

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 128m³ 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**

| | | |
|----------------------------------|--|-----------------------------|
| Principal Investigator | Manik Lal Sarkar, IFS Divisional Forest Officer Nabanita Sanyal, WBFS,ADFO | Silviculture South Division |
| | Koushik Sarkar, IFS Divisional Forest Officer | Silviculture North Division |
| Co-Principal Investigator | Niladri Shakha, FR | Arabari Range, |
| | Nibedita Majhi, FR | AFR |
| | Subrata Basu, FR | Purulia Range, |
| Support Staff | 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 *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 | | |
|---|--------------------|--|--|

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 3mt x 2.5 mt 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 | | | |
| | R2 | 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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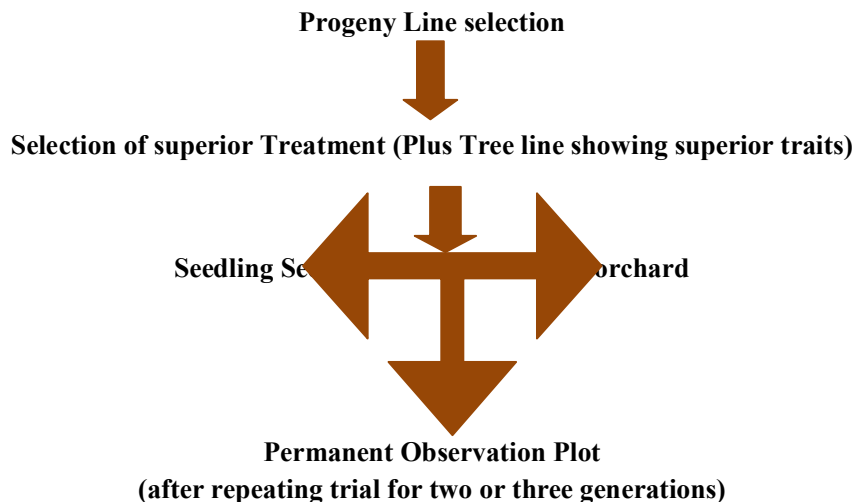
Colour references

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
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| | | | | | | | | | | |

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 |
| R2 | 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 |
| 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.

4th 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.

1st column- Between Group - No. of Treatment

1st column- Within Group- No. of individual recorded. Or the replication value as recorded.

2nd 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.

3rd column - D.f. = Degree of freedom =(N-1)

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

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

6th 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 :-

1st column - Treatment no.

2nd column - N- No. of individual observed with a single treatment.

3rd 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) , SI-3) |
| 3 | T3 C (Karnataka, 1993 Research, SI-4) |
| 4 | T4 D (Karnataka, Mumbar, SI-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 ³ | | | | | | |
| 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 ³ | | | | | | | | |
| | 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 ³ | | | | | | | | |
| | 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 |

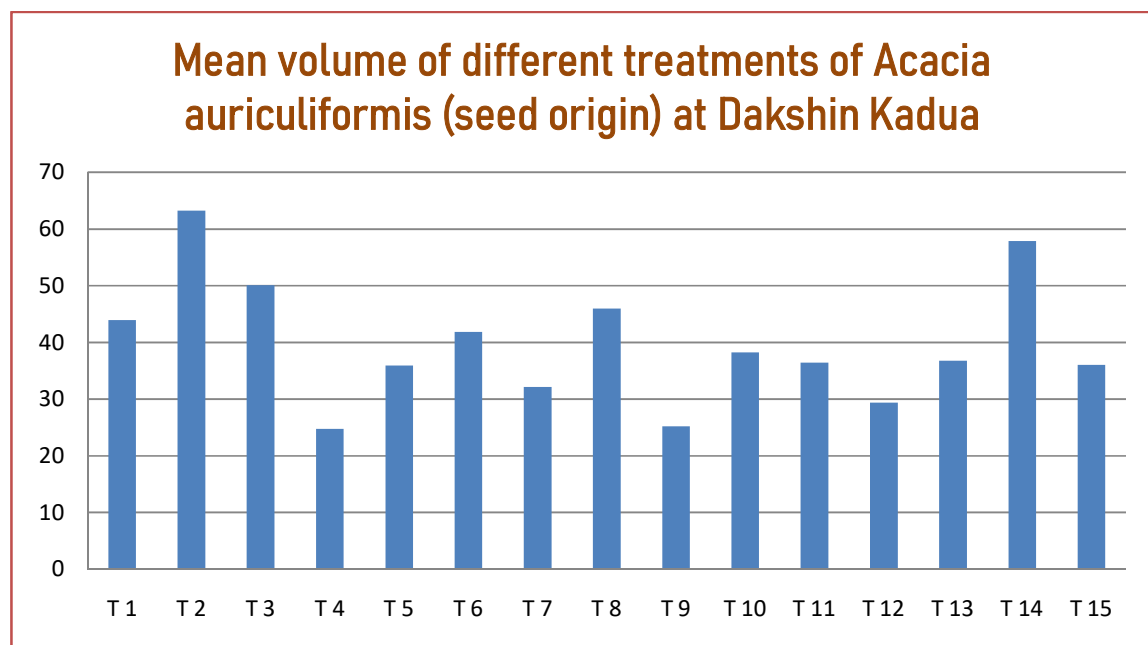
| ANOVA | | | | | |
|-----------------|----------------|------|-------------|-------|------|
| Cm ³ | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 139720.071 | 14 | 9980.005 | 4.791 | .000 |
| Within Groups | 2684874.001 | 1289 | 2082.912 | | |
| Total | 2824594.072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

Post Hoc Tests
Homogeneous Subsets

| Cm ³ | | | | | | | |
|-----------------|----|-------------------------|-------|-------|-------|---|---|
| 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

| Case Processing Summary | | | | | | |
|--------------------------------|----------|---------|----------|---------|-------|---------|
| | Cases | | | | | |
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| cm³ * Treat | 1414 | 94.3% | 86 | 5.7% | 1500 | 100.0% |

| Report | | | | | | |
|-----------------------|---------------|-------------|----------------|----------|-------------|---------------|
| Cm³ | | | | | | |
| 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

| Descriptives | | | | | | | | |
|-----------------------|----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
| Cm³ | | | | | | | | |
| | 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 |

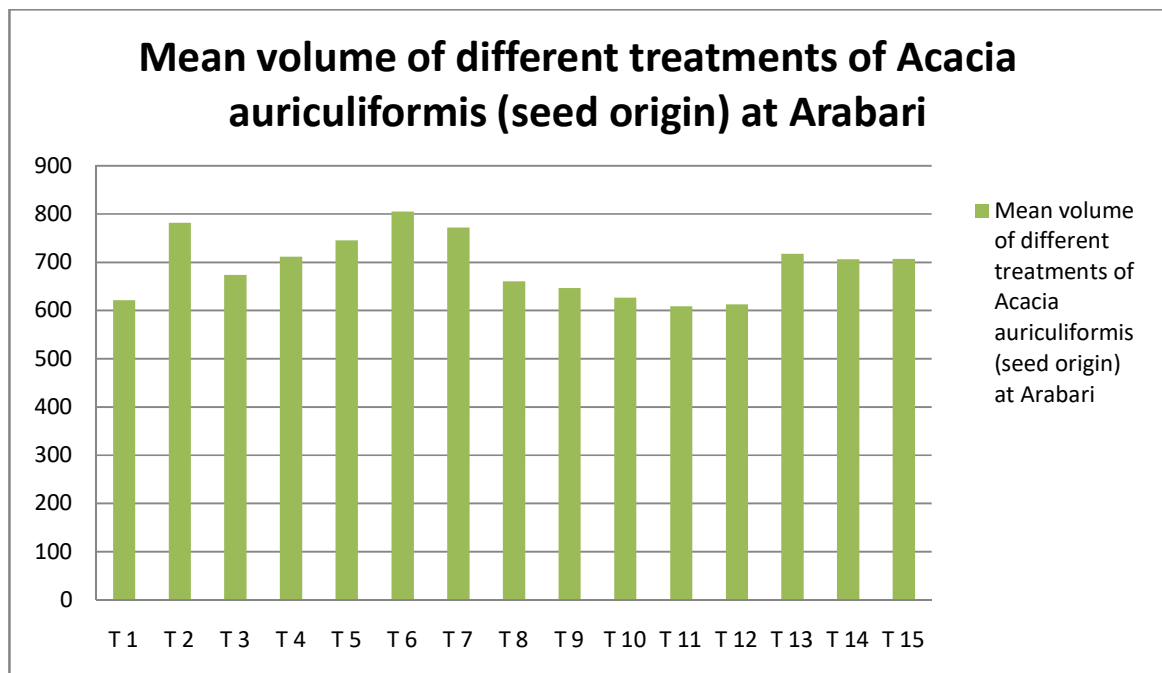
| | | | | | | | | |
|-------|------|--------|---------|--------|--------|--------|----|------|
| 3 | 94 | 673.73 | 350.736 | 36.176 | 601.90 | 745.57 | 82 | 1701 |
| 4 | 99 | 711.90 | 364.285 | 36.612 | 639.25 | 784.56 | 49 | 1593 |
| 5 | 92 | 745.02 | 428.964 | 44.723 | 656.18 | 833.85 | 38 | 1756 |
| 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 |

| ANOVA | | | | | |
|-----------------------|----------------|------|-------------|-------|------|
| Cm³ | | | | | |
| | 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**

| Cm³ | | | | | |
|-----------------------|----|-------------------------|--------|--------|--------|
| Duncan | | | | | |
| 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.**

| Case Processing Summary | | | | | | |
|--------------------------------|----------|---------|----------|---------|-------|---------|
| | Cases | | | | | |
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| Cm ³ * Treat | 1396 | 91.2% | 134 | 8.8% | 1530 | 100.0% |

| Report | | | | | | |
|-----------------|-------|------|----------------|---------|---------|--------------|
| Cm ³ | | | | | | |
| 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% |

| One way | | | | | | | | |
|-----------------|----|-------|----------------|------------|----------------------------------|-------------|---------|---------|
| Descriptives | | | | | | | | |
| Cm ³ | | | | | | | | |
| | 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 |

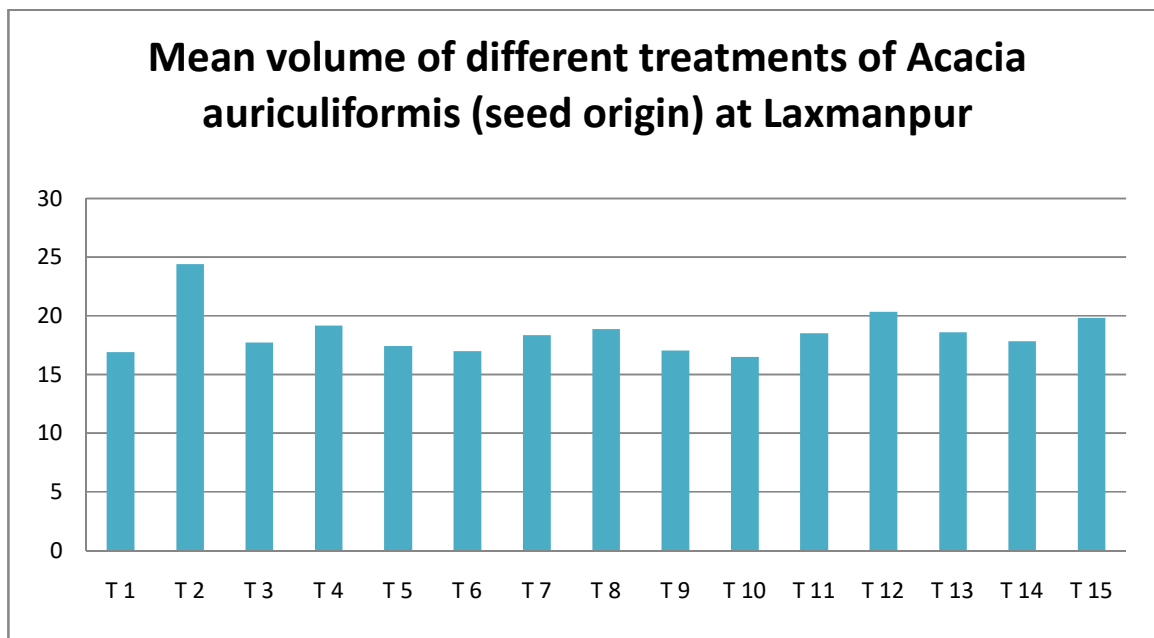
| | | | | | | | | |
|-------|------|-------|-------|------|-------|-------|---|----|
| 40 | 89 | 16.48 | 8.468 | .898 | 14.69 | 18.26 | 2 | 41 |
| 41 | 96 | 18.50 | 9.093 | .928 | 16.66 | 20.34 | 4 | 50 |
| 42 | 89 | 20.34 | 8.647 | .917 | 18.52 | 22.16 | 2 | 44 |
| 43 | 95 | 18.58 | 8.572 | .880 | 16.83 | 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 ³ | | | | | |
| | 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 ³ | | | | | |
|-----------------|----|-------------------------|-------|-------|-------|
| 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 (Cm³) of Acacia hybrid for Salugara
research Range under Silviculture (North) Division**

Means

| Case Processing Summary | | | | | | |
|--------------------------------|----------|---------|----------|---------|-------|---------|
| | Cases | | | | | |
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| cm_3 * Treat | 718 | 47.9% | 782 | 52.1% | 1500 | 100.0% |

| Report | | | | | | |
|-----------------------|---------------|------------|----------------|----------|--------------|---------------|
| Cm³ | | | | | | |
| 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% |
| Total | 173.11 | 718 | 767.190 | 0 | 20538 | 100.0% |

One way

| Descriptives | | | | | | | | |
|-----------------------|----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
| Cm³ | | | | | | | | |
| | 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 |

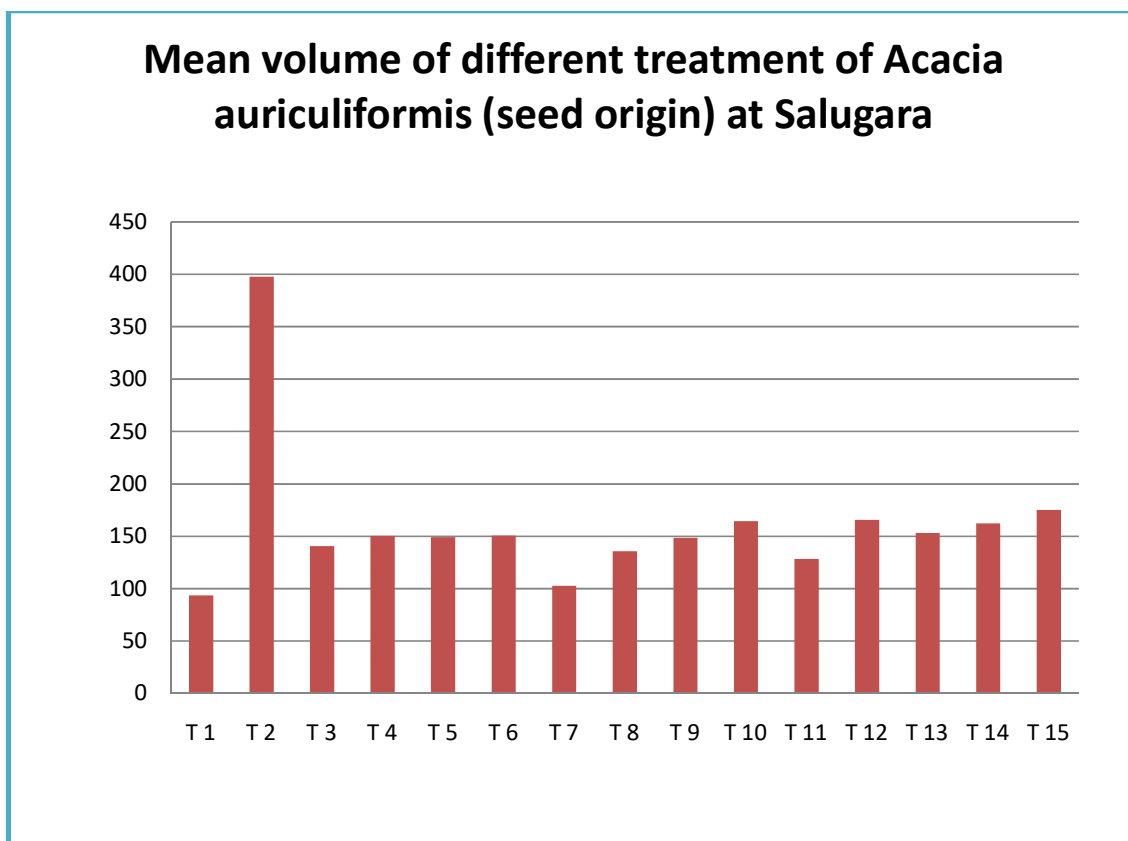
| | | | | | | | | |
|-------|-----|--------|---------|--------|--------|--------|----|-------|
| 8 | 53 | 135.85 | 78.547 | 10.789 | 114.20 | 157.50 | 16 | 424 |
| 9 | 59 | 148.51 | 100.394 | 13.070 | 122.35 | 174.67 | 17 | 393 |
| 10 | 45 | 164.15 | 124.862 | 18.613 | 126.64 | 201.66 | 0 | 447 |
| 11 | 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 |

| ANOVA | | | | | |
|-----------------------|----------------|-----|-------------|------|------|
| Cm³ | | | | | |
| | 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**

| Cm³ | | |
|-----------------------|----|-------------------------|
| 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-

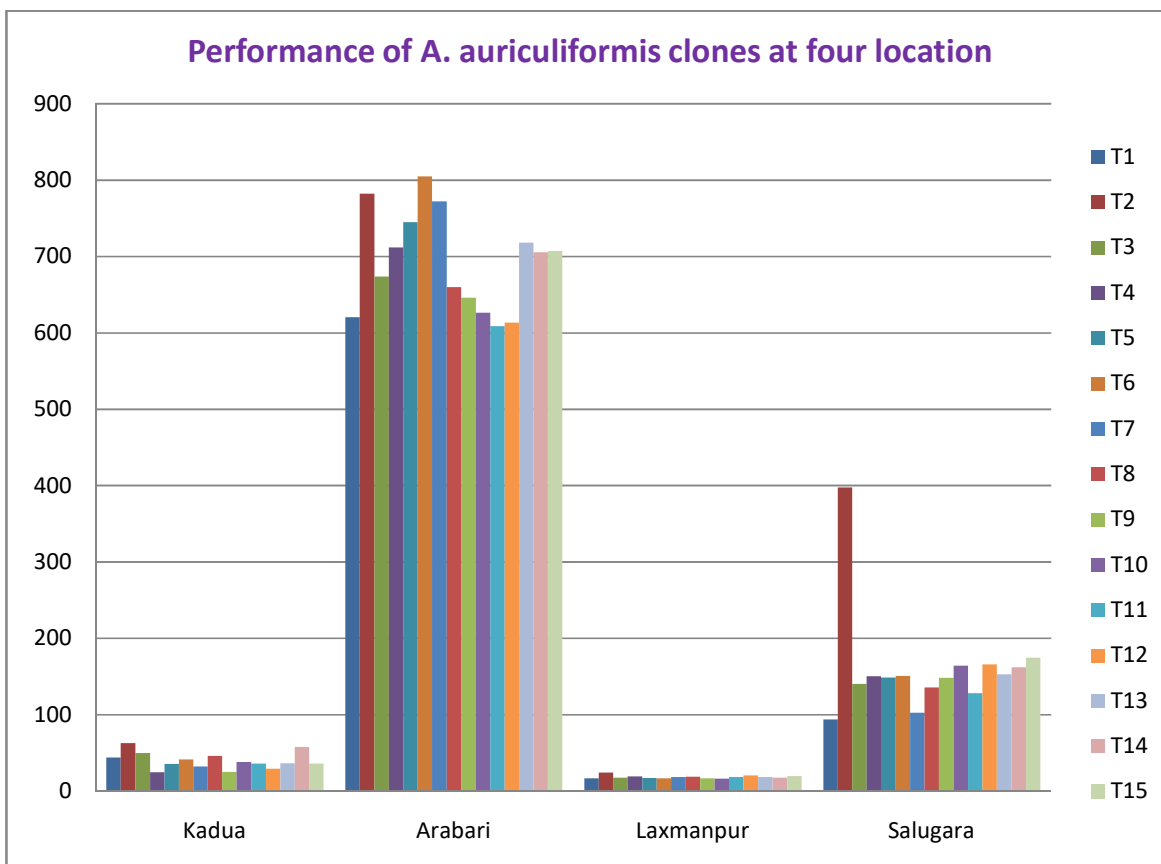
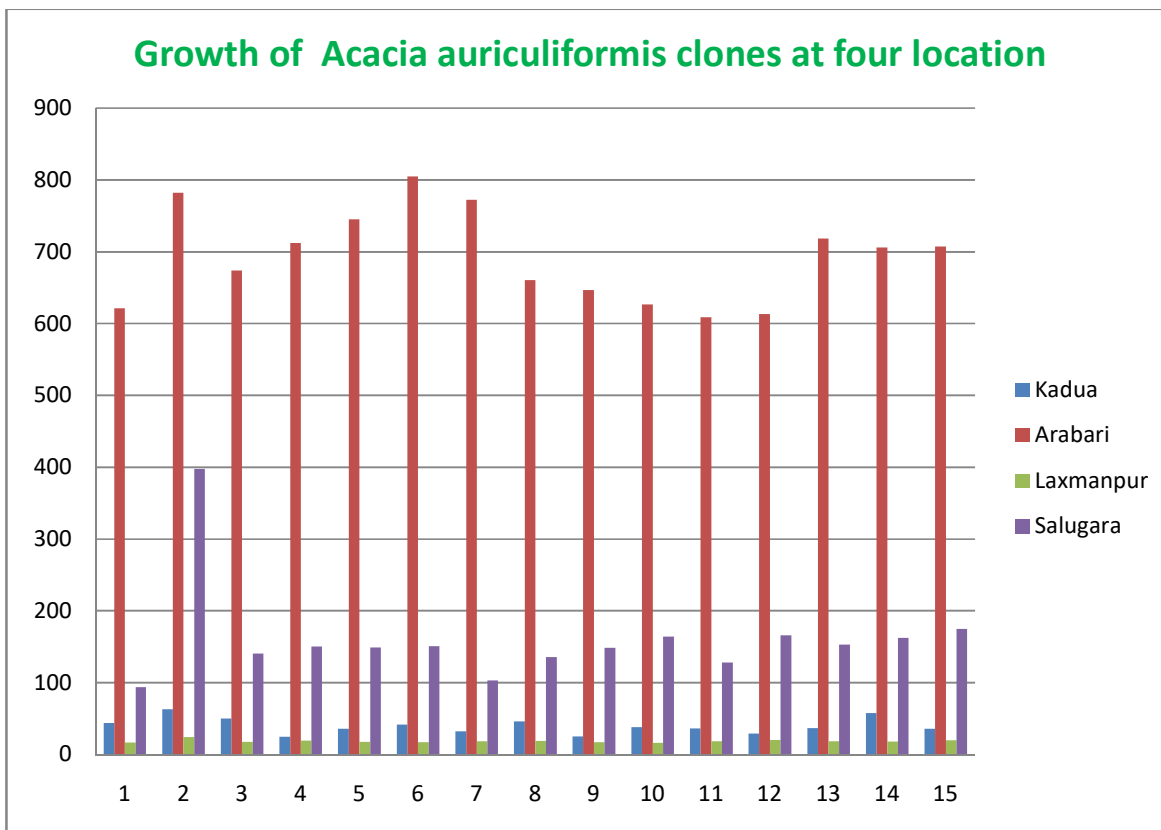
One way

| Descriptives | | | | | | | | |
|-----------------|----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
| Cm ³ | | | | | | | | |
| | 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 ³ | | | | | |
| | 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 ³ | | | | | | | | |
| | 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 |

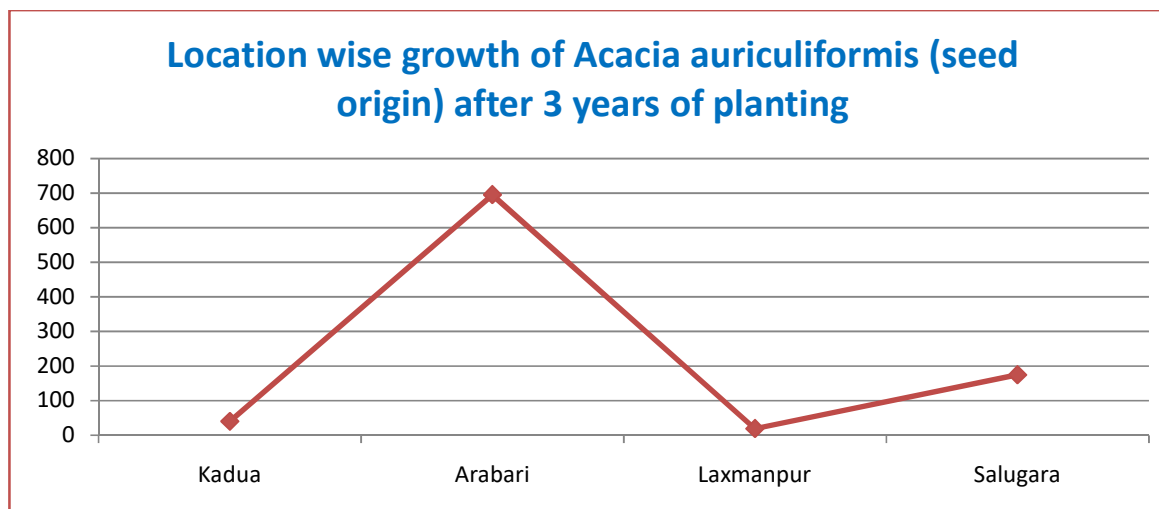
| ANOVA | | | | | |
|-----------------|----------------|------|-------------|--------|------|
| Cm ³ | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 4.1588 | 3 | 1.3868 | 1.0753 | .000 |
| Within Groups | 6.2178 | 4820 | 128988.051 | | |
| Total | 1.0389 | 4823 | | |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

Post Hoc Tests

Homogeneous Subsets

| Cm ³ | | | | |
|-----------------|------|-------------------------|--------|--------|
| 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 (CM³) 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 (Cm³) 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

| Descriptives | | | | | | | | |
|-----------------------|------|---------|----------------|------------|----------------------------------|-------------|---------|---------|
| cm³ | | | | | | | | |
| | 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 |

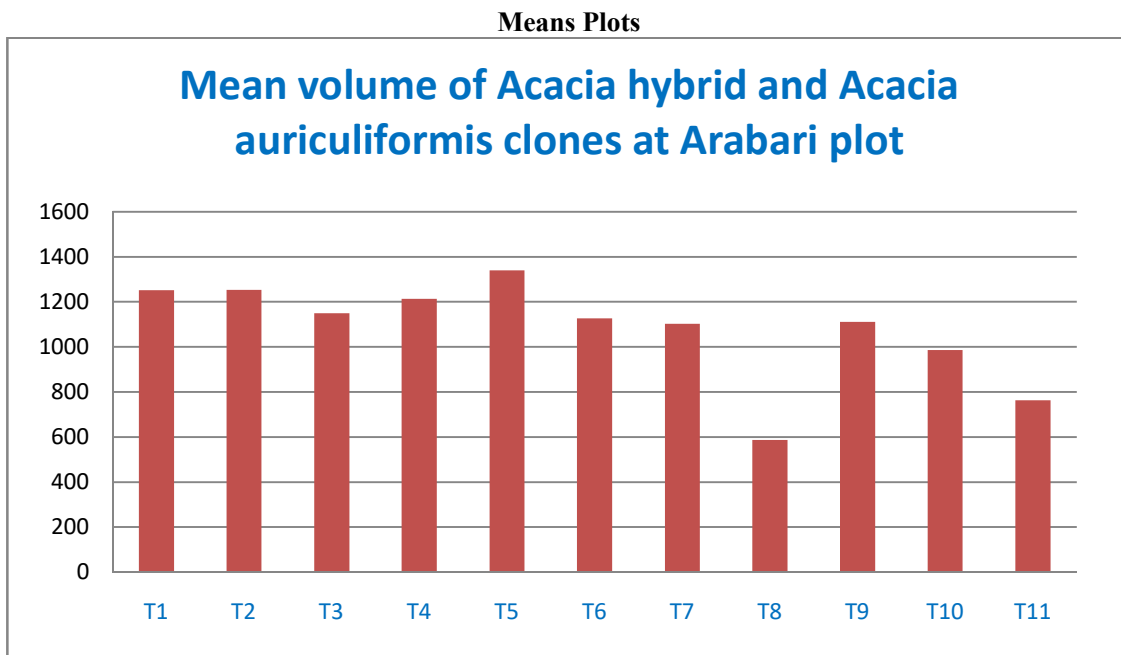
| ANOVA | | | | | |
|-----------------------|----------------|------|-------------|--------|------|
| cm³ | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 4.6297 | 10 | 4629334.762 | 18.503 | .000 |
| Within Groups | 2.5428 | 1016 | 250198.914 | | |
| Total | 3.0058 | 1026 | | | |

Post Hoc Tests

Homogeneous Subsets

| cm³ | | | | | | |
|-----------------------|----|-------------------------|--------|---------|---------|---|
| 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 | | | | | | | | |
|-------|-----|-------|----------------|------------|----------------------------------|-------------|---------|---------|
| | | | | | 95% Confidence Interval for Mean | | | |
| | N | Mean | Std. Deviation | Std. Error | Lower Bound | Upper Bound | Minimum | Maximum |
| 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 | | | |

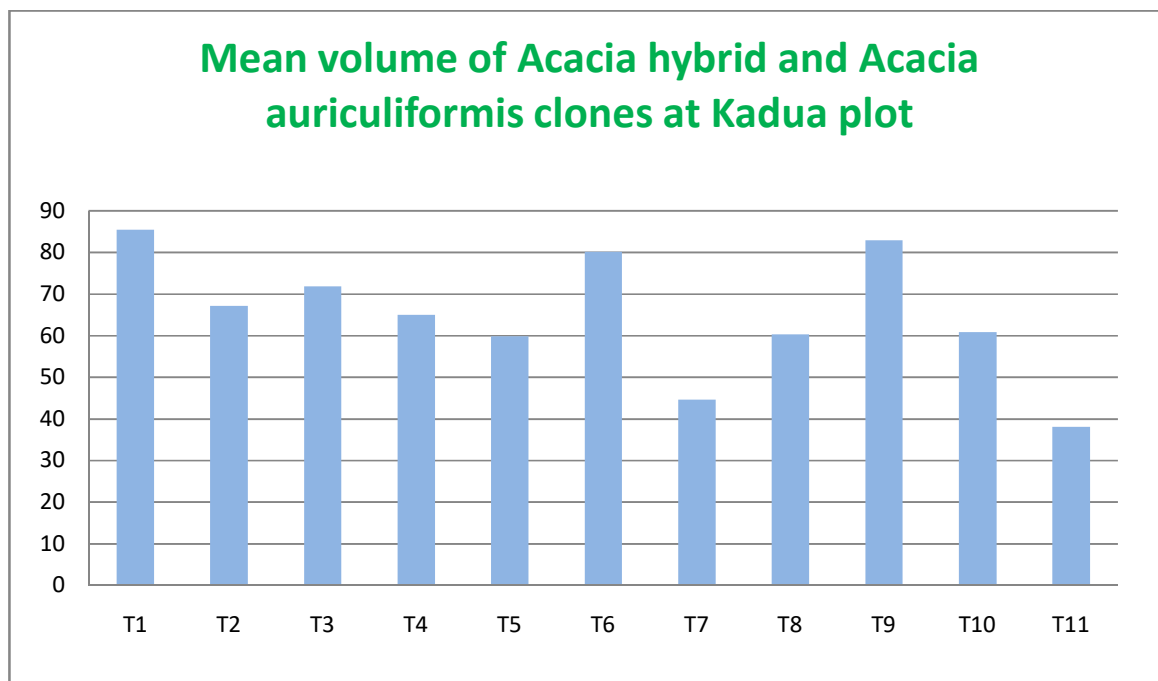
Post Hoc Tests

Homogeneous Subsets

| Cm ³ | | | | |
|-----------------|----|-------------------------|-------|-------|
| 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

| Cm³ | | | | | | | | |
|-----------------------|-----|-----------|----------------|------------|----------------------------------|-------------|---------|---------|
| | 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

| Cm³ | | | | | |
|-----------------------|----------------|-----|-------------|------|------|
| | 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 | | | |

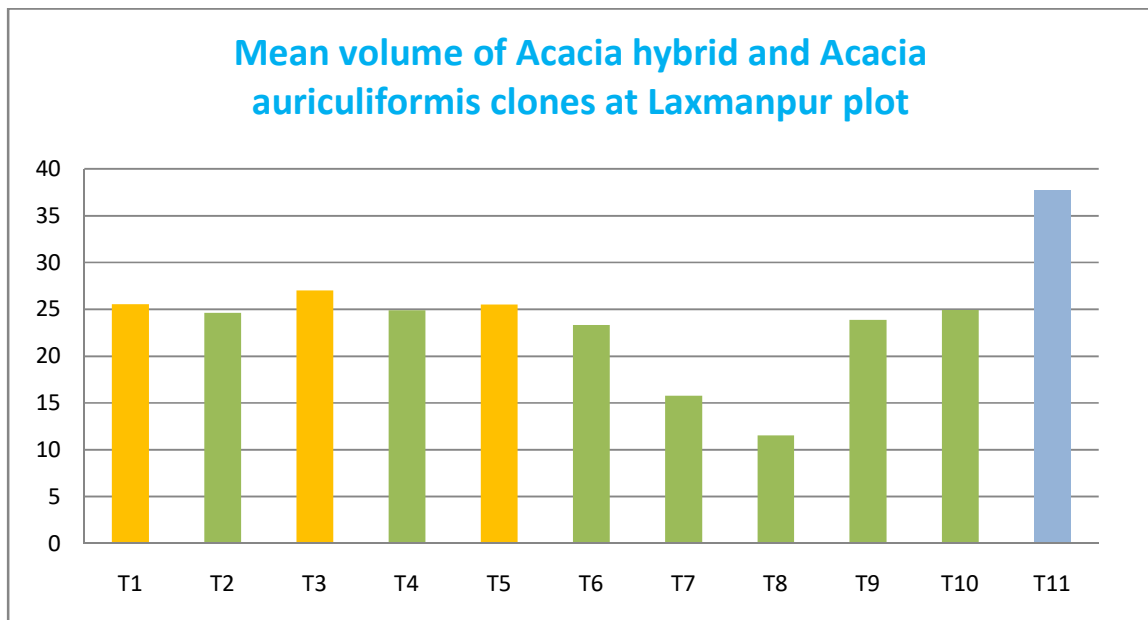
Post Hoc Tests

Homogeneous Subsets

| Cm³ | | | |
|-----------------------|----|-------------------------|-----------|
| 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 (Cm³) of Acacia hybrid at Salugara under Silviculture (North) Division

One way

Descriptives

| Cm ³ | | | | | | | | |
|-----------------|-----|--------|----------------|------------|----------------------------------|-------------|---------|---------|
| | 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 ³ | | | | | |
|-----------------|----------------|-----|-------------|-------|------|
| | 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 | | | |

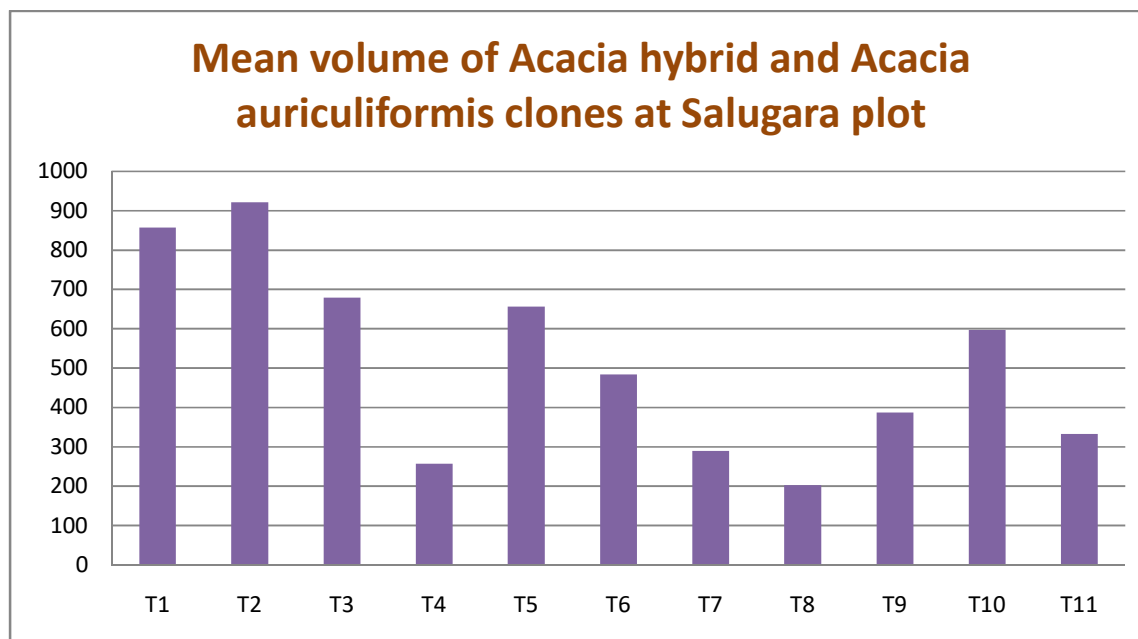
Post Hoc Tests

Homogeneous Subsets

| Cm ³ | | | | | | | |
|-----------------|----|-------------------------|--------|--------|--------|--------|--------|
| 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 **T 11**, 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 ³ | | | | | | | | |
|-----------------|----|---------|----------------|------------|----------------------------------|-------------|---------|---------|
| | | | | | 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 |

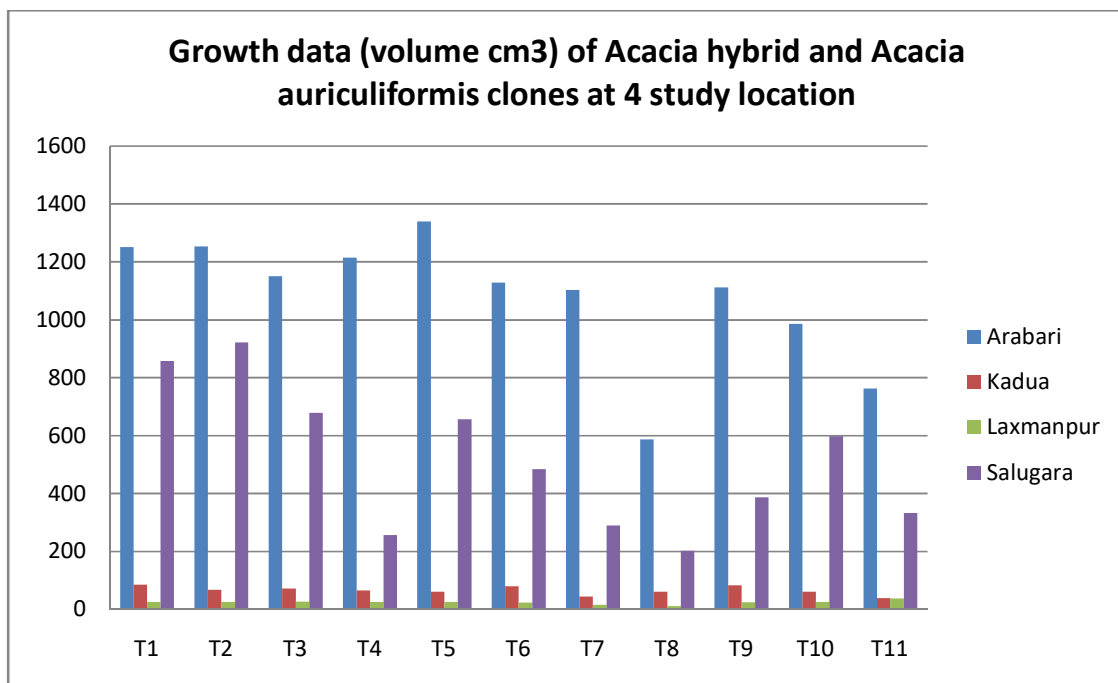
| ANOVA | | | | | |
|-----------------|----------------|------|-------------|---------|------|
| CM ³ | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 7.1018 | 43 | 1.6517 | 146.412 | .000 |
| Within Groups | 2.9668 | 2630 | 112783.236 | | |
| Total | 1.0079 | 2673 |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

Post Hoc Tests
Homogeneous Subsets

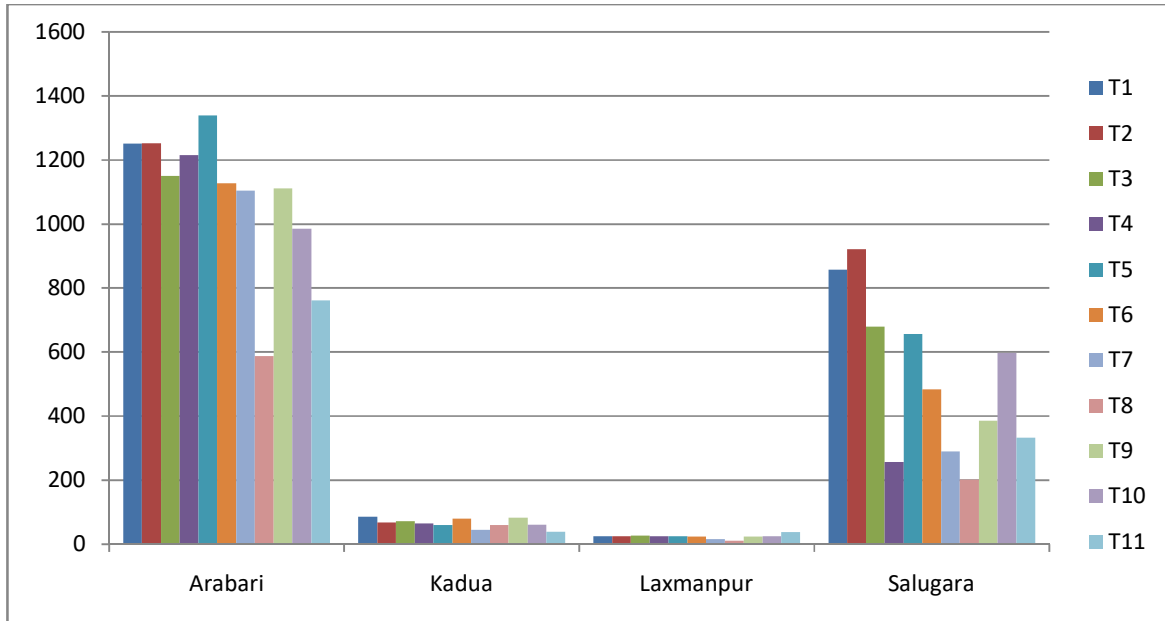
| CM ³ | | | | | | | | | | | | | | |
|-----------------|----|-------------------------|--------|--------|--------|--------|--------|--------|--------|---|----|----|----|----|
| Duncan | | | | | | | | | | | | | | |
| Treat | N | Subset for alpha = 0.05 | | | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 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 |

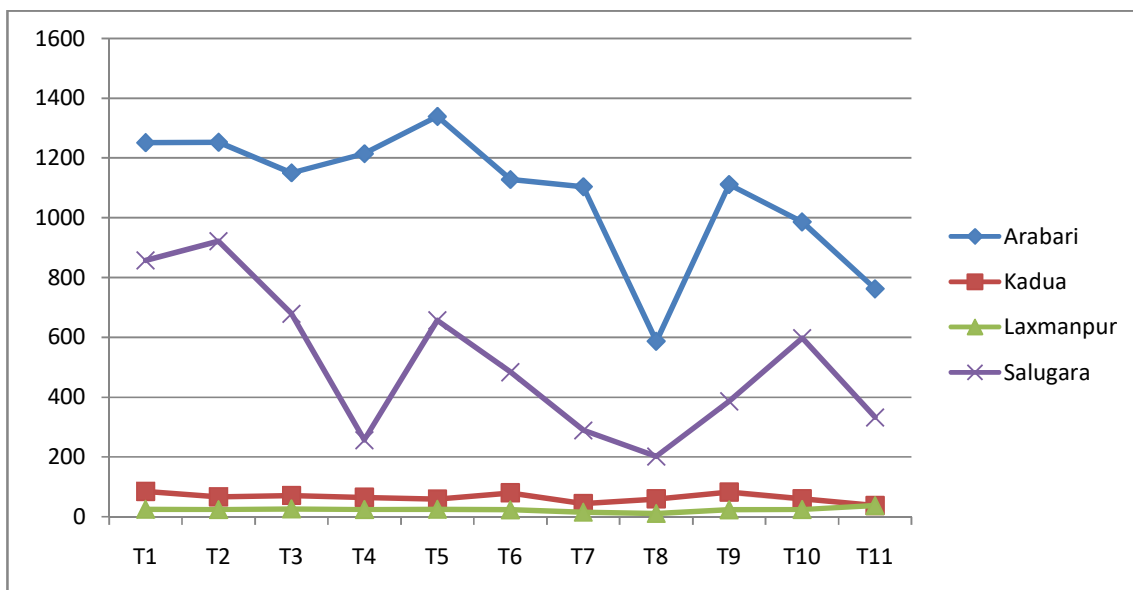
Means Plots



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



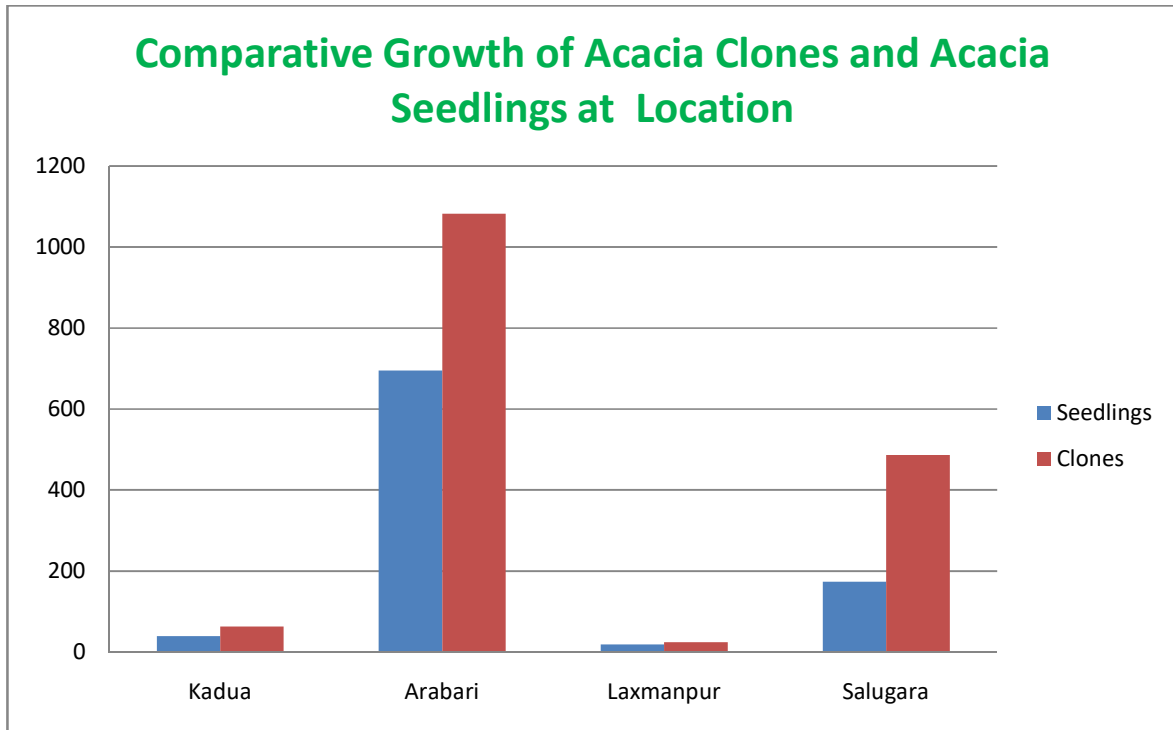
Comparative growth of Acacia Hybrid Clones and Acacia auriculiformis Clones at 4 location



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 ³ |
|-------|--------------|---------------------------|--------------------|---------------------------|---------------------------|
| 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 MumbarSI 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 ³ |
|--------|--------------|---------------------------|--------------------|---------------------------------|---------------------------|
| 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)

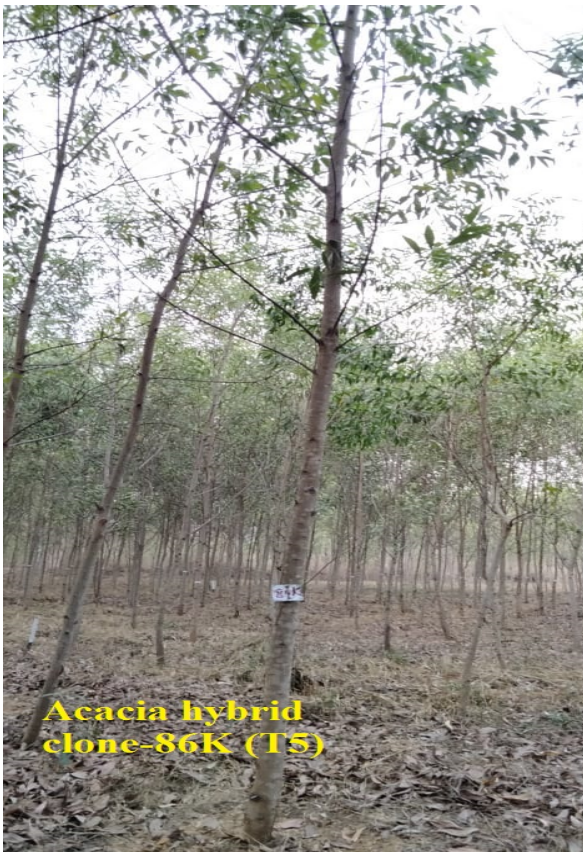


Khisma Tree No. 2 (T7)



Lataguri (T-15)

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





**Acacia auriculiformis
clone-M7 (T9)**



**Picture of Acacia hybrid
clone- K47 (T4)**



**Picture of Acacia Hybrid
Clone-69k (T2)**



**Picture of Acacia auriculiformis
clone- M8 (T10)**

