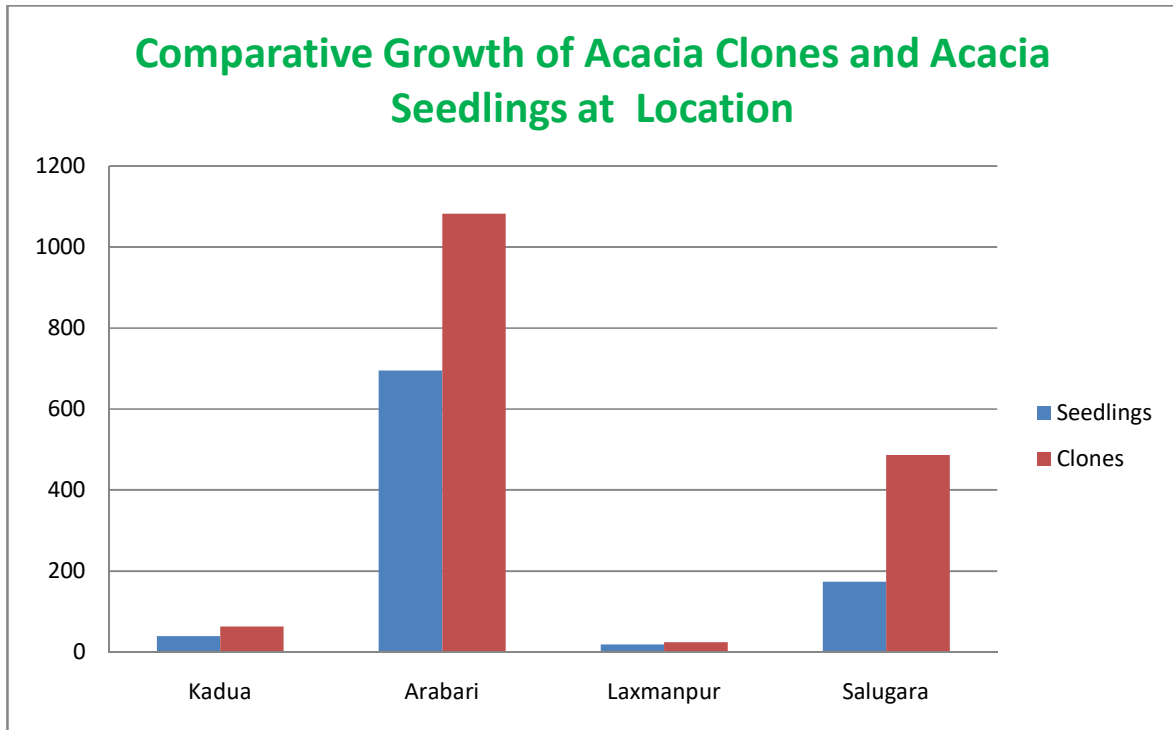
## Comparative growth of Acacia Hybrid Clones and Acacia auriculiformis Clones at 4 location



### Composite performance of Acacia hybrid clones and Acacia auriculiformis clones at 4 different locations:-

**Best Performer are clone no. -** Acacia hybrid clone-86K (T5), Acacia hybrid 69K (T2), Acacia hybrid B2S (T1), Acacia hybrid clone - K47 (T4), Acacia hybrid - 47K (T3), Acacia hybrid clone- H10 (T6), *Acacia auriculiformis* Clone- M7 (T9), *Acacia auriculiformis* Clone MA-6 (T7), *Acacia auriculiformis* Clone M8 (T10) All are at Arabari location. Acacia hybrid 69K (T2), Acacia hybrid B2S (T1), at Salugara location and Khisma mixed Bulk (T11) & *Acacia auriculiformis* Clone AS- 1(T8) at Arabari location.

Remaining location are not suitable as productivity is very less as per record taken in December 2020.



## Summary Report

Comparative account of growth performance of Acacia hybrid six clones brought from Karnataka, *Acacia auriculiformis* 4 clones brought from Karnataka, *Acacia auriculiformis* 4 seed origin brought from Karnataka, & *Acacia auriculiformis* seed origin seedling from 12 plus trees of West Bengal.

**Growth performance wise Acacia hybrid clones, *Acacia auriculiformis* clones & seed origin are given in ascending order**

**Location- at Chandmura, Arabari**

Sl No	Treatment No	Species	Clone /Seed origin	Origin	Volume in CM <sup>3</sup>
1	T5	Acacia hybrid 86K	Clone	Karnataka	1339
2	T2	Acacia hybrid 69K	Clone	Karnataka	1253
3	T1	Acacia hybrid B2S	Clone	Karnataka	1251
4	T4	Acacia hybrid K49	Clone	Karnataka	1214
5	T3	Acacia hybrid 47K	Clone	Karnataka	1150
6	T6	Acacia hybrid H10	Clone	Karnataka	1127
7	T9	Acacia auriculiformis M7	Clone	Karnataka	1111
8	T7	Acacia auriculiformis MA6	Clone	Karnataka	1104
9	T10	Acacia auriculiformis M8	Clone	Karnataka	986
10	T17	Acacia auriculiformis	Seed origin	Bhedua Plus tree No-5	805
11	T13	Acacia auriculiformis	Seed origin	KarnatakBeede(R)SI 3	772
12	T18	Acacia auriculiformis	Seed origin	Khisma Tree no 2	772
13	T11	Acacia auriculiformis	Seed origin	Khisma Bulk	762
14	T16	Acacia auriculiformis	Seed origin	Sitarampur, Tree no 44	745
15	T24	Acacia auriculiformis	Seed origin	Gobindapur Tree no 4	718
16	T15	Acacia auriculiformis	Seed origin	Karnataka MumbarSl 5	711
17	T26	Acacia auriculiformis	Seed origin	Lataguri	707
18	T25	Acacia auriculiformis	Seed origin	Khishma mixed	705
19	T14	Acacia auriculiformis	Seed origin	Karnataka 1993 Research 4	674

20	T19	Acacia auriculiformis	Seed origin	Khisma Tree no 4	660
21	T20	Acacia auriculiformis	Seed origin	Khisma Tree no 8	646
22	T21	Acacia auriculiformis	Seed origin	Khadalgobra Tree no 12	627
23	T12	Acacia auriculiformis	Seed origin	Karnataka Balmukh	621
24	T23	Acacia auriculiformis	Seed origin	Gangachar Tree no 21	613
25	T22	Acacia auriculiformis	Seed origin	Khadalgobra Tree no 13	608
26	T8	Acacia auriculiformis	Clone	Karnataka- AS1	587

### LOCATION:-DakshinKadua-Digha

Sl. No.	Treat No.	Species	Clone / Seed origin	Origin	Volume in CM3
1	T1	Acacia hybrid (B2S)	Clone	Karnataka	85.43
2	T9	Acacia auriculiformis Clone- M7	Clone	Karnataka	82.92
3	T6	Acacia hybrid Clone - H10	Clone	Karnataka	80.19
4	T3	Acacia hybrid (47K)	Clone	Karnataka	71.82
5	T2	Acacia hybrid-69K	Clone	Karnataka	67.19
6	T4	Acacia hybrid- K47	Clone	Karnataka	65.03
7	T13	Acacia auriculiformis	Seed Origin	Karnataka, Beede (R), Sl. 3	63.20
8	T10	Acacia hybrid M8	Clone	Karnataka	60.84
9	T8	Acacia auriculiformis clone - AS1	Clone	Karnataka	60.35
10	T5	Acacia hybrid (86K)	Clone	Karnataka	59.82
11	T25	Acacia auriculiformis	Seed Origin	Khisma- Nadia Bulk	57.88
12	T14	Acacia auriculiformis	Seed Origin	Karnataka-1993 Resea, Sl-4	50.13
13	T19	Acacia auriculiformis-	Seed Origin	Khisma Plus Tree No. -4	45.97
14	T7	Acacia auriculiformis M7	Clone	Karnataka	44.71
15	T12	Acacia auriculiformis	Seed Origin	Karnataka - Balmukh	43.94
16	T17	Acacia auriculiformis	Seed Origin	Bhedua Plus Tree No. - 5	41.82
17	T21	Acacia auriculiformis	Seed Origin	Khadalgobra Plus Tree. 12	38.25
18	T11	Acacia auriculiformis	Seed origin	Khisma Mixed Bulk	38.11
19	T24	Acacia auriculiformis	Seed Origin	Gobindapur Plus Tree -4	36.78
20	T22	Acacia auriculiformis	Seed Origin	Khadalgobra Plus Treeo. 13	36.42
21	T26	Acacia auriculiformis	Seed Origin	Lataguri	36.08
22	T16	Acacia auriculiformis	Seed Origin	Sitarampur Plus Tree - 44	35.94
23	T18	Acacia auriculiformis	Seed Origin	Khisma Plus Tree No-2	32.12
24	T23	Acacia auriculiformis	Seed Origin	Gangachar Plus Tree . 21	29.40
25	T20	Acacia auriculiformis	Seed Origin	Khisma Plus Tree No. -8	25.17
26	T15	Acacia auriculiformis	Seed Origin	Karnataka - Mumber Sl. -5	24.78

### Location at Laxmanpur, Purulia

Sl. No.	Treatm ent No.	Species	Clone / Seed origin	Origin	Volume in CM3
1	T2	Acacia auriculiformis- Karnataka, Beede (R), Sl. 3	Seed Origin	Karnataka	24.41
2	T12	Acacia auriculiformis-Gangachar Plus Tree No. 21	Seed Origin	Gangachar	20.34
3	T15	Acacia auriculiformis- Lataguri	Seed Origin	Lataguri	19.83
4	T4	Acacia auriculiformis- Karnataka - Mumber Sl. -5	Seed Origin	Karnataka- Sl-5	19.18
5	T8	Acacia auriculiformis-Khisma Plus Tree No. -4	Seed Origin	Khisma- Nadia	18.86
6	T13	Acacia auriculiformis- Gobindapur Plus Tree No-4	Seed Origin	Gobindapur	18.58
7	T11	Acacia auriculiformis-Khadalgobra Plus Tree. 13	Seed Origin	Khadalgobra	18.50
8	T7	Acacia auriculiformis-Khisma Plus Tree No-2	Seed Origin	Khisma- Nadia	18.37
9	T14	Acacia auriculiformis-Khisma Mixed Bulk	Seed Origin	Khisma- Nadia	17.85
10	T3	Acacia auriculiformis- Karnataka-1993 Rese Sl-4	Seed Origin	Karnataka	17.72
11	T5	Acacia auriculiformis-Sitarampur Plus Tree - 44	Seed Origin	Sitarampur	17.43
12	T9	Acacia auriculiformis-Khisma Plus Tree No. -8	Seed Origin	Khisma- Nadia	17.05
13	T6	Acacia auriculiformis-Bhedua Plus Tree No. - 5	Seed Origin	Bhedua	17.00
14	T1	Acacia auriculiformis- Karnataka - Balmukh	Seed Origin	Karnataka	16.89
15	T10	Acacia auriculiformis- Khadalgobra Plus Tree . 12	Seed Origin	Khadalgobra	16.48
16	T26	Acacia hybrid Khisma mixed	Clone	Khisma- Nadia	3.77
17	T18	Acacia hybrid (47K)	Clone	Karnataka	2.70
18	T16	Acacia hybrid (B2S)	Clone	Karnataka	2.55
19	T20	Acacia hybrid (86K)	Clone	Karnataka	2.55
20	T25	Acacia hybrid M8	Clone	Karnataka	2.49
21	T19	Acacia hybrid- K47	Clone	Karnataka	2.48
22	T17	Acacia hybrid-69K	Clone	Karnataka	2.46

23	T24	Acacia auriculiformis Clone- M7	Clone	Karnataka	2.38
24	T21	Acacia hybrid Clone - H10	Clone	Karnataka	2.33
25	T22	Acacia auriculiformis clone - MA6	Clone	Karnataka	1.57
26	T23	Acacia auriculiformis clone - AS1	Clone	Karnataka	1.15

### Location – at Salugara, North Bengal

Sl. No	Treatment No	Species	Clone /Seed origin	Origin	Volume in cm <sup>3</sup>
1	T2	Acacia hybrid 69K	Clone	Karnataka	921
2	T1	Acacia hybrid B2S	Clone	Karnataka	857
3	T3	Acacia hybrid 47K	Clone	Karnataka	679
4	T5	Acacia hybrid 86K	Clone	Karnataka	657
5	T10	Acacia auriculiformisM8	Clone	Karnataka	597
6	T6	Acacia hybrid H10	Clone	Karnataka	484
7	T13	Acacia auriculiformis	Seed origin	KarnatakBeede(R)Sl 3	398
8	T9	Acacia auriculiformis M7	Clone	Karnataka	386
9	T11	Acacia auriculiformis	Seed origin	Khisma Bulk	332
10	T7	Acacia auriculiformis MA6	Clone	Karnataka	290
11	T4	Acacia hybrid K49	Clone	Karnataka	257
12	T8	Acacia auriculiformis	Clone	Karnataka- AS1	202
13	T26	Acacia auriculiformis	Seed origin	Lataguri	175
14	T23	Acacia auriculiformis	Seed origin	Gangachar Tree no 21	166
15	T21	Acacia auriculiformis	Seed origin	Khadalgobra Tree no 12	164
16	T25	Acacia auriculiformis	Seed origin	Khishma mixed	162
17	T24	Acacia auriculiformis	Seed origin	Gobindapur Tree no 4	153
18	T17	Acacia auriculiformis	Seed origin	Bhedua Plus tree No-5	151
19	T15	Acacia auriculiformis	Seed origin	Karnataka MumbarSl no 5	150
20	T16	Acacia auriculiformis	Seed origin	Sitarampur, Tree no 44	149
21	T20	Acacia auriculiformis	Seed origin	Khisma Tree no 8	148
22	T14	Acacia auriculiformis	Seed origin	Karnataka 1993 Research Sl no 4	140
23	T19	Acacia auriculiformis	Seed origin	Khisma Tree no 4	135
24	T22	Acacia auriculiformis	Seed origin	Khadalgobra Tree no 13	128
25	T18	Acacia auriculiformis	Seed origin	Khisma Tree no 2	103
26	T12	Acacia auriculiformis	Seed origin	Karnataka Balmukh	621

**Conclusion-** Location wise, there is a significant difference at 95% probability level among growth of Acacia hybrid clone, *Acacia auriculiformis* clone and *Acacia auriculiformis* seed origin plant brought from Karnataka and different plus tree seed of West Bengal. Best growth has been observed at Arabari location followed by Salugara location and least growth is recorded from Purulia location. Most of the Acacia hybrid showing robust growth in almost every locations, clones of *Acacia auriculiformis* M7, *Acacia auriculiformis* MA6, *Acacia auriculiformis* M8 are also performing better in most location. Some seed originated plant like Bhedua Plus tree No-5, KarnatakBeede(R)Sl 3, Khisma Tree no 2, Khisma Bulk, Sitarampur, Tree no 44 etc are also showing promising growth.

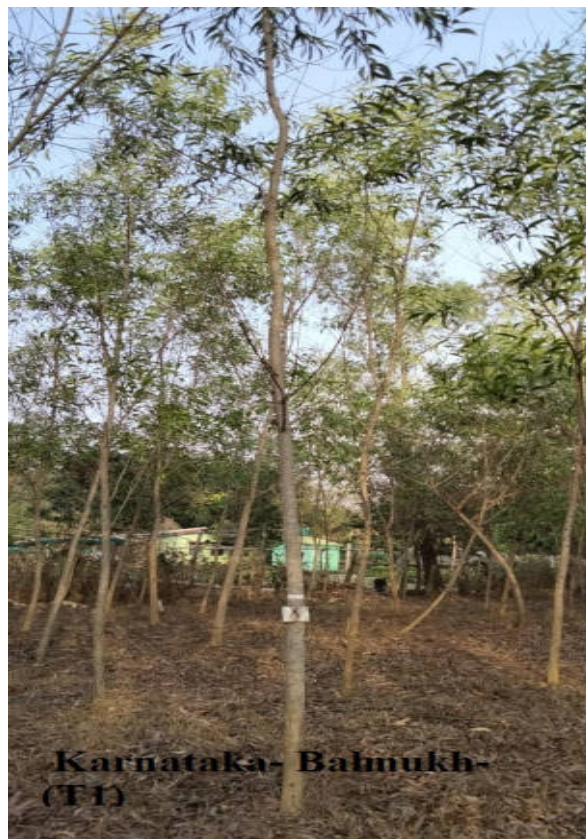
The study to be continued for another 5 years for

- Selection of best material to be continued with.
- Analyze the growth of the hybrid clones and standardize the technique for preparation of clone after making clonal multiplication area.
- Testing the timber quality of the hybrid clones and the *Acacia auriculiformis* clones.

**Photographs of *Acacia auriculiformis* at Chandmura-Arabari under Silviculture (South) Division**



***Acacia auriculiformis* seed  
origin- Bhedua, Tree No. 5,  
(T6)**



**Karnataka- Balmukh-  
(T1)**



**Karnataka- Mumber (SI-5)  
(T4)**



**Khadalgobra-Tree No. 12  
(T10)**



**Khadalgobra- Tree No.13  
(T11)**



**Khisma Mixed Bulk (T14)**



**Khisma Tree No. 2 (T7)**



**Lataguri (T-15)**



Photographs of Acacia hybrid Clone at Chandmura-Arabari under Silviculture (S) Division

