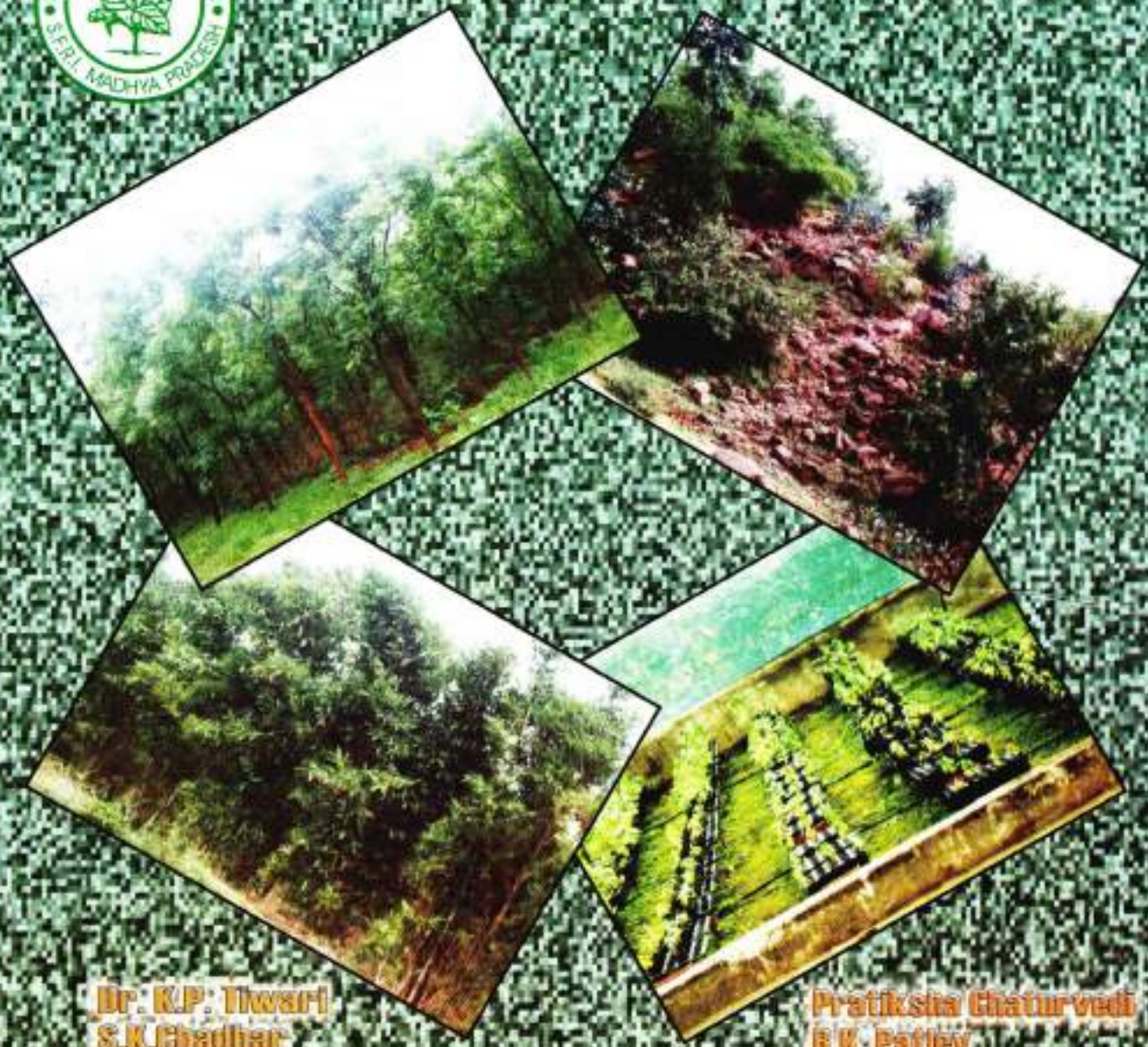
SILVICULTURE RESEARCH IN M.P.



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PREFACE

Silviculture research, in M.P. started about 80 years ago. With the establishment of the State Forest Research Institute in the state the research work became more systematic and its magnitude expanded. Despite various limitations, significant amount of work was done in the Institute and useful results obtained. However, it is a hard fact that use of the research results in the field was quite meagre. This compilation has been endeavoured with the aim of putting at one place the useful findings of silviculture research conducted in State Forest Research Institute, Jabalpur till the middle of nineties. These may be useful to those practising forestry or tree culture. Also, the people working in the field of forestry research may find useful information in this compilation.

The authors wish to thank all those who directly or indirectly helped in the preparation of this book. Ms. Manjeet Bhalla and Mr. Sajal Dhagat are two of them.

AUTHORS

INTRODUCTION

Silviculture research in the state of M.P. started as early as 1922. Although the present State Forest Research Institute was established at Jabalpur in the year 1963 but a research cell was in action from 1922 in the CCF's office. The officer in charge of this cell was designed as state silviculturist.

The research cell of the forest department had been conducting experiments on forestry matters since its inception and upto the year of establishment of the present State Forest Research Institute, many important results were obtained from the field trials conducted. A large number of such trials were related to silviculture. The subjects dealt with were natural and artificial regenerations of Sal, Teak and other important species, tending operations, fertilizer trials, choice of species for plantations and some others. After the State Forest Research Institute came into being, work on silviculture research started in a big way.

Documentation of the results of the experiments conducted has been being done in the form of Annual Research Reports and research articles but due to various reasons all the research results could not become known to all the field foresters and so not utilised in forestry practices. The common people were still less aware of the research results obtained from the forestry research trials. This compilation aims to bring at one place all the important and useful results of trials related to silviculture which were conducted in M.P. by either the Forest Research cell or State Forest Research Institute, Jabalpur in the period from 1922 to 1995.

In M.P., another Forest Research Institute, namely, Tropical Forests Research Institute (formally Regional Forest Research Centre) was established (at Jabalpur) in the eighties but no result of the works done by that institute has been included in this compilation. This relates only to the works done by the research organisation of the state forest department.

The approach, here, has been to highlight the contribution made to the silviculture of individual forestry species rather than going subject wise. This will help in knowing about the individual species and also the research gaps and about the less attended species. It is hoped that the compilation will be helpful to the people engaged in forestry practices in the way that they will be able to utilise the research results for their day-to-day needs and get benefit of them.

TRIALS ON INDIVIDUAL SPECIES

1. ACACIA AURICULIFORMIS

A. Species Trial

(i) The trial was taken up near Bilaspur in the year 1973. The soil was typical 'Bhata' type. Growth was compared with three other species of Acacia namely *A. senegal*, *A. arabica*, *A. campylicantha*, and *P. juliflora*. Its growth was found inferior to that of *P. juliflora* and *A. senegal*.

(ii) Another species trial was taken up at Jabalpur together with 14 other species of the *Acacia genus*. The species were *Acacia senegal*, *A. melifera*, *A. albida*, *A. mollisima*, *A. campylicantha*, *A. nilotica*, *A. victoria*, *A. saligna*, *A. dalbata*, *A. mengium*, *A. ferruginea*, *A. catechu*, *A. murroyma* and *A. salimata*. The species showed good performance.

(iii) A trial was taken up in the year 1994 at Pendaribhata under Bilaspur centre. The performance of species planted in Kanhari soil was quite good.

(iv) A trial was taken up in the year 1982 at Jabalpur. In all, 10 species of Acacia were tried which constituted the 10 treatments of the experiment. The growth data recorded showed that *A. auriculiformis* performed quite well on this site.

(v) An experiment was taken up in the year 1983 in Burhanpur division of Khandwa district. It intended to study the growth behaviour of *A. auriculiformis* in the locality which is comparatively drier. The growth data indicated that the survival and growth of *A. auriculiformis* was quite good.

B. Provenance Trial

(i) Seven provenances of *A. auriculiformis* were tried near Nepanagar (Khandwa distt.) in the year 1994. The seeds of these provenances were procured from Tree Seed Centre, Canberra, Australia. The provenances tried were, Northern territory, Papua New Guinea, Papua Nicaragua, Papua New Guinea (18302), Queensland (17961), Queensland (18564) and Queensland (15247). The "Northern Territory" provenance showed best results.

The trial were also taken up at Jabalpur. The treatment T1 i.e. Northern region seed lot No. 1860 is showing best performance of growth.

C. Biomass Production

A trial taken up at Koni (Bilaspur) in the year 1986 showed that a five year old plantation of the species was capable of producing more biomass than that from the plantation of *Acacia nilotica* of the same age raised on the same site.

D. Species Trial on Mined out Site

(i) A trial was taken up in the year 1979 on Bauxite mined out site near Amarkantak. After three years, a survival of 88% and an average height of 161 cm was recorded.

(ii) A trial was started in the year 1982 in Dhanpuri coalfields in Shahdol district. After 3½ years, the survival percent observed was 68 with average height of 3.36 m and average gbh of 12 cm.

(iii) An experiment was started in the year 1985 near Bilaspur. Ten different species including *A. auriculiformis* were planted on the dumps of a Dolomite mine at 2m x 2m. The planting stock consisted of polypotted seedlings. The growth data indicated that *A. auriculiformis* was quite successful on the given site.

(iv) Another trial was taken up in the year 1982 at Dhanpuri Coalmine. *A. auriculiformis* was observed to be one of the most suitable species for afforestation of OB dumps of opencast coalmines.

(v) An experiment was taken up in the year 1985 on OB dumps of Iron ore mines near Raipur. Planting of *A. auriculiformis* was done at 3m x 2m spacement. The data recorded showed that *A. auriculiformis* was quite successful in the Iron ore mined out areas. The trial was repeated in Dalli and Konde mines also where the results were again quite encouraging.

(vi) An experiment was started in the year 1984 on the OB dumps of Dolomite mines near Hirri (Bilaspur centre). Planting was done in the pits of 45 cm^3 size dug up at 2m x 2m. The growth data indicated that the species grows very well on the site concerned.

E. Root-Shoots V/s Seedlings

A trial was taken up in the year 1986 on a patch of wasteland near Amarkantak. In this, planting of polypotted seedlings and root-shoots was done with a view to study their growth trends in plantations. The growth data recorded after one and half years showed that *A. auriculiformis* gives better performance when planting is done using root-shoots.

F. Comparative Growth

The trial was taken up in the year 1947 in Bilaspur centre. It had eight treatments consisting of eight different species which included *A. auriculiformis*, *A. campylicantha*, *P. juliflora*, *E. tereticornis*, *E. cameldulensis*, *E. populinia*, *C. swetenia* and *E. hybrid*. The aim was to study the comparative suitability of the species to Bhata soil of Chhattisgarh. The observation data indicated that *A. auriculiformis* was inferior in growth.

G. Pit size Trial on Mine OB Dumps

This experiment was started in the year 1986 in Dhanpuri Coal mines (Amarkantak centre). There were three treatments in this experiment namely, planting in the pits of 30 cm^3 size (T1), planting in the pits of 45 cm^3 size (T2) and planting in the 60 cm^3 sized pits (T3). Six species were planted. Those were *P. pinnata*, *E. hybrid*, *E. cameldulensis*, *D. sissoo*, *E. citriodora*, *H. integerifolia*, *A. auriculiformis* and *S. robusta*. The data recorded indicated that *A. auriculiformis* planted in the pits of 60 cm^3 size gave the best performance.

H. IrrigationTrial

This experiment was started in the year 1986 on the OB dumps of a Coalmine in Amarkantak centre. There were two treatments in this experiment namely, Irrigation (I) and no-irrigation (Io) of the plantation of *A. auriculiformis*. The data recorded indicated that irrigation induces better growth in *A. auriculiformis*.

I. Irrigation-cum-spacement trial

(i) This experiment was started in the year 1985 in Seoni centre. It had two main treatments viz irrigation (i) and no irrigation (Io). There were two sub-treatments viz 2m x 1m planting spacement (T1) and 2m x 2m spacement (T2). The growth data recorded showed that *A. auriculiformis* showed better

performance under irrigated conditions but no effect of spacement was observed.

(ii) Another experiment was started in the year 1986 near Massak (Nepanagar). There were three main treatments namely : irrigation with the effluent of Nepa Mills (I1), irrigation with fresh water (I2) and no irrigation (I0). Sub-treatments were, planting spacement of 2m x 1m (P1) and the planting spacement of 2m x 2m (P2). The growth data recorded indicated that *A. auriculiformis* had higher survival percent and height growth under irrigated conditions. Spacement of 2m x 1m induced better growth.

Afforestation of Waterlogged Area

This experiment was started in the year 1986 near village Nimsadia in Hoshangabad district. The village lies in the command area of Tawa irrigation project. The area was facing the problem of waterlogging due to seepage from the irrigation canals. In this experiment, polypotted plants of 9 species were planted at 2m x 2m. The species were, *Terminalia arjuna*, *S. cumini*, *E. hybrid*, *D. sissoo*, *P. pinnata*, *A. auriculiformis*, *L. leucocephala*, *C. siamia* and *D. strictus*. The data recorded on survival and height growth showed that auriculiformis was performing quite well.

K. Bhataland Afforestation

This experiment was started in the year 1985 in Raipur centre with a view to find out the suitable species for afforestation of Bhataland. The data recorded indicated that *A. auriculiformis* performed quite good on the Bhataland.

L. Species Trial on a Ravinous Land

This experiment was started in the year 1983 near Morena and it aimed at studying the survival and growth of the species in the ravinous land. The growth data recorded, indicated that *A. auriculiformis* performed well in the ravinous land.

2. ACACIA CATECHU

A. Species Trial on a Mined out site

(i) In the year 1983, together with other species, *Acacia catechu* was planted on the heaps of overburden in the Dhanpuri (Shahdol distt.) coal mines. The survival and growth were observed to be less than those of *Acacia nilotica*.

(ii) An experiment was started in the year 1985 near Hirri (Bilaspur centre). *Acacia catechu* was planted on the OB dumps of a Dolomite mine. It showed only 36% survival on the minedout area.

B. Species Trial

(i) In the year 1983, a trial was taken up at Jabalpur but the species suffered failure.

(ii) A trial plantation was taken up in the year 1974 near Bilaspur. *A. catechu* was found to be a suitable species for the Bhata soil.

C. Irrigation Trial

This trial was taken up in the year 1991 near Nepanagar in Khandwa district. The observations recorded after a period of $3^{1/2}$ years showed higher survival as well as height growth in the irrigated block.

D. Plantation on Minedout Area (Spacement Trial)

This experiment was started in the year 1989 in Jayant Coal mines of NCL. Three spacements namely, 1m x 1m, 2m x 1m and 2m x 2m were tried *A. catechu* was found performing best in 2m x 1m spacement.

E. Pit Mixture Trial on a Coalmined out Site

This experiment was started in the year 1986 in Dhanpuri Coal mines in Amarkantak centre. There were four treatments in the experiment, namely, filling dump material in the planting pit, filling original soil plus cowdung manure in the pit, filling humus rich soil plus cowdung manure in the pit and filling humus rich soil and FYM in the pit. The growth data recorded showed that A. Catechu was giving best performance in the mixture of humus rich soil and FYM.

F. Pit Size Trial on Wastelands

This experiment was started in year 1990 near Bilaspur (Khuntaghat). *A. catechu* was planted in association with other species on a barren rocky hillock. Planting was done in the pits of 30 cm^3, 45 cm^3 and 60 cm^3 size. *A. catechu* showed the best height and survival percent in the pits of 60 cm^3 size.

3. ACACIA TORTILIS

A. Species Trial

(i) A trial was taken up in the year 1970 near Bhind (Gwalior). *A. tortilis* showed very good performance.

(ii) A trial was taken up in the year 1971 near Nepanagar. The species showed very good growth there.

(iii) A trial was taken up in the year 1973 in Indore centre. The data recorded showed *A. tortilis* having 91% survival.

(iv) Another trial was taken up in the year 1976 near Bilaspur, where also the species showed quite good performance.

B. Plantation in Minedout Area

An experiment was taken up on a dolomite mined out site, in the year 1985, near Bilaspur. Polypotted seedlings of 10 species including *A. tortilis* were planted in the pits of 45 cm^3 size at 2m x 2m *A. tortilis* was found successful on the site.

C. Spacement Trial

This experiment was taken up in the year 1970 near Nepanagar. Five different spacements were tried in it. The growth data indicated that *A. tortilis* showed best performance in 1.5m x 1.5m spacement block.

D. Mixed Plantation

(i) This experiment was started in the year 1973 near Nepanagar, to compare the rate of growth of *A. tortilis* and *E. tereticornis* when grown in pure stand and in mixture upto 5 years. The data indicated that planting of pure *Acacia tortilis* was beneficial.

(ii) *Acacia tortilis* was planted with *Eucalyptus tereticornis* near Indore in the year 1973. After a period of 5 years, it was observed that the survival percents of both the species were more than 80 percent.

E. Species Trial (Ravinous site)

This trial was taken up in Barhi Range of Bhind Distt. in the year 1970. After one year, a survival of 80 percent was observed.

F. Fertilizer Trial

Fertilizer trial on *Acacia tortilis* was taken up in the year 1974. Ten different mixtures of Phosphorus and Nitrogen were applied to the plants. After a period of 5 years, it was found that application of 25 gm of Nitrogen and 25 gm of Phosphorus was the lowest most beneficial dose inducing the maximum height and survival percent in the plants. Application of only 25 gm of Nitrogen and no Phosphorus was found producing least effect on the plant growth.

4. ACACIA CAMPYLICANTHA

A. Species Trial

(i) Trial plantation of the species was taken up near Bilaspur in the year 1973, together with *P. juliflora*, A. arabica, *A. senegal* and *A. auriculiformis*. The growth was less than that of *A. senegal* and *P. juliflora*.

(ii) An experiment was started in the year 1987 in Jabalpur centre. *A. campylicantha* was planted at 4m x 4m spacement. It showed very good performance.

(iii) Another experiment was started in the year 1991 near Amarkantak. Among the six species tried *A. campylicantha* showed poor growth.

B. Fertilizer Trial

In Ralamandal area (near Indore), the trial was conducted in the period from 1974 to 1979. The growth was found better where 25 gm of Urea and 25 gm of super phosphate were given to the plants continuously for four years than where the same doses were given only in the first year.

C. Species Trial on the Mined out site

(i) In the year 1983, the species was planted on the heaps of overburden of coalmines at Dhanpuri together with *Acacia catechu*, *A. nilotica*, *A. tortilis*, *A. senegal*, *A. victoria* and *A. melifera*. The growth of *A. campylicantha* was found inferior to that of other species.

(ii) An experiment was started in the year 1984 near Bilaspur on the OB dumps of Dolomite mines. In this, six species were tried. The species were, *A. auriculiformis*, *G. arborea*, *E. hybrid*, *A. procera*, *P. pinnata* and *A.*

campylicantha. As per the growth data recorded. *Acacia campylicantha* was found to be the most suitable species for the reclamation of Dolomite minedout areas.

(iii) Another experiment was started in the year 1985 near Bilaspur in the Dolomite mined out areas. Ten different species were planted on the overburden dumps at 2m x 2m. These species constituted 10 treatments of the experiment. The planting stock consisted of polypotted seedlings. *A. campylicantha* showed very good growth.

D. Irrigation-cum-pit size trial

An experiment was started in the year 1989 near Morena. It had two main treatments namely, irrigated conditions and rainfed conditions, and three sub treatments viz. 30 cm^3 sized pits, 45 cm^3 sized pits and 60 cm^3 sized pits. Six fuel and fodder species were tried, *A. campylicantha*, *H. integerifolia*, *A. nilotica*, *A. procera* and *A. indica*. The data indicated that *A. campylicantha* had better growth in the irrigated conditions. Different pit sizes did not produce any significant differential effect.

E. Fertilizer Trial

(i) This experiment was started in the year 1974 near Indore (Rala Mandal). There were four treatments in the experiment which included control also. As compared to control, application of 25 gm of Urea plus 25 gm of superphosphate per plant for three years gave the best result in terms of plant growth.

(ii) The experiment was started in the year 1986 near Hirri (Bilaspur centre). There were four fertilizer treatments in this experiment. Five species were tried. *A. campylicantha* grew maximum when Urea was applied at the rate of 50 gm/plant as compared to no fertilizer application and 25 gm/plant application. Higher dose of 75 gm/plant was not useful as probably the plants are unable to utilise this high dose.

F. Species Trial on Bhataland

This experiment was started in the year 1983 near Bilaspur. In this, 5 species of Acacias were tried. *A. arabica*, *A. senegal*, *A. auriculiformis* and *Prosopis juliflora* were the other four species. *Acacia campylicantha* gave the best average height and survival percent.

5. ACACIA NILOTICA

A. Species Trial

(I) In the year 1973, suitability trial of the species was taken up near Bilaspur with *A. senegal, A. campylicantha, A. auriculiformis* and *P. juliflora*, *A. nilotica* was found inferior in growth in comparison to *Acacia senegal* and *Prosopis juliflora*.

(ii) Another suitability trial was taken up near Jabalpur in the year 1982 with some other species. The species was among those which showed better performance.

(iii) An experiment was taken up in the year 1982 in Jabalpur centre. In all 14 species of Acacia were tried which constituted the 14 treatments of the experiment. The species were, *A. senegal, A. campylicantha, A. melifera, A. auriculiformis, A. mollisima, A. nilotica, A. saligna, A. victoria, A. dalbata, A. mangumae, A. teriginea, A. catechu, A. murroyma* and *A. salimata*. The growth data recorded showed that only acacia nilotica have shown good performance.

B. Species Trial on a mined out site

(i) In the Dhanpuri colliery, the species was tried together with other species of *Acacia genus*. It showed maximum survival on the heaps of overburden in the mined out site.

(ii) Another experiment was started in the year 1988 in the Coalmines (Amarkantak Centre). The observation data indicated *Acacia nilotica* performing quite good on the OB dumps.

C. Biomass Comparison

(iii) In the year 1986, a trial was taken up near Bilaspur (Koni) in which *D. sissoo Cassia siamea, Eucalyptus hybrid* and *Acacia auriculiformis* were planted with *Acacia nilotica*. After a period of 5 years, the biomass produced by individual species was compared. The biomass of *Acacia nilotica* was found to be minimum.

(iv) The trial was taken up in the year 1986 near Nepanagar (Khandwa district). Eight species were tried which included *Acacia nilotica*. The data indicated that *Acacia nilotica* produced the lowest biomass as compared to all other species.

D. Stump planting

Stump planting of *A. nilotica* was tried at Balaghat in the year 1932. The survival percent obtained was only 2 proving that stump planting of *A. nilotica* should not be resorted to.

E. Species Trial (Ravinous Site)

The trial was taken up in the year 1970 in Barhi Range of Bhind district. After one year, 86 percent plants were found surviving.

F. IrrigationTrial

This experiment was started in the year 1987 near Morena. It had two main treatments namely, irrigation (T1) and rainfed conditions (T2), and three sub-treatments viz. pits of 30 cm^3 size, pits of 45 cm^3 size and pits of 60 cm^3 size. The observations recorded indicated that irrigation and pits size both have produced positive effect on the growth of plants of *Acacia nilotica*.

G. Provenance Trial

(i) A trial was started in the year 1988 near Bilaspur (at Hirri). The provenances tried were, Karanjia, Tapti (Betul), Seoni, Bilaspur, Morena, Raipur, Gotamara (Orissa), Aravari, Midnapur (WB), Jabalpur, Massoorie, Manikpur, Mathura and Brindavan. The growth data recorded indicated that Karanjia (Mandla) and Midnapur (WB) provenances are better for this region.

(ii) Another trial was taken up in the year 1988 near Lakhna in Raipur centre. The growth data recorded showed that the local provenance (Raipur) is the best.

H. FertiliserTrial

This experiment was started in the year 1994 at Jabalpur to study the effect of vermiculture application on the growth of *Acacia nilotica* plants in the nursery. The growth data showed vermiculture to be less effective.

I. Afforestation of Fly Ash Dumps

This experiment was started in the year 1988 at Chachai in Amarkantak centre. In all 10 species were planted at 2m x 2m spacement. The growth data indicated that *A. nilotica* showed quite good performance.

J. Spacement Trial

This experiment was started in the year 1985 in Jayant coal mines of NCL. Three spacements namely, 1m x 1m, 1m x 2m and 2m x 2m were tried. *A. nilotica* gave better growth performance in 1m x 1m spacement.

K. Time for Seed Sowing

This experiment was laid out in the research nursery Jabalpur in October 1987. *A. nilotica* seed were sown in the first fortnight of October and also in the second fortnight of October. The observations recorded indicated that *A. nilotica* gave higher germination percent from the sowing of first week of October.

L. Method of Seed Sowing

An experiment was laid out in the research nursery Jabalpur in February, 1988. The experiment had two treatments viz sowing of seed by broadcast method and sowing of seed by drill method. The observations recorded showed that in case of *Acacia nilotica* broadcast sowing gives better results.

6. ACACIA PLANIFORMIS

Species Trial

The species trial was taken up in the year 1976 near Bilaspur. After a period of 10 years, survival percent of 54 and average height of 241 cm. was recorded.

7. ACACIA MOLLISIMA

Species Trial

An experiment was started in the year 1971 near Amarkantak. *Acacia mollisima* showed quite good survival percent.

8. AZADIRACHTA INDICA

A. Special Trial

(i) The trial was taken up near Bilaspur in the year 1970. 20 gm of Urea and 20 gm of super phosphate were also mixed up with the pit soil at the time of planting. After a period of four years, the survival percent was observed to be 80 and the average height 83 cm.

(ii) This trials was taken up in Jabalpur centre in the year 1984 to judge the suitability of the species for the local climate. The observation data indicated that *A. indica* performed well in the local conditions.

B. Provenance Trial

Seedlings of *Azadirachta indica* belonging to three different provenances were planted near Bilaspur in the year 1989. The three provenances were, Nepanagar, Bilaspur and Seoni. After a period of about 5 years, observations were recorded. The performance evaluation was done on the basis of survival percent and growth. Seoni provenance was found to be the best one.

C. Treatment with supersorb material

A trial was taken up in Jabalpur nursery in the year 1986. In this trial effect of a supersorb material (Jalshakti) was studied. Jalshakti showed positive effect on the survival and growth of *A. indica.*

D. Planting Stock

A trial was taken up in Morena centre in the year 1987 to compare the growth trend of plants in plantation with planting stock (a) polypotted seedlings and (b) Root shoots. The growth data indicated that the polypotted seedlings of *A. indica* gave better performance.

E. Plantation on mined out site

A trial was taken up near Raipur in the year 1986. *Azadirachta indica* was planted on the OB dumps of an Iron ore mine (Konkan mine). *A. indica* performed quite well on the said site.

F. Ravine Afforestation

Experimentation on the evolution of technology package for the afforestation of Chambal ravines was initiated in the year 1984 and it continued up to 1987 under the Morena centre. In this, planting of seedlings of *A. indica* was done in the pits dug up at a spacement of 2m x 2m. *A. indica* was found successful in the ravines.

G. Stecklings V/s Seedlings

This experiments was taken up in Jabalpur centre in the year 1988 with a view to compare the growth performance of rooted cutting (stecklings) and seedling

origin plants in the field. The observations indicated that *A. indica* stecklings performed better than the seedlings.

H. Super Seedlings V/s Ungraded Seedlings

This experiment was started in the year 1988 at Jabalpur. Super seedlings and ungraded seedlings of *A. indica* were planted at 2m x 2m. The observations indicated that performance of super seedlings was better.

I. Spacement Trial

The experiment was started in the year 1989 near the dolomite mines (open cost) at Hirri, Bilaspur. Pits of 45 cm^3 were dug and lower halves of pits were filled with local soil and upper halves with the mixture of soil, sand and FYM in the proportion of 3:1:1. Planting was done at four different spacements. Twelve species including *A. indica* were tried. Growth data showed that 2m x 0.5m was the best spacement for *A. indica* species.

J. Irrigation-cum-pit size trial

An experiment was taken up near Raipur (Nawagaon) in the year 1987 to study the performance or some important oil seed bearing tree species planted in the pits of different sizes and kept under irrigated and rainfed conditions. It was observed that irrigation coupled with 45 cm^3 sized pits proved to be the most effective for the growth of *A. indica*.

K. Irrigated and Unirrigated Conditions

A trial was taken up near Bilaspur in the year 1990 in which growth trend of species successful on Bhataland was studied under irrigated and unirrigated conditions. Irrigation was found most effective for the growth of *A. indica*.

9. ANOGEISSUS PENDULA

A. Species Trial

(i) The trial was taken up in the year 1981 at Jabalpur. After four years, survival percent of 96 was recorded with average height of 95 cm.

(ii) An experiment was started in the year 1987 near Jabalpur to study the growth trends of various forestry species. *Anogeissus pendula* was found performing fairly.

B. Pit Size Trial

An experiment was started during the year 1990 near Khuntaghat in Bilaspur centre. Polypotted seedlings of about one year age were planted in the pits of 45 cm^3 size and 60 cm^3 size which were already filled with dug up soil and 5 kg of compost. The growth data recorded showed that the best growth was induced by the 60 cm^3 sized pit.

C. Mixed Plantation

An experiment was started in the year 1972 near Bilaspur. *Anogeissus pendula* was planted in mixture with *Azadirachta indica*. The performance of *A. pendula* was found to be fair.

D. FertiliserTrial

(i) An experiment was laid out in the research nursery Jabalpur in the year 1988. It had two treatments namely, inoculation of seed with Rhizobium culture/ Azotobacter and control. In all five species were tried, *L. leucocephala*, *T. ballerica*, *A. pendula*,, *E. officinalis* and *M. azadirach*. The observations showed that inoculation with Rhizobium culture / Azotobacter had no positive effect on seed germination.

(ii) A trial was taken up in the year 1970 near Bilaspur. 20 gm of Urea and 20 gm of super phosphate were applied per plant. After a period of three years, the survival percent was observed to be 90 with average plant height of 63 cm.

E. Irrigated and Un-irrigated Conditions

An experiment was taken up in the year 1990 near Bilaspur to study the growth pattern of species successful on Bhataland, planted at various spacements, under irrigated and rainfed conditions. The growth data indicated that irrigation did not produce significant positive effects on the growth of *A. pendula*.

10. ANOGEISSUS LATIFOLIA

Mixed Plantation

This experiment was started in the year 1991 near Nepanagar. Ten species were planted in mixture following a definite pattern. The species tried were *Dalbergia sissoo*, *H. integerifolia*, *G. arborea*, *T. tomentosa*, *E. officinalis*, *A. indica*, *A. latifolia*, *P. juliflora*, *Z. jujuba* and *N. arbortristis*. *A. latifolia* showed fair performance.

11. AGAVE SISLANA

A. Spacement Trial

An experiment was started in the year 1970 near Bilaspur. Two planting spacements were tried out of which 3m x 1.5m gave good results.

B. Species Trial on Mined out site

This experiment was started in the year 1987 near Raipur. Fifteen tree species and *Agave sislana* were planted on O.B. dumps of an Iron ore mine at Nandini. *Agave sislana* performed very well.

C. Species Trial on Bhataland

The trial was taken up near Bilaspur in the year 1970. After four years period, the survival was found to be 86% and average height 1.02 m.

12. ALBIZZIA AMARA

Species Trial

This experiment was started in the year 1984 near Jabalpur. The growth data indicated that Albizzia amara is a suitable species for the region.

13. AEGLE MARMALOS

Species Trial

A trial was taken up in the year 1978 at Jabalpur. 59% survival was recorded in the first year.

14. ANTHOCEPHALUS CADAMBA

Species Trial

The species trial was taken up at Jabalpur in the year 1978. After a period of 7 years, the species showed survival percent of 72 and height of 270 cm.

15. ALBIZZIA FULCATARIA

Species trial on mined out site

(i) An experiment was started in the year 1985 near Dhanpuri in Shahdol district. Eight different species were planted on the OB dumps of coal mines in the

pits of 45 cm^3 size dug up at a spacement of 2m x 2m. The species were, *A. auriculiformis*, *E. cameldulensis*, *E. citriodora*, *E. officinalis*, *A. fulcataria*, *A. catechu*, *A. arabica* and *E. hybrid*. *Albizzia fulcataria* was one of the species which showed good performance.

(ii) An experiment was taken up in the year 1982 near Amarkantak. Twelve different species including *A. fulcataria* were tried on the overburden dumps in bauxite mined out site. Planting was done in the pits of 45 cm^3 size, dug up at a spacement of 2m x 2m, using polypotted seedlings. *A. fulcataria* gave quite good performance.

16. A. LEBBEK

A. Species trial on mined out site

(i) A trial was started in the year 1983 near Dhanpuri. Polypotted seedlings of 10 different species were planted on the OB dumps of coalmine. Planting spacement was 2m x 2m. *A. lebbek* showed quite good performance on the OB dumps.

(ii) An experiment was taken up in the year 1985 near Hirri in Bilaspur centre. Ten different species were planted on the overburden dumps of a Dolomite mine at 2m x 2m. The 10 species included *A. lebbek* also. The other nine species tried were ; *A. auriculiformis*, *A. tortilis*, *A. catechu*, *A. campylicantha*, *D. sissoo*, *D. strictus*, *E. hybrid*, *E. cameldulensis* and *G. arborea*. The planting stock consisted of polypotted seedlings. The growth data recorded indicated that *A. lebbek* had very good performance.

(iii) Another experiment was started in the year 1985 on Iron ore minedout site near Mahamaya (Durg district). Polypotted plants of about one year age were planted in the pits of 60 cm^3 size dug up at 2m x 2m. *A. lebbek* showed quite good performance.

(iv) An experiment was taken up in the year 1986 near Nandini (Raipur). Fifteen tree species including *A. lebbek* were planted on the minedout site of limestone. *A. lebbek* gave quite good performance.

B. Species Trial

(i) Species trial of *A. lebbek* was taken up at Jabalpur centre in the year 1987 with some other forestry species. *A. lebbek* showed very good performance.

(ii) An experiment was started in the year 1985 near Raipur to find out suitable species for the afforestation of Bhataland. Polypotted plants of about one year age were planted in the pits of 30 cm^3 size. *A. lebbek* showed quite good performance.

C. Irrigated and Un-irrigated conditions

(i) An experiment was taken up in the year 1986 near Nepanagar. There were three treatments namely, irrigation with effluent of Nepa paper mills, irrigation with fresh water and no irrigation. The sub-treatments were, planting spacement of 2m x 2m, 2m x 1m and of 1m x 1m. Three species planted included *A. lebbek* also. The data recorded indicated that *A. lebbek* performed better under irrigation with fresh water.

(ii) A trial was taken up in the year 1987 near Betul. It had two main treatments viz. Irrigation (I) and no irrigation (Io) and three sub-treatments viz. planting in the pits of 30 cm^3 size, planting in the pits of 45 cm^3 size and planting in the pits of 60 cm^3 size. The planting stock consisted of polypotted seedlings. The growth data indicated that *A. lebbek* had better survival percent under irrigation.

(iii) The above trial was replicated in Seoni area also. But there the treatments were found producing no differential effect (significant) on the growth of the plants.

D. Species Trial in Ravinous Land

A trial was started in the year 1983 in Morena centre. In this experiment eight pulpwood species were planted in Chambal ravines which included *A. lebbek*, *P. pinnata*, *E. tereticornis*, *B. ceiba*, *C. siamea*, *A. auriculiformis*, *E. hybrid* and *D. sissoo*. The growth data recorded indicated that *A. lebbek* showed quite good performance.

17. ALBIZZIA PROCERA

A. Species Trial (Central Zone)

(i) This trial was taken up in the year 1980 at Jabalpur. After a period of 5 years, a survival of 84% and height of 286 cm was recorded from *Albizzia procera* plantation.

(ii) Another experiment was taken up in the year 1984 in Jabalpur centre. Polypotted seedlings were planted in the pits of 45 cm^3 size. *A. procera* showed quite good performance.

(iii) An experiment was taken up in the year 1970 near Nepanagar to study the growth performance of some pulpwood species. *A. procera* showed quite good performance.

B. Irrigation and Pit Size Trial

(i) Another trial was started in the year 1987 near Betul. It had two main treatments viz irrigation (I) and no irrigation (Io) and three sub treatments viz planting in the pits of 30 cm^3 size, planting in the pits of 45 cm^3 size and planting in the pits of 60 cm^3 size. The planting stock consisted of polypotted seedlings and eight species were tried which included *A. procera*. The growth data indicated that *A. procera* had highest survival percent in irrigated conditions.

(ii) The above trial was replicated in Bilaspur and Seoni region also. There also similar results were obtained.

C. Irrigation and Fertilizer Trial

This trial was taken up at Vamandehi near Seoni in the year 1993. The observations were recorded after a period of 2½ years. It was found that the irrigation coupled with fertilizer produces positive effect on the height of the plants but the girth of the plants remained unaffected by the dose of the fertilizer.

D. Seed Treatment

An experiment was conducted in the year 1969 at Jabalpur nursery. One lot of seed of *A. procera* was kept in warm water for 24 hrs. while other was kept in cold water for the same period. The seed of both the lots were shown in nursery beds. After 15 days, seed treated with warm water gave higher germination i.e. the speed of germination was increased in that case.

E. Species Trial on minedout site

(i) An experiment was taken up in the year 1983 in Dhanpuri Coal fields. *Albizzia procera* was planted on OB dumps at 2m x 2m spacement. It gave quite good performance on the said site.

(ii) Another experiment was started in the year 1985 near Raipur in the Konde mine area to find out the suitable species for the afforestation of Iron ore mined out sites. The growth data indicated that *A. procera* was a suitable species for the said site.

18. ACACIA ANEURA

Species Trial

An experiment was started in the year 1970 near Bhind. Six months old potted plants were planted at 2m x 2m. *Acacia aneura* showed only 16% survival.

19. ACACIA DECURRENS

Species Trial

This experiment was started in the year 1971 near Amarkantak. *Acacia decurrens* showed quite good survival percent.

20. ACACIA VICTORIA

Species Trial

An experiment was started in the year 1971 near Nepanagar. *Acacia victoria* showed good performance.

21. ACACIA LEUCOFLOA

Species Trial

(i) This experiment was started in the year 1971 near Indore to find out the suitability of the species for Indore region. The growth data indicated that *A. leucofloa* was not successful on the given site.

(ii) Another experiment was taken up in the year 1974 near Bilaspur with a view to study the behaviour of the species on Bhata soil of Chhattisgarh. The data indicated that *Acacia leucofloa* can grow well on Bhata soil.

22. ACACIA SENEGAL

A. Species Trial

(i) An experiment was started in the year 1970 near Bhind. Six months old polypotted plants were planted. The growth data indicated that *A. senegal* was not a successful species on the given site.

(ii) A trial was taken up in the year 1974 at Parsada (Bilaspur). Nine species, including *A. senegal* were planted. *A. senegal* was found showing the best (89%) survival percent.

(iii) Another trial was started in the year 1982 near Jabalpur. In all 14 species of Acacias were tried which constituted the 14 treatments of the experiment. The species were, *A. campylicantha*, *A. senegal*, *A. melifera*, *A. auriculiformis*, *A. mollisima*, *A. nilotica*, *A. saligna*, *A. victoria*, *A. dalbata*, *A. margumae*, *A. ferruginea*, *A. catechu*, *A. murroyma* and *A. salimata*. The growth data recorded showed that *A. senegal* have shown good performance.

B. Plantation on Mined out site

(i) This experiment was started in the year 1983 in Dhanpuri Coal mines. In this, *A. senegal* was planted with other species of *Acacia genus*. As per the growth data recorded, *A. senegal* showed the best performance.

(ii) Another experiment was started in the year 1985 near Bilaspur on Dolomite mined out area. In this 10 species were tried. The growth data indicated that *A. senegal* showed quite good performance.

23. ADINA CORDIFOLIA

Irrigation-cum Pit Size Trial

This experiment was started in the year 1993 near Raipur. There were two treatments namely, irrigated conditions (I) and un-irrigated conditions (Io). Planting was done in 45 cm^3 sized pits dug up at 2m x 2m spacement. The growth data indicated that the growth performance was better under irrigated conditions.

24. AILANTHUS EXCELSA

A. Flowering and fruiting Behaviour

This experiment was started in the year 1956 at Chimanapur (Nepanagar centre) and time of flowering and fruiting of A. excelsa were observed. The observations indicated that *Ailanthus excelsa* flowers from January to March and it fruits from February to May.

B. Plant Percent

This experiment was started in the year 1958 near Nepanagar. One hundred

seeds each were sown in three nursery beds. The plant percent for *Ailanthus excelsa* was observed to be 14.5 under the local conditions.

C. Germination Capacity

The experiment was started in the year 1956 near Nepanagar. The tests were carried out in Grindwald's apparatus. Each test was done with 100 seeds. The germination percent of Ailanthus excelsa was found to be 15.

D. Irrigation-cum Pit Size Trial

This experiment was started in the year 1985 at Massak (Nepanagar). There were three main treatments, namely ; Irrigation with the effluent of Nepa paper Mill (I1), Irrigation with the fresh water (I2) and no irrigation (Io). The two sub-treatments were, planting spacement of 2m x 1m (P1) and planting spacement of 2m x 2m (P2). The observations recorded showed that the performance of A. excelsa was better under irrigation with paper mill effluent than that under other treatments.

E. Species Trial

A trial was taken up in the year 1983 in Burhanpur Division (Khandwa district) to study the growth and survival of A. excelsa in the locality where the conditions were comparatively drier. The growth data indicated that A. excelsa showed poor growth performance.

25. BOSWELLIA SERRATA

A. Planting Stock

The trial was taken up at Jabalpur in the year 1971. Polypotted seedlings of 6 months age and of 12 months age and naked plants of 12 months age were planted and survival and height growth observed. It was found that the performance of 6 months old polypotted seedlings was quite near to that of 12 months old naked plants.

B. Planting Technique

This trial was undertaken in the year 1973 near Seoni. Planting of 3 months old polypotted plants and also direct sowing of seed in the pits were done in the gaps available in the standing forest crop. The germination of kullu seed was found to be very low and also whatever seedlings obtained, all died after some time.

C. FertilizerTrial

This trial was taken up near Indore in the year 1973. One and half year old seedlings were planted and 25 gm of Ammonium sulphate and 25 gm of super phosphate were given to the plants in the first year, upto second year and upto third year separately. Observations recorded showed that fertilizer enhanced the height growth of the plants.

D. Branch Cuttings

A trial was taken up near Nepanagar in the year 1970-71. Branch cuttings of different combinations of length and mid girth were planted up. It was found that the combination of 45 cm. length and 50 mm mid girth was giving the best survival.

E. Regeneration

An experiment was started in the year 1949 near Nagpur, with the object of finding out the best time of applying treatments to roots of Salai (Boswellia serrata) for obtaining root sùckers. From February onwards, monthly digging of roots in four directions was done upto June 1949 of selected trees of girth class 12"-18" , 18"-24" and 30"-36".

The experiment was only of an exploratory nature. There were many variables and treatments with only few trees. These swamped the results. However, the observations indicated that :

(i) Sprouting occurs in June and July.

(ii) It takes 15 to 30 (minimum) days to sprout.

(iii) Sprouts obtained from the roots of trees of 18"-24" girth attain the maximum height.

(iv) Mortality of shoots (sprouts) is heaviest in trees over 30" in girth and also in roots of 1"-2" girth.

(v) Either due to drought or fire, dying back of root suckers occurs every year.

F. Protection

This experiment was started in the year 1958 at four centres namely, Chimnapur, Junwania, Hassanpura and Piplod. In each centre, there were two plots

out of which one was fenced while other was kept open (control). Eight to ten seeds were sown at 3m x 3m after the onset of Mansoon. In many cases resowing had to be done as the seed failed to germinate. The data indicated that the fenced plots at Chimnapur and Junwania showed good results. In these plots, 60 percent of the seedlings were surviving. Results in control plots were very poor in all centres, except Junwania, mainly because of heavy damage by cattle.

G. Planting Stock

An experiment was started in the year 1958 near Nepanagar. This had three treatments namely, A - planting naked transplants, B - planting transplants with ball of earth and C - planting transplants raised in polythene bags or bamboo buckets. The data recorded indicated that the survival was significantly more in case of seedlings transplanted with ball of earth. However, there was no significant difference in survival of naked transplants and transplants in bamboo buckets. Average height of Salai seedlings was found independent of different treatments.

H. Regeneration

An experiment was started in the year 1958 near Chimnapur in Nepanagar centre for studying the behaviour of root suckers of Salai. Fifty roots of Salai were injured to get root suckers. Root suckers came up from the injured roots but they failed to establish themselves.

I. Pollarding

This experiment was started in the year 1956 in Asir range (Nepanagar centre). Twenty four trees of Salai were pollarded in compartment No. 8 of East Asir range on 15th and 16th May 1956. Observations showed that most of the pollard shoots were fully established indicating that Salai pollards well.

J. Study of Phenology

This experiment was taken up in the year 1956 near Chimnapur. Time of flowering, time of fruiting, time of leafing and time of leaf fall were to be studied. The observations indicated that *Boswellia serrata* flowers from December to March and fruiting occurs from January to April. Time of new leafing is from January to August and leaf fall takes place from September to January.

K. Plant Percent

The experiment was started in the year 1958-59 for studying the plant percent of some forestry species which included *B. serrata*. The data were recorded from 1958 to 1961. The average plant percent of *B. serrata*. was found to be 12.

26. BURSERA DULPICHIANA

Species Trial

(i) A trial was taken up at Jabalpur in the year 1969. After a periods of 16 years, although the survival percent was observed to be 92 but the height was only 152 cm.

(ii) Another trial was taken up near Seoni in southern M.P. in the year 1976. Observations recorded showed the survival percent to be 100, height of 5.02m and girth of 21cm. after a period of 8 years.

27. BUCHNANIA LANZAN

A. Nursery Technique

This trial was taken up in Seoni and Bilaspur centres simultaneously in the year 1986. Depulped fruits of *B. lanzan* were sown in the polythene bags filled up with a mixture of soil, sand and FYM. Germination of seed obtained was very poor. Therefore the nuts were broken and seed obtained thus were sown in the polythene bags. In this case the germination obtained was better. The recruits obtained were transferred to the polythene bags where they grew well.

B. Planting Technique

In the year 1987, a trial was taken up in Seoni and Bilaspur centres. Polypotted seedlings of *B. Lanzan* were planted in the pits of 30 cm^3 size and also seed were sown in the above sized pits. The observations recorded showed better survival in case of seedling planting.

C. IrrigationTrial

This trial was also taken up in the year 1987, in Bilaspur and Seoni centres. In Seoni centre, the irrigation showed positive effect on the growth while in Bilaspur region it showed adverse effect.

28. BOMBAX CEIBA

A. Provenance Trial

(i) Provenance trials of *Bombax ceiba* were taken up in the year 1982 in Jabalpur, Bilaspur and Seoni centres. Observations recorded after two years showed that but for the provenances I and P, all the others had varying survival percent in Bilaspur centre. The height growth was best in case of the provenances H and S. In Jabalpur centre, except B and L, all the provenances did well. In Seoni centre also, except K, all the provenances did well.

(ii) Another provenance trial was taken up in 1983 in Seoni centre in which 5 provenances were tried. Out of these, B and J showed poor performance while others performed well. This result was based on the observations recorded after on year.

B. Species Trial

The trial was taken up in Bilaspur centre in the year 1976. Observations recorded after a year showed an average survival of 44% and an average height of 43 cm..

C. Species Trial in the Ravinous Land

This experiment was taken up in the year 1983 near Morena to study the growth behaviour of *B. ceiba* in the ravines of Chambal. The growth data recorded indicated that the performance of the species was quite good in the ravines.

D. Species Trial on Mined Out Site

This experiment was started in the year 1982 in Dhanpuri coalfields near Shahdol. Planting was done in the pits of 45 cm^3 size dug up at a spacement of 2m x 2m. The growth data indicated that *Bombax ceiba* is suitable species for the afforestation of coal mine area.

29. CALLIANDRA CALOTHYRSUS

Species Trial

(i) A trial was taken up at Jabalpur in the year 1980. Observations were recorded after a period of about 5 years. The survival percent found was 91 and the height was equal to 447 cm.

(ii) Another trial was conducted in 1980 in Seoni centre. After a period of four years, the survival was found to be 56% and the average height 558 cm..

30. CLEISTANTHUS COLLINUS

A. Species Trial On Bhataland

(i) This trial was taken up in the year 1970, near Bilaspur. Twenty gm of Urea and 20 gm of super phosphate were mixed with the pit soil at the time of planting. After four years, the survival percent was observed to be 43 and the height 1.01 m.

(ii) Another trial was also taken up near Bilaspur in the year 1973. Observations recorded after one year showed 75% survival and average height of 47 cm.

(iii) This experiment was started in the year 1974 near Bilaspur (Parsada), to study the survival and growth of *C. collinus* on Bhataland. Polypotted seedlings were planted in the pits. The observations recorded indicated that *C. collinus* had quite high (77%) survival percent on the site.

B. Species Trial on Mined Out Site

This experiment was started in the year 1983 in Dhanpuri coal mines. In this polypotted plants of ten different species were planted in the pits of 45 cm^3 size dug up at a spacement of 2m x 2m. The performance of *C. collinus* was observed to be very good (97%) survival.

C. Irrigation-cum-spacement Trial

This experiment was started in the year 1985 near Seoni. It had two main treatments viz. application of irrigation (I) and no irrigation i.e. control (Io). There were two sub-treatments namely ; 2m x 1m spacement (T1) and 2m x 2m spacement (T2). The growth data recorded showed that the treatments applied did not produce any effect on the growth of *C. collinus*.

D. Species Trial on a Rocky Land

The experiment was started during 1990 near Khuntaghat (Bilaspur) on the exposed rocky area. The dug up pits were filled with the mixture of soil and compost (5 kg per pit). Two pit sizes namely, 45 cm^3 (T1) and 60 cm^3 (T2) were tried. *C. collinus* showed better survival in the 60 cm^3 sized pits.

F. Fertilizer Trial

A trial was taken up near Hirri (Bilaspur) in the year 1986 in which the effect of 4 different doses of Urea fertilizer was studied. The doses were control (To), 25

gm, 50 gm, and 75 gm per plant. The results showed that 50 gm of Urea had produced the best results.

31. CASSIA SIAMEA

A. Species Trial

(i) Species trial of *Cassia siamea* was taken up at Jabalpur in the year 1982. After a period of 3 years, the survival percent was observed to be 55 and the average height 3.01 m.

(ii) Another species trial was done in Nepanagar centre which started in the year 1993. After on and half year, the survival percent was found to be 98 and average height 295 cm.

B. Irrigation Trial

A trial was taken up in Nepanagar centre in the year 1993 in which plants were given irrigation. Observations recorded after one and half year showed 100 percent survival and height of 350 cm.

Fertilizer Trial

This trial was taken up in Nepanagar centre in the year 1993. The fertilizer application was coupled with irrigation. After on and half year, the survival percent was found to be 96 and average height 365 cm.

32. CHLOROXYLON SWEITENIA

Species Trial

This trial was taken up in the year 1974 near Bilaspur (Pendaribhata). Polypotted seedlings of *C. sweitenia* were planted in the pits made on the Bhata soil. The object of the trial was to study the survival and growth of the species on Bhataland. The growth data recorded showed that *C. sweitenia* could have only 50% survival on the site concerned.

33. CASUARINA EQUISETIFOLIA

Species Trial

This experiment was started in the year 1973 near Indore (Ralamandal) with the object of studying the growth behaviour of C. equisetifolia in the local conditions. The growth data recorded showed that the species was not successful.

34. CEIBA PANTANDRA

Species Trial

This experiment was started in the year 1983 in Burhanpur division to study the growth and survival of C. pantandra in the locality which is having comparatively drier conditions. The observations recorded showed that C. pantandra was not successful in the locality.

35. CASSIA FISTULA

Species trial on Minedout Site

This experiment was started in the year 1986 near Raipur (Nandani). Planting of *Cassia fistula* seedlings (polypotted) was done on the OB dumps of Limestone mine. Planting pits were made at a spacement of 2m x 2m. The observations showed that the species was successful on the site.

36. DELONIX REGIA

Species Trial

This experiment was started in the year 1984 near Raipur. The growth data indicated that Delonix regia gave quite good performance on the site concerned.

37. DALBERGIA LATIFOLIA

A. Planting Stock

An experiment was taken up in the year 1986 near Vamandehi (Seoni). There were two treatments in the experiment viz. planting of polypotted seedlings (T1) and planting of root-shoots (T2). The observations recorded in December, 1990, indicated that plants of both the origins performed equally well in respect of survival percent.

B. Spacement Trial

(i) An experiment was taken up in the year 1961 in Seoni centre. From the spacement trial, the suitable spacement found was T1 (1.5m x 1.5m) which showed the best survival of 84.6%.

(ii) This experiment was taken up in the year 1981 in Seoni centre. In this trial, three spacements were tried out of which T1 (1.5m x 1.5m) gave the best (84.5%) survival and T3 (2.5m x 2.5m) induced average height of 177.25 cms.

(iii) Another experiment was taken up in the year 1981 in Seoni (Vamandehi) centre. The maximum volume production due to spacement was shown by T1 (1.5m x 1.5m).

38. DALBERGIA SISSOO

A. Planting Stock

(i) This experiment was taken up in the year 1986 near Bilaspur. In this, polypotted seedlings of *D. sissoo* were planted in the pits of 30 cm^3 size and the root-shoots were planted in the crow bar holes, for comparing the performance of two types of planting stock. The growth data suggested that the growth was inferior when the planting stock was root shoots.

(ii) The same experiment was repeated in the year 1986 near Jabalpur. The growth data indicated that *D. sissoo* gave better height in case of normal seedling plantation and better survival percent in case of root-shoot plantation.

(iii) The above experiment was repeated near Seoni also. There the observations indicated that plants of both the origins did equally well in respect of survival percent.

(iv) However, in Nepanagar centre, *D. sissoo* gave better performance in case of planting of root-shoots. Similar results were obtained from Morena centre also.

B. Pit Size Trial on Minedout Site

This experiment was started in the year 1986 at Dhanpuri Coalmines. The treatments consisted of planting pits of three different sizes namely, 30 cm^3, 45 cm^3 and 60 cm^3. The planting spacement was kept 2m x 2m. Polypotted plants of six species including *D. sissoo* were planted. The interim data recorded indicated no significant effect of pit size on the growth performance of the species.

C. Species Trial on Minedout Site

(i) An experiment was started in the year 1983 in Dhanpuri Coalmines. *Dalbergia sissoo* and 9 other species were planted on the OB dumps. *Dalbergia sissoo* showed a moderate survival on the site.

(ii) Another experiment was taken up in the year 1986 near Raipur (Nandini) on the Lime stone Mined out site, Fifteen tree species and *D. sissoo* were planted on the site. The data indicated that *D. sissoo* performed quite well.

(iii) An experiment was started in the year 1986 in an Iron ore mine (Dalli Rajhara) also. In this, eight species were planted on the OB dumps. The planting was done at 2m x 2m spacement. The growth of *D. sissoo* when observed after two years, was found to be moderate.

(iv) The trial was repeated in another mine near Raipur. The growth data indicated that *D. sissoo* was not successful on the OB dumps of Iron ore mines.

(v) An experiment was taken up in the year 1985 near Hirri (Bilaspur) on the OB dumps of a dolomite mine. The 10 species constituted 10 treatments of experiment. The planting stock consisted of polypotted seedlings. Observations recorded after three years showed that *D. sissoo* grew very well on the given site.

D. Species Trial on Bhataland

(i) An experiment was taken up in the year 1974 near Parsada (Bilaspur) with a view to find out the comparative suitability of species on Bhata soils of Chhattisgarh. The observations indicated that *D. sissoo* was a suitable species for afforestation of Bhatalands.

(ii) Another experiment taken up in the year 1974 near Bilaspur gave similar results.

E. Mixed Plantation V/s Pure Plantation

This experiment was started in the year 1974 near Bilaspur with a view to study the growth of species planted on Bhataland in pure and in mixture with Bamboo. The observations indicated that planting of *D. sissoo* in mixture with Bamboo resulted in better growth in *D. sissoo*.

F. Trial on Growing Medium

(i) A trial was taken up at Dhanpuri Coalmines in wnich *D. sissoo* was planted in the pits having (i) dump material (ii) dump material + C.D. manure (iii) Humus rich soil, and (iv) Humus rich soil + C.D. manure. The growth data indicated that *D. sissoo* grown in humus rich soil gave the best results.

G. Species Trial on Waterlogged Area

This experiment was started in the year 1986 near village Nimsadia in Hoshangabad district. In this polypotted plants of 9 species namely, *T. arjuna*, *S. cumini*, *E. hybrid*, *D. sissoo*, *P. pinnata*, *A. auriculiformis*, *L. leucocephala*, *C. siamea* and *D. strictus* were planted at 2m x 2m. The growth data of *D. sissoo* indicated that the height growth was maximum among the species tried.

H. Species Trial on Fly Ash Dumps

This experiment was started in the year 1986 near Amarkantak (Ash dumps of MPEB at Chachai). The experiment had four treatments namely, T1=filling the pits with original material, T2=filling the pits with humus rich soil, T3=filling the pits with humus rich soil and applying Ammonium sulphate and T4=filling the pits with humus rich soil plus compost. The observations recorded after 5 years have shown that *D. sissoo* had the best performance with humus rich soil mixed with compost.

I. Irrigation Trial on a Minedout Site

This experiment was started in the year 1986 near Amarkantak. There were two treatments in this experiment namely irrigation(I) and no irrigation(Io). The four species tried included *D. sissoo* also. Growth data indicated that the prescribed dose of irrigation did not prove to be beneficial for the growth of the species on the Bauxite mined out site.

J. Irrigation-cum-spacement Trial on Bhataland

This experiment was started in the year 1990 near Bilaspur. It had two main treatments namely I=irrigation and Io=No irrigation. Three spacements namely, 2m x 2m, 3m x 3m, and 3m x 2m were the sub-treatments. The data indicated that the treatments could not produce differential effect on the growth of *D. sissoo*.

K. Fertilizer Trial

(i) The trial was taken up in the year 1973 in Bilaspur centre. Uniform doses of Ammonium sulphate and super phosphate (50 gm each) produced positive effect when applied in the first year and third year or in the first and fifth year.

(ii) This experiment was started in the year 1989 near Bilaspur. It had three main treatments namely, 30 cm^3 sized pits (P1), 45 cm^3 sized pits (P2), and 60 cm^3 sized pits (P3) and sub-treatments were, no fertilizer (Fo), application of 25

gm of fertilizer per plant (P1) and application of 50 gm of fertilizer / per plant (F2). *D. sissoo* did not feel any differential effect of prescribed doses of fertilizer on its growth.

L. Sowing Depth

This experiment was started in the month of February 1988 and it was closed in April 1988. The treatments in the experiment were, sowing of seed in the bed to the depth of 1 cm (T1), sowing of seed to the depth of 2 cm (T2), sowing of seed to the depth of 3 cm (T3) sowing of seed to the depth of 5 cm (T4) and sowing of seed to the depth of 7 cm (T5). Six species were tried which included *D. sissoo*. The observations recorded showed no significant effect of the sowing depth on the germination of seeds.

M. Sowing Time

This experiment was laid out in the research nursery Jabalpur in October 1987 and it ended in June 1988. It had two main treatments namely sowing of seed in the first fortnight of October (T1) and sowing of seed in the second fortnight of October (T2). The sub-treatments were irrigation of beds daily (I1), irrigation of beds on alternate day (I2) and irrigation of beds at an interval of three days (I3). Twelve species were tried which included *D. sissoo* also. The data recorded showed that *D. sissoo* gave highest germination percent from the sowing of first week.

N. Sowing Method

The experiment was laid out in the research nursery Jabalpur in February 1988 and it ended in March 1988. It had two treatments viz. sowing of seed by broadcast method (T1), and sowing of seed by drill method (T2). *D. sissoo* gave higher germination percent in case of sowing by drill method.

O. Plantation on Rocky Hillock

The experiment was started during 1990 near Bilaspur (Khuntaghat) to find out the technique for afforestation of barren rocky hillock. Pits of 30 cm^3 size, 45 cm^3 size and 60 cm^3 size were dug up and filled up with the mixture of soil and compost (5 kg per pit). Planting was done in these pits. The growth data indicated that *D. sissoo* grew best in the pits of 45 cm^3 size.

P. Species Trial

(i) This trial was taken up in the year 1979 in Bilaspur centre, Planting was done in the pits of 30 cm^3 size and 50 gm of Calcium ammonium nitrate and

50 gm of superphosphate were given to each plant at the time of planting. The observation data indicated that an average increment of 15 cm was obtained in 7 months.

(ii) Another trial was taken up in the year 1979 at Jabalpur. Observation data indicated that *Dalbergia sissoo* gave quite good performance.

(iii) A trial was taken up in the year 1981 in Nepanagar centre. Polypotted seedlings of *D. sissoo* were planted in the pits of 45 cm^3 size. The observations recorded indicated that the species can grow successfully in the region.

Q. Provenance Trial

(i) A trial was taken up in the year 1982 at Jabalpur. The experiment had three provenances forming three treatments. The provenances were, Lot No. 3001, 3002 and 3003. The best growth was observed in P2 (Lot No. 3003).

(ii) Another experiment was taken up in the year 1982 near Seoni with a view to compare the growth performance of different provenances of *D. sissoo* with the local *D. sissoo*. Planting of eight provenances constituted the 8 treatments. The provenance tried were, FRI - 3005, FRI - 3010, FRI - 3013, FRI - 3014, FRI - 3015, FRI - 3016, FRI - 3017, and local. The growth performances of T2 (FRI - 3010) and T3 (FRI - 3013) provenances were found superior.

(iii) A trial was taken up in the year 1983 near Seoni. In This, FRI 3005 was found to be the best provenance and it was seconded by FRI - 3007.

(iv) One more Trial was taken up in the year 1983 in Bilaspur centre (Khuntaghat). In this, 18 provenances of *Dalbergia sissoo* were tried out of which T4 (seed lot No. 3005) showed 100% survival and best height was observed in case of T 10 (seed lot No. 2010).

R. Irrigation-cum Pit size Trial

This experiment was started in the year 1987 near Betul. It had two main treatments namely ; irrigation (I) and no irrigation(Io). The sub-treatments were, planting in the pits of 30 cm^3 size, planting in the pits of 45 cm^3 size and planting in the pits of 60 cm^3 size. The planting stock consisted of polypotted seedlings. The growth data indicated that the pit size had a positive effect on the height growth and irrigation had positive effect on survival and height both. Similar results were observed in Raipur region also. The same trial was replicated in Seoni region also but there the treatments were observed to be ineffective.

S. Species Trial on Ravinous Land

This experiment was started in the year 1987 near Morena. There, polypotted seedlings were planted in the pits dug up in the ravines of Chambal. The observations recorded showed that *D. sissoo* performed quite well.

39. DENDROCALAMUS STRICTUS

A. Planting Stock

(i) A trial was taken up near Indore to find out the best planting stock out of the three types included in the trial. The three types were, polypotted seedlings of 6 months age, polypotted seedlings of 9 months age and naked seedlings of 9 months age. After a period of 5 years. It was concluded that the polypotted plants of 9 months age were giving the best results.

(ii) Another trial on planting material was taken up in 1991 near Raipur (Nawagaon) in which Bamboo rhizomes of one, two and three years age were planted to see as to what should be the age of the rhizome to get best results. After a period of three years, it was concluded that the growth was comparable in all the three cases. However, survival was highest in case of 3 years old rhizome origin plants.

(iii) The above trial was repeated in the year 1993 at Amarkantak in which naked and polypotted rhizomes of one, two and three years age were planted to observe their survival. After a period of two and half years, the survival of plants was found to be comparable but height was more in case of older rhizomes.

B. FertilizerTrial

(i) One more fertilizer trial was done in Pendaribhata near Bilaspur in the year 1973. The trial period was 5 years and fertilizer application was done in uniform doses but at different times i.e., first year, second year, third year, fifth year and third and fifth year. At the end, it was found that application of fertilizer doses in third year and also in fifth year resulted in higher recruitment in the clumps. The poorest result was obtained where fertilizer was applied only in the fifth year.

(ii) In the year 1974, an experiment was taken up near Nepanagar in which 16 doses of Inorganic fertilizer were tried to find out the best dose for obtaining

maximum growth in *D. strictus*. The dose consisting of 50 gm of Nitrogen fertilizer and 50 gm of Phosphorus gave the best result while that consisting of 50 gm of Nitrogen and no Phosphorus showed the poorest result.

(iii) Another fertiliser Trial, also taken up near Indore, consisted of application of 100 gm and 200 gm of Ammonium sulphate to the plants of *D. strictus*. After four years, it was observed that the dose consisting of 100 gm of Ammonium sulphate was the best one.

(iv) In the year 1957, a fertilizer trial was conducted in Rukhar area (Seoni District) to know the best mixture of Ammonium sulphate and super phosphate for the growth of *D. strictus*. The data recorded in the year 1978 showed that survival and growth was higher in the treated plants in comparison to those not treated and out of the two mixtures tried, application of 80 gm of Ammonium sulphate with 20 gm of super phosphate was found to be a better dose.

(v) An experiment was started in the year 1986 near Jabalpur. It was done with four species. The treatments were, application of Azotobactor (T) and Control (To). The data indicated that *D. strictus* gave better performance in the control.

C. Moisture Conservation Techniques

(i) In the year 1972, with a vies to evolve the best moisture conservation technique for a *D. strictus* plantation raised on the Bhatalands of Chhattisgarh. The trial was taken up near Bilaspur. The result of the trial was that a trench with 20 cm depth and 30 cm width around the planting pit and at a distance of 15 cm from the pit was the best moisture conservation technique.

(ii) Another trial on moisture conservation technique was taken up near Nepanagar (Khandwa district) in the year 1973. Planting of *D. strictus* in the pits of 30 cm^3 size and making a circular trench around the plant and making a semi circular trench 45 cm away from the plant were tried. After a period of 5½ years, it was found that making circular trench around the plant, at a distance of 45 cm, was the technique which induced maximum survival and growth and also recruitment in Bamboo. However, results obtained for semicircular trenches also were quite near to these results.

D. Comparison of Growth

In the year 1981, three species of Bamboos namely, *D. strictus*, *Bambusa vulgaris* and *Bambusa arundinancea* were planted near Amarkantak to compare the suitability of these species to the site. After a period of 5 years the data were analysed and it was found that *D. strictus* and *Bambusa arundinancea* had shown comparable survival percent and good growth while *Bambusa vulgaris* failed.

E. Effect of Overhead Cover

In the year 1926, a Bamboo plantation was done in Yeotmal Division. This plantation was subjected to a study on the effect of removal of overhead cover on the growth of Bamboo(*D. strictus*). Observations showed that recruitment in the exposed clumps was more than that in the clumps over which the cover was retained.

F. Effect of Fire on the Growth

In the year 1930-31, a study was conducted in Betul Forest Division in which the effect of fire was observed on the growth of Bamboo crop. It was found that clumps developed in the following years were less healthy in the burnt area than those in the unburnt area.

G. Best Method of Working

(i) An experiment was started in the year 1934 near Balaghat. It had two treatments namely (I) 3,4 and 5 years felling cycle and (II) N+O, N+2, N+8, N+N and N+2N retention of culms during the felling where N=number of current year culms. Indications from the data collected were that N+8 was the best retention followed by N+2N, N+N, N+O in all the felling cycles.

(ii) In the year 1936-37, an experiment was started in Balaghat Division to determine the best felling cycle for working of *D. strictus* forests. Three years, four years, and five years felling cycles plus different degrees of felling were tried. At the end, it was observed that retaining all the new culms plus six old culms was the best method of working in all the felling cycles.

(iii) However, in the year 1946-47 and 1950-51, FRI Dehradun informed that retaining N+8 culms was the best method of working following N+2N an N+N culms where 'N' is the new recruitment at the time of felling.

H. Longivity of culms

An experiment was started in the year 1934 near Balaghat to study the longivity of individual culms. It was found that the culms normally live up to 10 years.

I. Species Trial

(i) This experiment was started in the year 1974 near Bilaspur. In this, nine species were planted in the Bhataland. Those were, *A. senegal*, *A. campylicantha*, *C. sweitenia*, *C. collinus*, *D. strictus*, *A. indica*, *D. sissoo*, *E. cameldulensis* and *E. hybrid*. The data recorded indicated that D. strictus had a survival percent of 52.

(ii) Another species trial was taken up in the year 1974 near Raipur. There the species showed 88% survival.

J. Mixed Planting

This experiment was started in the year 1974 near Bilaspur. In this, D. strictus was planted in mixture with *D. sissoo*. The data recorded showed that maximum survival was obtained in case of pure Bamboo plantation while maximum height was recorded from the mixed plantation.

K. Species Trial On Mined Out Site

(i) A trial was started in the year 1984 in Amarkantak centre. The planting was done at a spacement of 2.5m x 2.5m. There, *D. strictus* showed 99% survival

(ii) Another experiment was started in the year 1985 near Hirri (Bilaspur). D. strictus was planted on the OB dumps of dolomite mines. Polypotted seedling of *D. strictus* were planted at 2m x 2m. A survival percent of 83 and very good height growth was recorded.

(iii) Another experiment was taken up in the year 1985 at konde (Durg district) on an iron ore mined out site. D. strictus planting was done at 3m x 2m spacement. The growth data indicated that *D. strictus* was successful on the site.

(iv) Another trial was started in the year 1986 near Dalli-Rajahara on an Iron ore mined out site. The planting was done at 2m x 2m spacement. The growth data recorded showed that *D. strictus* performed quite good with survival percent of 89.

(v) One more experiment was taken up in the year 1987 in coalmines near Dhanpuri. The growth data indicated that *D. strictus* did not show good growth.

L. Species Trial on a Fly Ash Dump

This experiment was started in the year 1986 on fly ash dumps of Thermal Power Plant at Chachai. The experiment had four treatments namely, T1-Filling the pits with original material. T2-Filling the pits with humus rich imported soil, T3-filling the pits with humus rich soil plus compost and T4-filling the pits with humus rich soil and applying Ammonium sulphate. The growth data recorded indicated that *D. strictus* was the most successful species in all the treatments.

M. Irrigation-cum-soil working

This experiment was started in the year 1986 near Chakarbhata (Bilaspur). There were two main treatments in this experiment namely, application of irrigation (I) and no irrigation (Io), and three sub-treatments viz planting in the pits of 30 cm^3 size (P1), planting in the pits of 45 cm^3 size (P2) and planting in the pits of 60 cm^3 size (P3). The data recorded indicated that *D. strictus* survived most in P2 i.e. pits of 45 cm^3 size and under irrigation.

N. Sowing Depth

This experiment was started in the month of February 1988 in Morena centre. The treatments were sowing of seed to the depth of 1 cm (T1), sowing of seed to the depth of 2 cm (T2), sowing of seed to the depth of 3 cm (T3), sowing of seed to the depth of 5 cm (T4) and sowing of seed to the depth of 7 cm (T5). The data recorded indicated that *D. strictus* gave best results with T1 i.e. sowing to the depth of 1 cm.

40. DALBERGIA PANICULATA

A. Germination Capacity

The experiment was started in the year 1956 near Nepanagar. The tests were carried out in Grindwald's apparatus. Each test was done with 100 seeds. The observations indicated that Dalbergia paniculata gave 92% germination.

B. Plant Percent

This experiment was started in the year 1958 near Nepanagar. One hundred seed each were sown in three beds. The plant percent of *Dalbergia paniculata* was observed to be 60.

41. ERYTHRINA TUBEROSA

A. Germination Capacity

An experiment was started in the year 1956 near Nepanagar. The tests were carried out in Grindwal's apparatus. Each test was done with 100 seeds. The observations indicated that *Erythrina tuberosa* gave 78% germination.

B. Plant Percent

This experiment was started in the year 1958 near Nepanagar. One hundred seed each were sown in three nursery beds. The plant percent of *Erythrina tuberosa* was observed to be 15.3.

42. EUCALYPTUS CAMELDULENSIS

A. Species Trial

A trial was taken up near Bilaspur (Mohanbhata) in the year 1973. Polypotted seedlings were planted at a spacement of 2m x 4m. Line to line spacement was kept wider for interplanting of *Cleistanthes collinus, Gmelina arborea, Dalbergia sissoo* and *Azadirachta indica*. After one year, the species performed quite well and among the species interplanted, performance of *A. indica* as the best.

B. Provenance Trial

(i) This trial was taken up in the year 1971 near Bilaspur for finding out the suitable provenance of *E. camaldulensis* for Bhata soil. Eight provenances of *E. camaldulensis* were tried, They were,

T1-*E. camaldulensis* 6872, T2-*E. camaldulensis* 7080. T3-*E. camaldulensis* 7030. T4-*E. camaldulensis* 6872, T5-*E. camaldulensis* 6986, T6-*E. camaldulensis* 6983, T7-*E. camaldulensis* 6953, and T8-*E. camaldulensis* 7029. The observations showed that the best survival and height growth was shown by the provenance no. 7080 (T2).

(ii) One more trial was taken up in the year 1971 near Nepanagar to compare the rate of growth and survival of different provenances of *E. camaldulensis*. The provenances tried were.

T1-*E. camaldulensis* 6953, T2-*E. camaldulensis* 6983, T3-*E. camaldulensis* 6986, T4-*E. camaldulensis* 7029, T5-*E. camaldulensis* kings kenyan, T6-*E. camaldulensis* 6872, T7-*E. camaldulensis* 6871, T8-*E. camaldulensis* 7030.

T9-*E. camaldulensis* 7037, T10-*E. camaldulensis* 7116, T11-*E. camaldulensis* 6869, T12-*E. camaldulensis* 6372, T13-*E. camaldulensis* 6988, T14-*E. camaldulensis* 7080, T15-*E. camaldulensis* 7030. The observations showed that *E. camaldulensis* provenance 7030 (T9) and kings kenyan (T5) were the suitable provenances.

(iii) Another trial was started in the year 1971 near Indore. In this trial, 6 provenances of *E. camaldulensis*, namely T1-*E. camaldulensis* 6872 (Jodhpur), T2-*E. camaldulensis* (Jabalpur) T3-*E. camaldulensis* 6872 (Jabalpur), T4-*E. camaldulensis* 7080 (Jodhpur), T5-*E. camaldulensis* 7030 and T6-*E. camaldulensis* 6986 (Jabalpur) were tried to find out the best provenance. The results showed that *E. camaldulensis* 7030 was the most suitable provenance as regards the height growth.

C. IrrigationTrial

This trail was started in the year 1986 near Bilaspur to study the effect of irrigation and various moisture conservation measures on the survival and growth of plants planted in Bhataland. The main treatments were, application of irrigation (I) and no irrigation (Io). Planting was done in the pits of 50 cm^3 size and in the trenches of 2.5x0.5x0.5 m size. The data showed that bigger sized pits (trenches) conserved more moisture and were thus helpful in boosting the plant growth.

D. Planting Stock

(i) A trial was started in the year 1986 near Nepanagar. In this, there were two main treatments, namely, T1- planting of polypotted seedlings andT2 - planting of Root-shoots. The results showed that the treatmentT1(planting of polypotted seedlings) was beneficial as compared to T2.

(ii) The trial was started in the year 1986 at Amarkantak. In this experiment the growth trends of plants in plantation with planting stock as (a) polypotted seedlings and (b) Root-shoots were compared. The species tried were S1 - *Kydia calycina*, S2 - *Toona ciliata*, S3 - *A. auriculiformis*, S4 - *D. sissoo* and S5 - *E. camaldulensis*. The results showed that Root-shoots origin plants gave better performance in case of *E. camaldulensis*.

E. Species Trial on Minedout Areas

(i) This Trial was started in the year 1982 near Dhanpuri coalmines to study the suitability of species to the overburden dumps of coal mined out areas.

Polypotted seedlings were planted in the pits made on the OB dumps. The result showed that the performance of *E. camaldulensis* was quite good.

(ii) Another trial was taken up near Amarkantak in the year 1983 to find out the suitability of different Eucalyptus species for afforestation of Bauxite mined out sites. The planting was done at the spacement of 2m x 2m In this experiment. Six Eucalyptus species were tried. They were:

T1- *Eucalyptus camaldulensis* - Jabalpur lot No. 7037/83

T2- *Eucalyptus camaldulensis* - lot No. 6870/80

T3- *Eucalyptus camaldulensis* - lot No. 8031/70

T4- *E. hybrid*

T5- *E. grandis and ;*

T6 *E. citriodora*

The result showed that the performance of *E. camaldulensis* was poor in comparison to other species.

(iii) Another trial was taken up in the year 1990 on the OB dumps of a Coalmine. Polypotted seedlings were planted in the pits made on the dumps. The species performed quite well.

F. Mixed Plantation

A trial was started in the year 1972 near Bilaspur to study the performance of *E. camaldulensis* when planted with teak in alternate rows, on Bhataland. The result showed that the growth performance of *E. camaldulensis* was better than Teak in respect of height.

G. Pit Size Trial

(i) This trial was started in the year 1986 near Dhanpuri on the OB dumps of opencast coal mines, to study the effect of pits of different sizes on the growth of the plants. Three pit sizes namely, 30 cm^3, 45 cm^3 and 60 cm^3 were tried. Polypotted seedlings were planted in the filled up pits. The results showed that the pit size had no appreciable effects on plant growth probably because mining makes the surface pulverized.

(ii) The experiment was started in the year 1989 near Chimnapur (Nepanagar) to study the effects of pit size on the growth of timber, fuel and fodder species. The pit sizes tried were, 30 cm^3, 45 cm^3 and 60 cm^3. Species tried were *A. lebbek, G. arborea, P. pinnata, A. nilotica, A. auriculiformis, E. camaldulensis* and *D. sissoo*. Measurements recorded in Dec. 1990, showed that the pit size of 60 cm^3 is more appropriate than other size especially for *E. camaldulensis* and *A. nilotica*.

H. Pulpwood Plantation

(i) This trial was taken up in the year 1983, near Nepanagar in Khandwa district to study the comparative growth and survival of some pulpwood species. The species tried were, *Acacia auriculiformis, Ailanthus excelsa, Ceiba pantandra, Dendrocalamus strictus, E. camaldulensis, Leucaena leucocephala, Pongamia pinnata* and *Morus alba*. The observations showed that the performance of *E. camaldulensis* was better in comparison to other species.

(ii) Another experiment was started in the year 1984 near Mandu in Dhar district to study the growth trends of some pulpwood species. The species tried were, *A. auriculiformis, E. hybrid, P. pinnata, A. excelsa, G. arborea, M. alba,* and *C. pantandra*. The growth of *E. camaldulensis* was poor.

I. Comparative Growth (on Coal mined out site)

An experiment was taken up in the year 1985 in Dhanpuri Coalfields near Shahdol. In this, planting of polypotted plants of *A. auriculiformis, E. camaldulensis, E. citriodora, E. officinalis, A. fulcataria, A. catechu, A. nilotica* and *E. hybrid* was done in the pits of 45 cm^3 size. The data recorded indicated that all the species tried were suitable for the site, but highly suitable species were *E. camaldulensis, E. hybrid* and *E. citriodora* in the given order.

J. Comparative Growth (Bauxite mined out site)

An experiment was started in the year 1982 near Amarkantak. Twelve different species were tried on the overburden dumps of bauxite minedout site. The species tried were *G. robusta* (T1), *E. camaldulensis* (T2), *A. auriculiformis (T3), E. officinalis* (T4), *M. Azadirach* (T5), *E. hybrid* (T6), *S. urens* (T7), *Toona cillata* (T8), *P. pinnata* (T9), *E. grandis* (T10), *A. fulcataria* (T11), and *G. pteridifolia* (T12). The results showed that the growth performance of *E. camaldulensis* was superior to others.

K. Comparative Growth (Dolomite mined out site)

A trial was started in the year 1985 near Bilaspur (Hirri), to assess the suitability of species for afforestation of overburden dumps of Dolomite minedout area. Ten species were tried which were, T1- *A. auriculiformis*, T2 - *A. tortilis*, T3 - *A. catechu*, T4 - *A. campylicantha*, T5 - *A. lebbek*, T6 - *D. sissoo*, T7 - *D. strictus*, T8 - *E. hybrid*, T9 - *E. camaldulensis* and T10 - *G. arborea*. The growth data recorded in June 1987 indicated that *E. camaldulensis* was the most suitable species for the afforestation of Dolomite minedout areas.

L. Spacement Trial

This experiment was started in the year 1985 on a Bauxite mined out site near Amarkantak. Four planting spacements namely, 1m x 1m, 1m x 2m, 1.5m x 1.5m and 2m x 2m were tried with the species *Grevillia pteridifolia*, *Grevillia robusta*, *E. camaldulensis*, *Pinus kesiya* and *Shorea robusta*. The data recorded (June 1988) indicated that for *E. camaldulensis*, 1.5 x 1.5m was the best planting spacement.

M. Comparative Performance on Bhataland

This trial was started in the year 1974 near Parsada (Bilaspur) to study the comparative suitability of species on Bhata soil of Chhattisgarh. The species tried were, T1 - *Acacia senegal*, T2 - *A. campylicantha*, T3 - *Chloroxylon sweitenia*, T4 - *Cleistanthes* collinus, T5 - Bamboo, T6 - *A. indica*, T7 - *D. sissoo*, T8 - *D. sissoo* and T9 - *E. camaldulensis* (King kenyan). The results showed that *E. camaldulensis* (king kenyan) was most suitable species for Bhata soil as compared to other species tried in the trial.

N. IrrigationTrial

(i) This trial was taken up in the year 1991 near Nepanagar to study the growth performance of *E. camaldulensis* raised under irrigated and rainfed conditions. The experiment had two main treatments namely, T0 - control and T1 - application of irrigation. The planting spacement was kept at 2m x 2m. The observations revealed that irrigation had direct positive effect on the growth and survival of plants, as compared to control.

(ii) Another trial was taken up in the year 1986 near Nepanagar to study the effect of irrigation with effluent of paper mill and with fresh water on the growth of some pulpwood species planted in the area nearby Nepa mill. The species

tried were, S1 - *Ailanthus excelsa*, S2 - *Acacia auriculiformis*, S3 - *A. lebbek*, S4 - *E. camaldulensis* and S5 - *A. procera*. In this experiment the effluent water irrigation was found beneficial as compared to the control and fresh water irrigation.

O. Irrigation cum Pit Size Trial

An experiment was started in the year 1987 near Parsadabhata (Bilaspur). Five species viz *P. pinnata*, *E. camaldulensis*, *G. arborea*, *A. procera* and *T. grandis* were planted. The first 4 species were tried using polypotted seedlings while in case of Teak root-shoot planting was done. Planting was done in the pits of 30 cm^3 45 cm^3 and 60 cm^3 sizes. Application of irrigation and rainfed conditions were the two main treatments. Observations recorded after 4 years of planting showed that irrigation had shown positive effects on the growth of *E. camaldulensis*. Bigger sized pits expectedly showed better results.

P. Mixed Plantation

(i) This trial was started in the year 1974 near Ralamandal in Nepanagar centre, to study the growth performance of Eucalyptus camaldulensis in mixture with *Gmelina arborea* as well as in pure plantation. The observations showed that the performance of *E. camaldulensis* in pure plantation was better and *G. arborea* performed better in mixture.

(ii) The other trial was started on the OB dumps of bauxite mines in the year 1983 near Amarkantak. Three species were tried in mixture with Sal; forming following three treatments :

T1 - Sal + *Grevillia pteridifolia*

T2 - Sal + *E. camaldulensis*

T3 - Sal + *Pinus kesiya*

The results showed that the growth of *E. camaldulensis* grown with Sal in alternate lines on the Bauxite mined out area was the most impressive with best average height and survival percent.

43. EUCALYPTUS GRANDIS

Species Trial

This trial was started in the year 1983 near Amarkantak for finding out the

suitability of different Eucalyptus species for the afforestation of Bauxite mined out area. The Planting was done at the spacement of 2m x 2m. In this experiment, 6 Eucalyptus species were tried. They were :

T1 - *E. camaldulensis*, Jabalpur Lot No. 7037/83.

T2 - *E. camaldulensis*, Lot No. 6870/80.

T3 - *E. camaldulensis*, Lot No. 8031/76.

T4 - *E. hybrid*

T5 - E. grandis, and;

T6 - *E. citriodora*

The result showed that the performance of *E. grandis* was inferior to other species. A similar result was obtained from a trial conducted in 1982.

44. EUCALYPTUS OLEOSA

Comparative Performance

The trial was started in the year 1972 near Bilaspur. The growth performances of *E. oleosa* and *E. camaldulensis* were studied for the purpose of comparison. The plantations were raised on Bhataland. The results showed that the growth of *E. oleosa* was inferior to that of *E. camaldulensis*.

45. EUCALYPTUS MICROTHECA

Provenance Trial

A Provenance trial of *E. microtheca* was started in the year 1985 near Nepanagar. Seven provenances namely, T1 -12532, T2 - 13200, T3 - 13360, T4 - 12811, T5 - 12827, T6 - 12525 and T7 - 12495 were tried. It was observed that T5 (12827) provenance was showing the best survival and growth.

46. EUCALYPTUS CITRIODORA

Species Trial

This trial was started in the year 1983 near Amarkantak to find out the suitability of different Eucalyptus species for afforestation of Bauxite mined out area.

The planting was done at the spacement of 2m x 2m. In this, *E. citriodora* was tried with 5 other species of Eucalyptus for knowing the comparative performance. The species tried were :

T1 - *E. cameldulensis*, Jabalpur Lot No. 7037/83.

T2 - *E. cameldulensis*, Lot No. 6870/80.

T3 - *E. cameldulensis*, Lot No. 8031/76.

T4 - *E. hybrid*

T5 - *E. grandis*, and

T6 - *E. citriodora*

The results showed that the growth performance of *E. citriodora* was the best.

47. EUCALYPTUS TERETICORNIS

A. Provenance Trial

A trial was taken up in the year 1979 near Bilaspur to find out the best provenance of *E. tereticornis* for afforestation of Bhataland. Six provenances were tried constituting the six treatments. Provenance nos. 11953, 10952 and 11952 were found suitable for the site concerned. Provenance nos. 11955 & 12377 failed.

B. Planting Stock

This trial was started in the year 1985 near Vamandehi (Seoni) to compare the growth of plants in plantations when raised from (i) polypotted plants and (ii) Root-shoots. The observations indicated that plants of both the origins did equally well. However, in Betul region polypotted seedlings origin plants showed better performance.

C. Species Trial in a Ravinous Site

This trial was started in the year 1983 in Morena district (near Masudpur village) to study the suitability of some tree species for the afforestation of Chambal ravines and to evolve their planting techniques. The species tried were, *P. pinnata*, *E. hybrid*, *E. tereticornis*, *B. ceiba*, *C. siamea*, *A. auriculiformis*, *A. lebbek* and *D. sissoo*. The results showed that *E. tereticornis* with highest survival and average height was the most suitable species for afforestation of Chambal ravines.

D. Pure and Mixed Planting

This trial was started in the year 1973 near Indore to compare the growth of *E. tereticornis* when grown in pure stand and in mixture with *Acacia tortilis*, up to 5 years. There were 3 treatments namely T1 - planting *E. tereticornis* in pure, T2 - raising *E. tereticornis* in mixture with *A. tortilis* T3 - planting *A. tortilis* in pure. The observations showed that the growth performance of *E. tereticornis* was better in the pure stand.

E. Species Trial on Iron Ore Minedout Site

This trial was started in the year 1985 on an Iron ore minedout site in Durg district (Konde mines). In this experiment, planting of polypotted plants was done in the pits of 60 cm^3 size made at 2m x 2m. The lower halves of the planting pits were filled up with original overburden material while the upper halves with humus rich soil. Ten species were tried. They were *Eucalyptus tereticornis*, *D. sissoo*, *L. leucocephala*, *A. procera*, *A. lebbek*, *P. pinnata*, *D. strictus*, *A. auriculiformis*, *Prosopis juliflora* and *Agave sp.* The observations showed that the performance of *Eucalyptus tereticornis* was inferior to some other species. Similar results were obtained from another trial.

F. Size of Seedlings

(i) This trial was started in the year 1970 near Nepanagar. It aimed at determining the optimum size of seedlings of *Eucalyptus tereticornis* to be used for plantation. T1 - 25 cm height, T2 - 35 cm height, T3 -45 cm height, T4 - 55 cm height, T5 - 65 cm height, T6 - 75 cm height, T7 - 85 cm height, T8 - 95 cm height and T9 -105 cm height.

It was observed that the optimum size of seedlings of *E. tereticornis* which shall give the best results as regards to survival percent and height growth after planting out in the field was the treatment T6 i.e. seedlings of 75 cm height.

48. EUCALYPTUS HYBRID

A. Provenance Trial

(i) In the year 1971-72, a trial of different provenances of *E. hybrid* was taken up on Bhata soil. The best survival and height growth was given by the provenance no. 7030.

(ii) A study was started in the year 1980 near Seoni (Vamandehi) in which 11 provenances of *E. hybrid* were tried. The results showed that FRI 9856/14 had given maximum height and girth proving itself the best provenance.

B. Comparative Performance

(i) Observations were started near Nepanagar in the year 1987 on the comparative growth of six hybrids of Eucalyptus planted for this purpose. The hybrids were, T1 - *E. hybrid*, T2 - E. FRI4, T3 - E. FRI5, T4 - *E. camaldulensis* 6988, T5 - *E. camaldulensis* 7037, T6 - *E. camaldulensis* 36948. Planting was done at 2m x 2m spacement. Out of the six hybrids tried T5 (*E. camaldulensis* 7037) showed the best growth performance.

(ii) Another trial was conducted near Indore in the period 1978-84 to compare the growth of six Eucalyptus hybrids namely : *E. hybrid* local, *E. hybrid* FRI-4, *E. hybrid* FRI-5, *E. camaldulensis* 6948 Bilaspur. It was observed that maximum growth was attained by *E. camaldulensis 6948* Bilaspur. This showed quite good survival percentage also.

(iii) This experiment was started in the year 1984 near Mandwa (Nepanagar) for studying the growth trends of some pulpwood species planted nearby Nepanagar. *E. hybrid*, *P. pinnata*, *A. excelsa*, *G. arborea*, *M. alba* and *C. pantandra* were the species planted. The growth data recorded in Dec. 1987 indicated that the performance of *E. hybrid* was not satisfactory.

C. Species Trial on Mined Out Site

(i) This trial was started in the year 1982 near Dhanpuri in an opencast Coalmine. It was intended to study the suitability of species that can be raised on overburden dumps in coalmined out areas. The results showed that *E. hybrid* was the most suitable species for this site, and after this came *E. camaldulensis*.

(ii) Another trial was taken up near Amarkantak in the year 1983 to find out the suitability of different Eucalyptus species for afforestation of Bauxite minedout area. The planting was done at the spacement of 2m x 2m. In this experiment six different species of Eucalyptus were tried. Those were :

T1 - *E. camaldulensis*, Jabalpur Lot No. 7037/83.

T2 - *E. camaldulensis*, Lot No. 6870/80.

T3 - *E. camaldulensis*, Lot No. 8031/76.

T4 - *E. hybrid*

T5 - *E. grandis*, and

T6 - *E. citriodora*

The results showed that *E. hybrid* had the best survival percent but the height growth was inferior to some other species tried.

(iii) One more trial was started in the year 1986 in the Nandini mines near Raipur to find out the suitable species for the afforestation of lime stone mined out areas (OB dumps). The species tried were, *E. officinalis*, *P. pinnata*, *D. sissoo*, *E. hybrid*, *D. strictus*, *A. procera*, *Peltaphorum*, *L. leucocephala*, *H. binata*, *D. latifolia*, *Cassia siamea*, *A. auriculiformis* and *T. arjuna*. The growth data showed that all the species tried were successful.

(iv) Another experiment was laid out on a Dolomite minedout site (OB dumps) near Bilaspur in 1984. In all 6 species were planted on the dumps of overburden. Planting was dine in the pits of 45 cm^3 size made at 2m x 2m. The growth data showed that *E. hybrid* had performed very well on the site concerned. Similar results were obtained from a trial conducted in 1985 also.

D. Irrigation-cum-Pit size Trial

This trial was taken up in the year 1986 near Bilaspur to study the effect of various sizes of planting pits and application of irrigation on some species planted on Bhataland. The species used were *E. hybrid*, *A. lebbek*, *G. arborea*, *D. sissoo*, *M. azadirach*, *A. Procera*, *D. strictus* and *A. auriculiformis*. The treatments were, application of irrigation (I), application of no irrigation (Io), and the subtreatments were the pits of 30 cm^3, 45 cm^3 and 60 cm^3 sizes. The results showed that *E. hybrid* had highest survival in the pits of 45 cm^3 size and irrigation showed positive effect on the survival and growth of this species.

E. Planting Stock

This trial was taken up in the year 1986 at Chakarabhata near Bilaspur to compare the growth trends of plants in plantations raised from planting stock as (a)

polypotted seedlings and (b) Root-shoots. The results showed that the polypotted seedlings gave the best growth performance. Similar results were obtained in Betul and Raipur areas also.

F. Best Time and Conditions for Sowing Seed

This experiment was laid out in Oct. 1987 at Jabalpur to find out the best time of sowing of seed and favourable conditions for the best germination percent in some common forest species. This had two main treatments namely, sowing of seed in the first fortnight of October (T1) and sowing of seed in the second fortnight of October (T2). The sub-treatments were, irrigation of beds daily (T1), irrigation of beds on alternate day (T2) and irrigation of beds at an interval of three days (T3). Twelve species were tried and *Eucalyptus hybrid* was one of them. The observations recorded indicated that the species gave higher germination percent from the sowing of first week.

G. Fertilizer Trial

This trial was started in the year 1986 at Hirri near Bilaspur to study the effect of application of different doses of nitrogenous fertilizers on biomass production of some species on Bhataland. There were four fertilizer treatments in this experiment, namely, application of no fertilizer (Fo), application of 25 gm of fertilizer (F1), application of 50 gm of fertilizer (F2) and application of 75 gm of fertilizer per plants (F3). Five species viz. *E. hybrid*, *Cleistanthes collinus*, *Albizzia procera*, *Acacia campylicantha* and *Gmelina arborea* were tried. The observations showed that fertilizer (Urea) application at the rate of 50 g/plant was the most beneficial dose of fertilizer, higher dose of 75 gm/plant was not useful.

H. Moisture Conservation

This experiment was taken up in the year 1989 on the lateritic soil near Bilaspur to study the effects of two different water conservation techniques on the growth of the planted plants. It had two treatments viz. planting of plants in the furrowed (like along trenches) area and planting in the pits of 30 cm^3 size. Planting was carried out at the spacement of 2m x 2m. The species tried were *E. hybrid* (S1), *Cleistanthes collinus* (S2), *D. sissoo* (S3), *A. procera* (S4), and *L. leucocephala* (S5). The growth data recorded showed that *E. hybrid* planted in the furrows was having better growth than those planted in the pits of 30 cm^3 size.

I. IrrigationTrial

(i) This trial was taken up in the year 1987 near Betul for evolving the technique for raising fuelwood plantation. The experiment had two main treatments namely, application of irrigation(I) and application of no irrigation (Io). The species tried were, *A. lebbek*, *E. hybrid*, *G. arborea*, *D. sissoo*, *P. pinnata* and *E. officinalis*. The results showed that better height growth is attained by the plants under irrigated conditions. Similar result was obtained in Seoni region.

(ii) This trial was started in the year 1989 near Nawgaon (Raipur). It was intended to compare the rate of growth of species suitable for afforestation of Bhatalands of Chhattisgarh region under irrigated and un-irrigated conditions. There were two treatments namely, T1- application of irrigation and T2 - no application of irrigation. The species tried were *E. officinalis* (S1), *E. hybrid* (S2), *G. arborea* (S3), *A. lebbek* (S4), *A. catechu* (S5), *H. binata* (S6), *D. sissoo* (S7), *C. collinus* (S8), *L. leucocephala* (S9) and *A. procera* (S10). The growth data showed that irrigation was beneficial to the plant growth in initial stage.

J. Species Trial in Ravinous Land

This trial was started in the year 1983 in Morena district to study the growth performance of some species in the ravines of Chambal so that suitable species, which can be used for afforestation of ravines of Chambal, can be identified. The results showed that *E. hybrid* was not suitable for the afforestation of Chambal ravines.

K. Species Trial in Central Zone

A trial was taken up in the year 1984 at Jabalpur to study the growth performance of *E. hybrid* in the Central zone of M.P.. In this, polypotted plants were planted in the pits of 45 cm^3 size. The performance of the species was found to be quite good.

L. Species Trial on Bhataland

The experiment was started in the year 1974 near Mohanbhata (Bilaspur) to study the performance of some species in Bhataland and to find out the best suitable

ones for Bhata soils of Chhattisgarh. The species tried were, *E. hybrid*, *E. camaldulensis* (king kenyan), *E. camaldulensis* 7080, *Acacia leucophloa* and *A. catechu*. The results showed that the suitability of *E. hybrid* was inferior to some other species.

M. Fertilizer Trial

This trial was started in the year 1972 at Pendaribhata near Bilaspur to study the effect of fertilizer application (of the same intensity) on the growth of *E. hybrid* planted on Bhata soils. There were 8 treatments namely,

T1 - No fertilizer applied (control).

T2 - In 1st year only.

T3 - In 3rd year only.

T4 - In 5th year only.

T5 - In 1st & 3rd year only.

T6 - 1st, 3rd, & 5th year only.

T7 - In 1st & 5th year only.

T8 - In 3rd & 5th year only.

30 gm of Ammonium sulphate and 25 gm of superphosphate had been tried in all the 8 treatments. The best positive effect was obtained from the treatment T5 (In 1st & 3rd year only.

N. Coppice Shoots

This trial was started in the year 1987 near Amarkantak to determine the correct number of coppice shoots of *E. hybrid* to be retained on the main stump for obtaining maximum timber volume. There were 4 treatments namely :

T0 - No felling of coppice i.e. retaining all the coppice shoots.

T1 - Retaining only one coppice shoot.

T2 - Retaining two coppice shoots.

T3 - Retaining three coppice shoots.

The results showed that the average height was found maximum in treatment T3 (with 3 coppice shoots). Best average GBH was recorded in treatment T1 (with only 1 coppice shoot). Treatment T3 was found to be the best for the maximum volume production.

O. Irrigation cum Spacement Trial

This experiment was started in the year 1987 near Seoni, to study the growth performance of some timber and fuelwood species under irrigated and rainfed conditions when planted in the pits of different sizes (30 cm^3, 45 cm^3 and 60 cm^3) in sandy soil. The species tried were, *A. auriculiformis*, *A. procera*, *A. lebbek*, *E. hybrid*, *C. collinus*, *D. sissoo*, *P. pinnata* and *E. officinalis*. The observations recorded in June 1990 indicated that bigger pit size (60 cm^3) was effective only in case of *E. hybrid* but irrigation had no significant effect on the growth.

P. Pit Size Trial

The experiment was started in the year 1987 near Chimnapur (Nepanagar) to study the growth of some timber, fuel and fodder species planted in the pits of 30 cm^3, 45 cm^3 and 60 cm^3 size. Species used were, *A. lebbek*, *A. procera*, *A. nilotica*, *P. pinnata*, *E. hybrid*, *A. auriculiformis*, *H. binata* and *D. sissoo*. Measurements recorded in June 1991 showed that *E. hybrid* was doing better in the pits of 45 cm^3 and 60 cm^3 sizes.

Q. Pure & Mixed Plantation

The trial was started in the year 1974 near Bilaspur to study the growth of *E. hybrid* when grown in pure and in mixture with *A. senegal*. There were 2 treatments, namely : T1 - planting *E. hybrid* in pure. T2 - planting of *E. hybrid* and *A. senegal* in mixture in rows (pure rows of each species). The results showed that the treatment in which *E. hybrid* and *A. senegal* were planted in alternate rows was beneficial for the growth of *E. hybrid*.

R. Species Trial in Waterlogged Area

This experiment was started in the year 1986 near village Nimsadia in Hoshangabad district which lied in the command area of Tawa project. The area was suffering from the problem of waterlogging caused by the Tawa Dam. Polypotted plants of 9 species were planted at 2m x 2m. Planting was done on the raised

mounds. The species tried were, *Terminalia arjuna*, *Syzyzium cumini*, *E. hybrid*, *D. sissoo* and *D. strictus*. The data recorded in December 1986 showed that the growth performance of *E. hybrid* was satisfactory.

S. Farmyard Manure V/s Inorganic Manure

In Nepanagar centre, in 1965, observations were made to compare the effects of farmyard manure and In-organic fertilizer on the growth of *E. hybrid* seedlings in nursery beds. The results indicated that :

a. Farmyard manure can be safely replaced with In-organic fertilizer.

b. 8 Tasla (Iron pan) of farmyard manure is equivalent to 0.125 kg. in-organic fertilizer (Ammonium sulphate or super phosphate).

c. Organic manure and in-organic fertilizer can also be used in combination viz. 8 Tasla of farmyard manure and 125 gm Ammonium sulphate of super phosphate were quite sufficient for a nursery bed of 15' x 3' size.

d. There is however no significant difference in performance of farmyard manure and in-organic fertilizer.

In the year 1965, at Nepanagar, observations were made to determine suitable combination of pair of leaves and transplanting of *E. hybrid* seedlings from nursery beds, with a view to obtain maximum healthy plants at the time of planting out in the field. The results showed that the best stage of transplanting in polythene bags was the stage of 3 pairs or 4 pairs of opposite leaves.

No significant difference among three four of five pairs of leaves was found on survival. Transplanting in beds with 3,4 and 5 paired plants yielded significantly more survival over 6 paired seedlings of polythene bags.

T. Method of Sowing

In the year 1967-68, at Chimnapur (Nepanagar), observations were made on comparative performance of line sowing and broadest sowing of *E. hybrid* seed in nursery beds with regards to the availability of the transplantable seedlings. It was noted that no significant difference was found in number of seedlings of prickable size raised by the two methods.

U. Comparison of Germination Percents

In the year 1967-68, a study was done in Nepanagar centre to compare germination percent and plant percent of local *E. hybrid* seed and *E. hybrid* seed of Mysore origin. It was observed that there was significant difference in germination percents of seed of Mysore and Rewa origins.

V. Irrigation In Nursery

A study was done in Nepanagar centre (Chimanapur) in the year 1967-68 to determine the influence of different intensities of irrigation on different aged *E. hybrid* seedlings in the nursery with a view to obtain optimum sized planting stock without sacrifying their sturdiness during planting season. The observations recorded indicated that :

a) There is no significant difference in height of *E. hybrid* seedlings of different ages raised under different intensities of watering.

b) Age did not influence height of plants when the difference was small. Plants aged 6 to 7 months and 8 to 9 months did not differ in height and both of these had given significantly better results as compared to 4 to 5 months old plants.

W. Ploughing of Planting Area V/s Uprooting of Stumps

In the year 1968, observations were started to study the effects of uprooting of stumps and ploughing of the area and then planting in the pits, on the survival and growth of *E. hybrid* in the field. Following observations were recorded :

(i) The height and girth of *E. hybrid* at the end of 10 months in the field were found unaffected by the two treatments.

(ii) The survival percent of *E. hybrid* was also found unaffected by the two treatments.

X. Time of Seed Sowing

In the year 1968-69, a study was done to determine the effect of different periods of sowing on the germination of the seed of *E. hybrid*. The observations showed that the seed sown in the month of January had given maximum germination percent.

49. EMBLICA OFFICINALIS

A. Species Trial

(i) The trial was taken up at Jabalpur in the year 1978. After a period of 7 years, survival percent of 97 and height equal to 382 cm was obtained.

(ii) Another trial was taken up in the year 1982 near Seoni. Here, a survival percent of 92 and average height of 171 cm was observed after a period of 3½ years.

(iii) A species trial of Panna Aonla was taken up near Seoni in the year 1982. After a period of 2½ years, an average height of 181 cm was obtained.

(iv) Also, in the year 1982, a trial was taken up near Bilaspur. After 1½ years, the survival percent was found to be 93 but the average height was only 79 cm.

(v) A species trial was conducted near Raipur in the year 1983 showed a survival of 75% and an average height of 87 cm after a period of 1½ year.

(vi) A species trial was conducted in Bilaspur region in the year 1983. Here a survival of 79 and an average height of 1.13 m was observed in November, 1985.

(vii) One more species trial taken up near Indore in the year 1983 showed a survival percent of 86 and average height 57 cm at the age of 1½ years.

B. Species Trial on Minedout Site:—

(i) This trial was taken up near Amarkantak in the year 1982 in which *E. officinalis* was planted on OB dumps of Coal mines. After one and half years, an average survival of 53 and average height of 89 cm was recorded.

(ii) Another trial began in the year 1982 in Dhanpuri Coalmines. After 3½ years, 92% survival and 158.5 cm height was observed.

(iii) A trial was started in the year 1982 in Dhanpuri Coal mines for finding out the suitable species for afforestation of overburden dumps of coal mines. *E. officinalis* was planted on the OB dumps with *E. cameldulensis*, *A. procera*, *A. lebbek*, *Holoptelia integerifolia* and *Shorea robusta*. The observations showed that *E. officinalis* was suitable for the afforestation of

the site concerned. However trials conducted in 1982 and 1990 showed that rate of growth of *E. officinalis* was slow.

(iv) Another trial was started in the year 1988 near Nandini (Raipur) for finding out suitable species for afforestation of lime stone mined out areas. The species tried were, *D. sissoo*, *T. arjuna*, *L. leucocephala*, *H. binata* and *E. officinalis*. The results showed that *E. officinalis* was most successful species for the site concerned.

C. Planting Stock

A trial was started in the year 1985 near Seoni. There were 2 treatments namely T1 = Planting of polypotted seedlings and T2 = Planting of root-shoots. The species tried were, *L. parviflora*, *G. arborea*, *A. procera*, *P. pinnata*, *E. officinalis*, *D. latifolia*, *D. sissoo*, *M. latifolia*, and *A. lebbek*. The observations recorded in November 1990 indicated that plants of both the origins are equally good in respect of survival and height growth.

D. Pit Size cum Fertilizer Trial

This experiment was taken up in the year 1989 on the lateritic soil near Newra (Bilaspur). It had three main treatments namely, planting in the pits of 30 cm^3 size (P1), planting in the pits of 45 cm^3 size (P2), and planting in the pits of 60 cm^3 size (P3). The three sub-treatments applied were, application of no fertilizer (FO), application of 25 gm of fertilizer per plant (F1) and application of 50 gm of fertilizer per plant (F2). The other species tried were : *A. lebbek*, *A. procera*, *D. sissoo*, and *H. binata*. The result showed that *Emblica officinalis* showed best growth in P1 (F1).

E. Application of Vermiculture

This trial was started in the year 1995 at Jabalpur for studying the effect of application of vermiculture on the growth of forestry plants in a plantation (plantation of E. officinalis). It had 3 main treatments viz. application of compost (2 kg per plant (T1), application of vermi-compost (2 kg/plant) (T2) and control (To). The observations revealed that the effect of treatments was not significantly different.

50. GMELINA ARBOREA

A. Mixed Plantation

(i) This experiment was started in the year 1974 near Ralamandal (Indore). The experiment had four treatments namely, planting of pure *G. arborea*.

planting or pure Eucalyptus cameldulensis, planting of *G. arborea* and *E. cameldulensis* alternately in rows and planting of *G. arborea* and *E. cameldulensis* in alternate rows at the spacing of 1.75 x 1m. Observations made revealed that *Gmelina arborea* was doing better in mixture.

(ii) Another experiment was taken up in the year 1975 near Mohanbhata (Bilaspur). Four different species including *G. arborea* were interplanted with the *E. hybrid* plants of 1972 which meant for providing shade to the seedlings planted underneath. *G. arborea* showed quite high (96%) survival.

(iii) This experiment was started in the year 1973 near Ralamandal (Indore). It had four treatments namely, T1= planting of pure *Casuarina equisetifolia*, T2= planting of pure *G. arborea*, T3= planting of the plants of the two species alternately and T4= planting of the two species in alternate rows. The observations recorded showed that *G. arborea* showed better growth in pure stand (T2) and also in alternate rows (T4).

B. Species Trial on Bhataland

This experiment was started in the year 1975 near Bilaspur. *G. arborea* was planted at 2m x 2m spacing in 30 cm^3 pits, for testing its suitability to Bhata soil of Chhattisgarh. *G. arborea* could well be used for reclamation of Bhataland as suggested by the observations recorded.

C. Planting Stock

This experiment was started in the year 1986 near Betul. There were two treatments in this, namely, planting of polypotted seedlings (T1) and planting of Root-shoots (T2). Ten species were tried at 2m x 2m spacement which included *G. arborea*. The data recorded showed that *G. arborea* was showing better performance in the treatment plot T2 (planting of Root-shoots). But, the result was opposite at Chakarbhata near Bilaspur. In Raipur area also, survival was higher in T1 plot. In Jabalpur area, plant growth was found better in T1. plot (which is obvious). At Seoni, the survivals were equal in T1 & T2.

D. Irrigation Cum Spacement Trial

(i) An experiment was laid out near Chakarbhata (Bilaspur) in the year 1985. The main treatments of the experiment consisted of application of irrigation (i) and control (Io). The sub-treatments were, planting in the trenches of 2.5m

x 0.5m x 0.5m size (P1) and planting in the pits of 50 cm^3 size. Nine species were tried. The growth data of *G. arborea* showed that irrigation and pit size have some positive effect on the growth of the species.

(ii) This experiment was laid out near Vamandehi Seoni in the year 1985. The main treatments consisted of application of irrigation (I) and control (Io). The sub-treatments were planting spacement of 2m x 2m (P1) and 2m x 1m (P2) Six species were tried. The growth data indicated that irrigation has little effect on the growth of *G. arborea* and 2m x 1m seemed to be a better spacement.

(iii) A trial was taken up near Raipur in the year 1993-94. The observations recorded after 3½ year indicated that application of irrigation was quite beneficial for the growth of the plants.

E. Sowing Depth

This experiment was started in Morena centre in the month of February, 1988 and it was closed in April 1998. The treatments in the experiment were, sowing of seed to a depth of 1 cm (T1), sowing of seed to the depth of 2 cm (T2), sowing of seed to the depth of 3 cm (T3), sowing of seed to the depth of 5 cm (T4) and sowing of seed to the depth of 7 cm (T5). Six species were tried. The growth data indicated that *G. arborea* gave highest germination when seed sown to the depth of 2 cm (T2).

F. Time for Seed Sowing

This experiment was laid out in the research nursery at Jabalpur in October, 1987 and it ended in June, 1988. It had two main treatments namely, sowing of seed in the first fortnight of October (T1) and sowing of seed in the second fortnight of October (T2). The sub-treatments were, irrigation of beds daily (I1). Irrigation of beds on alternate day (I2) and irrigation of beds at an interval of three days (I3). Twelve species were tried. *G. arborea* gave higher germination percent in case of sowing of seeds in the first week. However, the applied frequencies of irrigation did not seem to produce any differentiable effect.

G. Plantation on Minedout Site

(i) An experiment was taken up in the year 1984 near Hirri (Bilaspur) on the Dolomite mined out site. Six species were planted. Planting was done in the

pits of 45 cm^3 size dug up at 2m x 2m. The growth data indicated that *G. arborea* had excellent growth on the OB dumps of dolomite mined out site.

(ii) Another experiment was started in the year 1985 on an Iron ore mined out site near Mahamaya (Durg district). Polypotted plants of about one year age were planted in the pits of 60 cm^3 size dug up at 2m x 2m. The lower halves of the pits were filled up with the original overburden material and the upper halves with humus rich soil. In all Ten species were planted. The growth data indicated that *G. arborea* failed on the given site.

H. Provenance Trial

(i) A trial was taken up at Jabalpur in the year 1978. Seeds of eight provenances were obtained from FRI, Dehradun. Observations taken after a period 7½ years showed that the provenance FRI-58 (82) was the best for Jabalpur region. This was followed by the provenance FRI-76.

(ii) A trial was taken up in the year 1979 near Seoni. Three provenances of *G. arborea* were tried. The provenances were, Simlipal (Orissa), Ghotli (Maharashtra) and Agartala (Tripura). Observations recorded in June 1986 showed that the Orissa lot was the best performer.

(iii) Another trial was taken up in the year 1980 in which also Tripura, Maharashtra and Bengal provenances were tried. After six years, it was found that the Agartala (Tripura) lot (FRI-132) was giving the best results.

(iv) Another trial which was also taken up near Seoni showed Kuda (Maharashtra) provenance performing well. In this trial 5 provenances were tried.

(v) In the year 1980, another trial was taken up near Seoni with 10 different provenances. After six yeas period, Andhra Pradesh (FRI-138) and Maharashtra (FRI-141) were found comparable best. Meghalaya provenance showed the poorest growth.

(vi) In another provenance trial which was taken up in the year 1983 (near Seoni) FRI-58/82 was found having maximum height.

(vii) In 1982, another trial was taken up with 5 provenances. After four years, FRI-132 was found the best provenance.

I. Species Trial

This trial was taken up in Nepanagar region in the year 1984. Observations recorded after 3½ years showed a survival percent of 33 and an average height of 92.5 cm.

J. Fertilizer Trial

This trial was started in the year 1970 near Bilaspur. Five different doses (treatments) including control, were applied to the plants in alternate years. Measurements recorded in May 1974 showed that 20 gm of Ammonium sulphate and 10 gm of super phosphate was the best and economical combination.

K. Spacement Trial

(i) This trial was taken up near Seoni in the year 1981. Four different planting spacements were tried. Observations recorded after six years showed that maximum height growth was obtained in the 1.5m x 1.5m spacement but maximum girth of 28 cm was obtained in 3m x 3m spacement as against 25 cm in 1.5m x 1.5m spacement plot.

(ii) Another trial was taken up in Nepanagar centre in which 1.5m x 1.5m, 2m x 2m, and 3m x 3m spacements were tried. After a period of 5 years, 2m x 2m spacement was found giving maximum height growth of 115.5 cm.

L. Irrigation-cum Pit Size Trial

This experiment was started in the year 1987 near Parsadabhata (Bilaspur). There were two main treatments viz irrigation(I) and no irrigation(Io) and the sub-treatments were, pits of 30 cm^3 size, pits of 45 cm^3 size and pits of 60 cm^3 size. The growth data indicated that *G. arborea* gave better growth performance in bigger sized pits and under irrigated conditions. Similar results were obtained from Raipur area also.

51. GREVILLIA ROBUSTA

A. Species Trial on a Mined out Site

(i) The experiment was started in the year 1985 near Amarkantak on the OB dumps of Bauxite mines. Five different species were planted which included *G. robusta*. The data indicated that *G. robusta* showed very good performance.

(ii) Another experiment was taken up in the year 1980 near Amarkantak in Dhanpuri opencast coal mines. The experiment had four treatments in the

form of different species. The growth data showed that *G. pteridifolia* had better growth than *G. robusta* on the OB dumps.

(iii) Another species trial was taken up, on Bauxite mined out site near Amarkantak in the year 1979. After three years, 94% survival and 210 cm average height was recorded.

B. Fertilizer Trial

This experiment was started in the year 1986 near Amarkantak in the bauxite mined out site. It had three treatments namely, T1= application of Urea, T2= application of NPK and T3= application of super phosphate at the rate of 25 gm/ plant. The observation data recorded showed that different fertilizers did not produce differential effects on the growth of *G. robusta*.

C. Spacement Trial

This trial was taken up near Amarkantak in Shahdol district in the year 1975. Three different spacements namely 2m x 2m, 2.5m x 2.5m and 3m x 3m were tried. After 5 years, the observations were recorded and 2m x 2m spacement was found producing over all best results.

D. Species Trial

(i) This trial was taken up near Amarkantak in the year 1975. Observations recorded after 8 years showed a survival percent of 73 with an average height of 362 cm and average girth of 14 cm.

52. GREVILLIA PTERIDIFOLIA

A. Species Trial on Fly Ash Dumps

This experiment was started in the year 1986 near Amarkantak on the ash dumps of MPEB at Chachai. It had four treatments namely, T1= filling the pits with original material, T2= filling the pits with humus rich imported soil, T3= filling the pits with the mixture of humus rich soil and compost, and T4= filling the pits with humus rich soil and applying Ammonium sulphate. Ten different species were tried. Growth data indicated that *G. pteridifolia* performed best in the T3 plot.

B. Species Trial on a Mined out Site

This experiment was started in the year 1985 near Amarkantak. Five species were planted on the OB dumps of Bauxite mined out area. The data indicated that

G. pteridifolia was one of the best performing species. In 1979 and 1981 also, species trials were conducted and the results were similar to this trial.

C. Trial on Growing Medium

This experiment was started in the year 1986 near Dhanpuri (Amarkantak) on the OB dumps of Coal mines. There were four treatments in the experiment namely, filling of original soil in the planting pits (T1), filling of original soil plus cowdung manure in the pits (T2), filling of humus rich soil in the pits (T3) and filling of humus rich soil plus cow dung manure in the pits (T4). Pits were of 45 cm^3 size. Four different species were planted. The data indicated that *G. pteridifolia* showed best performance in the pits containing mixture of humus rich soil and compost.

D. Pit Size Trial

This experiment was started in the year 1986 in Dhanpuri opencast coalmines. This experiment had three treatments namely, T1= 30 cm^3 pit size, T2= 45 cm^3 pit size and T3= 60 cm^3 pit size. Six different species were tried. The data indicated that pit size has no appreciable effect on the plant growth probably because mining makes the surface pulverized.

E. Spacement Trial

This experiment was taken up in the year 1988 near Amarkantak on the OB dumps of mined out site. It had three treatments, namely, T1= planting at 2m x 2m, T2= planting at 1.5m x 1.5m, and T3= planting at 1m x 1m spacement. Seven species were tried in coalmine area. The observations indicated that *G. pteridifolia* had better growth in closer spacement.

F. Mixed Plantation

This experiment was started in the year 1984 in Balco mines Amarkantak. It had three treatments, namely, T1= planting of *Shorea robusta*, T2= interplanting of *Shorea robusta* with *D. strictus*, and T3= interplanting *Shorea robusta* with *G. pteridifolia*. The data indicated that interplanting of *Shorea robusta G. pteridifolia* was beneficial to Sal plantation raised in bauxite mined out area.

53. HARDWICKIA BINATA

A. Species Trial

The trial was taken up near Bilaspur in the year 1974. After one and half years, 80% survival and 43 cm height (av.) was recorded.

B. Fertilizer Trial

(i) This trial was started in the year 1974, near Bilaspur on Bhataland. Six treatments, including control, were given. 25 gm of Urea and 25 gm of super phosphate were to be given to the plants in increasing manner. i.e. only in first year, in first and second year and so on, up to the fifth year. At the end, except the last treatment, i.e. application of fertilizer upto 5 years, no other treatment showed any significant difference from the control.

(ii) Another experiment was started in the year 1989 near Raipur (Nawagaon). The experiment had three different pit sizes namely, 30 cm^3, 45 cm^3 and 60 cm^3 as main treatments and three different doses of fertilizer to be applied as sub-treatments (No fertilizer ; fertilizer 25 gm/plant, and fertilizer 50 gm/plant). The observations indicated that application of 25 gm fertilizer per plant was showing the best performance.

C. Sowing Depth

This experiment was laid out in October 1987 and it ended in June 1988. It had two main treatments, namely ; sowing of seed in the first fortnight of October (T1) and sowing of seed in the second fortnight of October (T2). The sub-treatments were, irrigation of beds daily (T1), irrigation of beds on alternate day (T2) and irrigation of beds at an interval of three days (T3). Twelve species were tried. The observations indicated that *H. binata* gave higher germination percent in the sowing of first week of October.

D. Sowing Method

This experiment was laid out in the research nursery in Feb. 1988 and it ended in March 1988. The experiment had two treatments namely, sowing of seed by broadcast method (T1) and sowing of seed by drill method (T2). The observations recorded indicated that for *H. binata*, drill method was more beneficial.

E. Species Trial in Bhataland

This experiment was started in the year 1986 near Raipur. Polypotted plants of *H. binata* were planted in the pits of 30 cm^3 size. Performance of the species on the Bhataland was quite good.

54. HOLOPTELEA INTEGERIFOLIA

A. Species Trial on Mined out Site

(i) This experiment was started in the year 1983 in Dhanpuri coalfields. Polypotted seedlings of *H. integerifolia* were planted on the OB dumps of coal mine at a spacement of 2m x 2m. Observations showed that *H. integerifolia* was one of the most suitable species for the afforestation of overburden dumps of coalmines.

(ii) Another experiment was started in the year 1984 near Amarkantak. Polypotted plants of *H. integerifolia* were planted in the pits of 45 cm^3 size at a spacement of 2m x 2m. The observation recorded showed that *H. integerifolia* was one of the most suitable species for the afforestation of bauxite mined out site.

B. Irrigation-cum Pit Size Trial

This experiment was started in the year 1987 near Morena. It had two main treatments namely, irrigated conditions and rainfed conditions, and three sub-treatments namely, 30 cm^3 sized pits, 45 cm^3 sized pits and 60 cm^3 sized pits. Polypotted seedlings were planted in the pits. The growth data indicated that the pit size and irrigation produced positive effects on the growth of the plants.

C. Species Trial on Ravinous Land

A trial was taken up in the year 1987 in the ravines of Chambal near Morena. It aimed at finding out the species suitable for the afforestation of ravines of Chambal. Polypotted plants of *H. integerifolia* were planted in the pits of 30 cm^3 size made at a spacement of 2m x 2m. The observations recorded showed that *H. integerifolia* was successful on the ravinous land.

55. JUNIPERUS PROCERA

Species Trial

This trial was taken up in the year 1969, near Amarkantak. After 10 years, the

observations were recorded and the survival percent of 90 and average height of 470 cm were obtained.

56. JATROPHA CURCAS

Planting Stock

This trial was taken up in the year 1972 near Bilaspur. Polypotted seedlings and cuttings of *J. curcas* were planted in the pits of 25 cm^3 size. After 18 months period the observations were recorded. The survival and height of cuttings was found better than those of whole seedlings.

57. KYDIA CALYCINA

A. Flowering and Fruiting Behaviours

This experiment was started in the year 1956 near Chimnapur (Nepanagar centre). In this, time of flowering and fruiting were observed. The observations indicated that the species flowers in January to April and fruiting takes place in April-may.

B. Plant Percent

This experiment was started in the year 1958 near Nepanagar. In this, 100 seed each were sown in three nursery beds. The plant percent of *Kydia calycina* was observed to be under 10.

C. Germination capacity

The experiment was started in the year 1956 near Nepanagar. The tests were carried out in Grindwald's apparatus. Each test was done with 100 seed. The observation data indicated that *Kydia calycina* showed 10% germination.

58. LAGERSTROEMIA PARVIFLORA

A. Planting Stock

This experiment was started in the year 1986 near Jabalpur. It had two treatments viz planting of polypotted seedlings (T1) and planting of Root-shoots (T2). The growth data indicated that *L. parviflora* raised from root-shoots survived more. But in another trial conducted elsewhere in the same year the survival of plants raised from two types of planting stock was equal.

B. Time For Seed Sowing

This experiment was laid out in the research nursery Jabalpur in October 1987 and it ended in June 1988. It had two treatments namely sowing of seed in the first fortnight of October (T1) and sowing of seed in the second fortnight of October (T2). The sub-treatments were, irrigation of beds daily (I_1), irrigation of bed on alternate day (I_2) and irrigation of beds at an interval of three days (I_3). *L. parviflora* gave higher germination percent from the sowing of first week.

59. LANNEA COROMANDELICA

A. Flowering and Fruiting Behaviour

This experiment was started in the year 1936 near Chimnapur in Nepanagar centre. In this, time of flowering and time of fruiting were observed. The observations indicated that *L. coromandelica* flowered from January to March and fruiting took place from February to May.

B. Plant Percent

An experiment was started in the year 1958 near Nepanagar. In three beds, 100 seed each were sown. The plant percent of *Lannea coromandelica* obtained was 17.

60. LEUCAENA LEUCOCEPHALA

A. Species Trial

(i) This trial was taken up near Nepanagar in the year 1982. K-8 and K-28 varieties were tried simultaneously. After 10 years, the height and of girth of K-8 variety plants were found to be 585 cm and 18 cm respectively while those of K-28 variety were 462 cm and 17 cm respectively.

(ii) In Bilaspur centre, three trials were taken up in 1979, 1980, and 1981. Measurements recorded in November 1982 showed respectively 71%, 53% and 21% survival and 1.88m, 0.9m and 1.28m average height.

(iii) In Raipur centre species trials were taken up in the year 1982 and 1983. Two varieties, namely, K-8 and K-28 were tried. Observations recorded in December, 1994 showed survivals of 57 and 81 and average heights of 1196 cm and 1067 cm respectively for K-8 and K-28. In the 1983 plantations, 26%

and 69% survivals and 1100 cm and 1276 cm average heights were recorded respectively for K-8 and K-28 varieties.

(iv) An experiment was taken up in the year 1987 at Jabalpur. In this, the growth trends of some forestry species, including *Leucaena leucocephala* were studied. The growth of this species was found very good.

B. Species Trial in Waterlogged Area

This experiment was started in the year 1986 near village Nimsadia in Hoshangabad district. The village falls in the command area of Tawa Dam and the land around this is affected by waterlogging. The object of the trial was to test the possibility of reducing the waterlogging through afforestation. *L. leucocephala* gave 100% survival in the area.

C. Species Trial on Mined out Site

(i) This experiment was started in the year 1985 on the Iron ore mined out site near Konde (Durg district). The planting was done at 3m x 2m spacement. Performance of the species was found very good.

(ii) Another experiment was started in the year 1986 near Nandini (Raipur) on a Lime stone mined out area. *L. leucocephala* was found growing quite well on the site.

D. Irrigation-cum Pit size Trial

This experiment was started in the year 1985 near Chakarbhata Bilaspur. There were two main treatments namely ; application of irrigation (I) and no irrigation (Io), and two subtreatments namely ; planting in the trenches of 2.5m x 0.50m x 0.50m size (P1) and planting In the pits of 50 cm^3 size (P2). No significant effect of pit size and irrigation was observed on the growth of *L. leucocephala*.

61. MELIA AZADIRACH

A. Spacement Trial

The experiment was taken up near Nepanagar in the year 1973. Three different planting spacements were tried. Observations recorded after 5 years showed poor to very poor survival of the plants, which seemed to be due to high temperature.

The best height growth was recorded in 2m x 2m spacement block. However, height growth was comparable to it in 1.5m x 1.5m block also.

B. Species Trial on a Mined Out Site

This experiment was started in the year 1982 near Amarkantak. Twelve different species were tried on the overburden dumps of bauxite mined out site. *Melia azadirach* was one of them. Planting was done in the pits of 45 cm^3 size dug up at a spacement of 2m x 2m. The growth data indicated that *M. azadirach* performed very well on the OB dumps.

C. Planting Stock

A trial was taken up in the year 1987 near Morena. In this, the treatments were, T1-planting of polypotted plants and T2- planting of root shoots. The growth data recorded showed that the performance of Root-shoot origin plants was better.

D. Species Trial on a Ravinous Land

This experiment was started in the year 1984 in the ravines of Chambal. The object was to find out the species which can survive and grow in the ravines so that a tree cover can be provided to these lands. Polypotted plants were planted in the pits of 30 cm^3 size. The observations recorded showed that *M. azadirach* was successful on the site.

E. Irrigation-cum Pit Size Trial

This experiment was started in the year 1985 near Chakarbhata (Bilaspur). There were two main treatments, namely, application of irrigation and no irrigation (Io), and two sub-treatments, namely; planting in the trenches of 2.5m x 0.5m x 0.5m size (P1) and planting in the pits of 50 cm^3 (P2). The number of species tried was eight. The observations showed that the treatment did not produce any differential effect on the growth of *M. azadirach*.

62. MITRAGYNA PARVIFLORA

Irrigation-cum-Fertilizer Trial

This trial was taken up in Raipur centre in the year 1993. Data recorded after $2^{1/2}$ years indicated positive effects of irrigation and fertilizer application on the growth of the plants.

63. MADHUCA LATIFOLIA

A. Species Trial

(i) The trial was taken up near Bilaspur in the year 1972 but all the plants died in the summer of 1973. However, in the year 1987, the species was planted in Bilaspur and Jagdalpur areas where it gave quite good performance in the early years.

(ii) Another experiment was started in the year 1984 near Jabalpur. Polypotted plants were planted in the pits of 30 cm^3 size. *Madhuca latifolia* showed 100% survival.

B. Species Trial on Bhataland

This experiment was started in the year 1974 near Bilaspur. Planting of poly-potted plants was done to observe survival and growth of *Madhuca latifolia* in the kanhari soil of Bhataland. The growth data recorded showed that the performance of madhuca latifolia was quite good.

C. Fertilizer Trial

This experiment was started in the year 1975 near Bilaspur. In this, fertilizer application was done at the rate of 25 gm of Ammonium sulphate and 25 gm of super phosphate per plant. A 3 Cm deep ring was formed around the plants and fertilizer application was done through this ring. The observations recorded showed that the specified dose did not produce any effect on the growth of *M. latifolia* plants.

64. MELALEUCA LEUCODENDRON

Species Trial on Mined Out Site

This experiment was started in the year 1979 near Amarkantak. In this, poly-potted seedlings of *M. leucodendron* were planted in the pits of 45 cm^3 size. The observations recorded showed that the species performed quite well.

65. POPLARS

A. Species Trial

(i) Eleven species of poplars were tried at Jabalpur in the year 1965-66. Cuttings were prepared from one year old seedlings by cutting the stems from one Inch above the collor. The observations showed that *Populas robusta* was giving best survival percent.

(ii) In the same year, poplar cuttings prepared by cutting the stem of the seedling from two inch above the collar were also planted to observe the survival percent. *Populas cusale* and *P. robusta* gave highest survival percent.

(iii) In 1965-66, poplar cuttings having atleast one bud and 15-20 cm length were tried (at Jabalpur) in the field. In this case, observations showed *P. yunnanerisis* having highest survival percent.

B. Propagation Method

This trial was also conducted at Jabalpur in the year 1965-66. Poplar cuttings of different diameter and also the splitted cuttings were planted out. Observations recorded showed that cuttings of 1.0 to 1.2 cm dia. with four buds gave highest survival percent (70). However, cuttings of dia. upto 1.6 cm also gave good survival percent. In case of splitted cuttings, only those having 1.0 to 1.2 cm dia. gave good survival percent.

C. Time of Preparing Planting Stock

The trial was conducted in Jabalpur nursery in the year 1966-67. The result obtained was that the cuttings inserted in the soil in the month of November sprouted in least time of 15 days.

66. PONGAMIA PINNATA

A. Species Trial On Minedout Site

(i) This trial was taken up in the year 1982 near Dhanpuri on a coal mined out site to find out the suitability of species for the afforestation of overburden dumps of Coal mines. The observations showed that the survival percent of *P. pinnata* was very good.

(ii) Another experiment was started in the year 1983 in Dhanpuri Coalfields. Planting of polypotted seedlings was done in the pits of 45 cm^3 size dug up at a spacement of 2m x 2m. The growth data indicated that *P. pinnata* was successful on the OB dumps.

(iii) One more experiment was started in the year 1984 at Amarkantak. The object was to study the growth performance of *P. pinnata* on the OB dumps of bauxite mined out site. Polypotted seedlings were planted in the pits made on the OB dumps. The growth data recorded showed that the performance of *P. pinnata* was quite good.

(iv) A trial was started in the year 1984, near Hirri (Bilaspur) for evolving the technology for the reclamation of Dolomite minedout site. The species tried were, *A. auriculiformis. G. arborea, A. campylicantha, E. hybrid, A. procera* and *P. pinnata.* Observations indicated that performance of the species (*P. pinnata*) was quite good on the mined out site.

(v) This experiment was started in the year 1985 on the Iron ore minedout site near Konde to findout suitable species for its afforestation. Polypotted plants were planted in the pits made on the OB dumps. The growth data showed that *P. pinnata* gave quite good performance.

B. Planting Stock

This experiment was started in the year 1986 near Betul. There were 2 treatments namely, planting of polypotted plants (T1) and planting of root-shoots (T2). The growth data recorded in December, 1988 showed that the survival percent of the root-shoots origin plants was similar to that of the plants of polypotted seedlings origin. But, In Nepanagar centre, seedling origin plants survived most.

C. Time and Conditions For Seed Sowing

An experiment was started in the year 1987 at Jabalpur, for finding out the best time of sowing of seed and favourable conditions for the best germination percent in some common tree species. It had two main treatments namely, sowing of seed in the first fortnight of October (T1) and sowing of seed in the second fortnight of October (T2). The sub-treatments were, irrigation of beds daily (I1), irrigation of beds on alternate day (I2), and irrigation of beds at an interval of 3 days (I3). Twelve species were tried which included *P. pinnata.* In case of *P. pinnata,* better germination was obtained from the sowing in second week of October.

D. Spacement Trial

(i) This experiment was taken up in the year 1985 at Bilaspur for studying the effect or spacement on biomass production in some species. It had two main treatments namely; planting at 2.m x 1m spacing and planting at 2m x 2m spacing. The species tried were *A. lebbek. A. procera, D. sissoo, D. strictus, P. pinnata, L. leucocephala, G. arborea* and *A. auriculiformis.* Observations showed that the closer spacing of 2m x 1m is more beneficial than 2m x 2m for *P. pinnata.*

(ii) A trial was started in the year 1988 near Amarkantak. It was intended to determine the economically viable spacement for plantations on OB dumps of coal. There were 3 treatments (spacements) namely; 2m x 2m (T1), 1.5 x 1.5 (T2) and 1m x 1m (T3). The observations showed that for *P. pinnata* the spacing of 2m x 2m is the best as compared to the other two closer spacings.

(iii) An experiment was started in the year 1989 near Bilaspur. Pits of 45 cm^3 size were dug up and lower halves of pits were filled with local soil and upper haves with the mixture of soil, sand and FYM in the ratio of 3:1:1. There were 4 treatments of different spacements namely; 2m x 2m (S1), 2m x 1.5m (S2), 2m x 1m (S3), and 2m x 0.5 (S4). The growth data showed that spacement of 2m x 1m was better suitable tan other spacements.

E. Species Trial On Bhataland

This trial was started in the year 1985 near Nawagaon (Raipur) to determine the suitability of some species for afforestation of Bhataland. The species included *P. pinnata* also.The results showed that the performance of *P. pinnata* was not appreciable.

F. Species Trial on a Waterlogged Site

This experiment was started in the year 1986 near village Nimsadia in Hoshangabad district. The village fell in the command area of Tawa dam and the land around this was facing the problem of waterlogging. Polypotted plants were planted on the mounds made at 2m x 2m. The growth data indicated that *P. pinnata* was not successful on the site.

G. Pit Size Trial

An experiment was started in the year 1987 near Chimanapur (Nepanagar). There were three treatments in the trial namely, planting pits of 30 cm^3, 45 cm^3 and 60 cm^3 size. The growth data indicated that the treatments did not produce differential effect on the growth of the plants planted.

H. Species Trial

This experiment was started in the year 1983 near Burhanpur (Khandwa district) to study the growth and survival of various pulpwood species. Polypotted seedlings were planted in the pits. The observation data indicated that *P. pinnata* was showing inferior growth on the site. It is mentioned here that the site falls in drier region of the M.P. state.

I. Irrigation-cum-Pit Size Trial

This experiment was started in the year 1987 near Nepanagar. The main treatments consisted of application of irrigation (I) and control (Io). The sub-treatments were, planting in the pits of 30 cm^3 size (P1), planting in the pits of 45 cm^3 size (P2) and planting in the pits of 60 cm^3 size (P3). The observation data indicated that *P. pinnata* had cent percent survival. This trial was repeated in Bilaspur region also where the treatments produced positive effects on the growth of the plants.

67. PARKINSONIA ACULATA

Species Trial

This trial was started in the year 1984 near Morena to find out the suitable species for the afforestation of Chambal ravines. Planting was done in the pits of 30 cm^3 size dug up at a spacement of 2m x 2m. The observations showed that the performance of *Parkinsonia* was very good.

68. PINUS PETULA

A. Spacement Trial

A trial was taken up near Amarkantak (Chakratirtha) in the year 1969 to determine the spacing suited to the growth of *P. petula*. The two spacements tried were T1-2.5m x 2.5m and T2- 3m x 3m. The observations recorded in 1979 showed that the best spacement for the plantation of *Pinus petula* was 2.5m x 2.5m in respect of average height and survival percent.

B. Comparative Growth

(i) A trial was taken up in the year 1972 near Amarkantak (Bhundakona) to find out the best tropical pines so as to eliminate the unsuitable species for taking up large scale plantations of pines. The species tried were, (1) *P. caribaea* (Nicaragua) (2) *P. caribaea* (Oxen Bahamensis), (3) *P. caribaea* (Cuba), (4) *P. petula* (Kenya), (5) *P. roxburghii* (Supkhar), (6) *P. oocarpa* (Honduras), (7) *P. pseudostrobis* (Mexico) (8) *P. elliotii* (Mississippi), and (9) *P. elliotii* (USA). On the analysis of the growth data, *P. petula* (Kenya) was found to be the best species.

(ii) Another trial was started in the year 1972 at Bhundakona near Amarkantak. In this experiment seven species including *P. petula* were tried. The species tried were : (1) *P. oocarpa* (Honduras(, (2) *P. pseudostrobis* (Mexico), (3) *P.*

elliotii (S. Mississippi), (4) *P. kesiya* (Shillong), (5) *P. petula* (Kenya), (6) *P. caribaea* (Cuba) and (7) *P. roxburghii* (Supkhar). *Pinus petula* showed the best performance in comparison to other species.

(iii) One more trial was taken up in the year 1974 at Supkhar in Balaghat district. In this trial 6 species were tried Those were T1-*P. caribaea*, T2- *P. oocarpa*, T3- *P. petula*, T4- *P. caribaea*, T5-*P. taeda* and T6- *P. roxburghii*. The observations showed that *P. caribaea* performed the best among the species tried.

C. FertilizerTrial

This trial was taken up in the year 1974 at Bhundakona near Amarkantak to study the comparative growth of Tropical pines raised with and without mycorrhizal inoculation. The details of treatments are given below.

(1) Pinus caribaea (Var. British Honduras seed lot no. FRI/445/1973)
   (a) With mycorrhizal inoculation - T1
   (b) without mycorrhizal inoculation - T2

(2) Pinus oocarpa (Origin Gwatemala) seed lot no. FRI/106.1973)
   (a) with mycorrhizal inoculation - T3
   (b) Without mycorrhizal inoculation - T4

(3) Pinus gregii (Origin Mexico) Seed no. FRI/123/1973)
   (a) with mycorrhizal inoculation - T5
   (b) without mycorrhizal inoculation - T6

(4) Pinus petula (Origin Sume Tanzania) seed lot no. FRI/188/1973)
   (a) with mycorrhizal inoculation - T7
   (b) without mycorrhizal inoculation - T8

(5) Pinus roxburghii (Supkhar of N. Balaghat) control species
   (a) with mycorrhizal inoculation - T9
   (b) without mycorrhizal inoculation - T10

The results showed that micorrihza application induced better growth in *Pinus caribaea*, *Pinus oocarpa*, *Pinus gregii* and *Pinus petula*.

69. PINUS INSULARIS

A. Species Trial

The trial was taken up near Amarkantak (Jagatpur) in the year 1971 to compare the growth performance of *P. insularis* on the locality with that of *Pinus roxburghii*. The results showed that *P. insularis* was performing better than *Pinus roxburghii*.

B. Planting Stock

A trial was taken up in the year 1970 near Amarkantak (Kabeer Chabutra) to determine the correct age of seedlings to be planted in the field. Following treatments were included in the trial;

T1- Planting of 6 months old seedlings

T2- Planting of 12 months old seedlings and,

T3- Planting of 19 months old seedlings.

The observations showed that the 12 months old seedlings raised directly in polythene bags gave better results, as compared to other treatments.

70. PINUS CARIBAEA

A. Comparative Growth Performance

(i) In the year 1971, *Pinus caribaea* was planted together with some other species of pines for the purpose of doing a comparative growth study. The observations Indicated that *P. caribaea* performed the best.

(ii) One more trial was taken up in the year 1974 at Supkhar near Balaghat, In this, 6 species of pines were tried. Those species were: T1 *P. caribaea*, T2-*P. oocarpa*, T3-*P. petula*, T4- *P. caribaea*, T5- *P. taeda* and T6 - *P. roxburghii*. The observations showed that *P. caribaea* had the best growth .

(iii) Another trial was taken up in the year 1974 at Tamia (Chhindwara district). *Pinus caribaea* was planted together with *Pinus roxburghii*. The observations showed that *P. caribaea* was showing better growth than that of *P. roxburghii*.

(iv) Another trial was taken up in the year 1978 at Matighat near Ambikapur (Sarguja district). Planting was done at 2m x 2m spacing. There were 3 treatments namely. T1- planting of *Pinus caribaea*, T2- planting of *Pinus*

roxburghii and T3- planting of *Pinus kesiya*. The results showed that *Pinus caribaea* and *Pinus roxburghii* were the suitable species for the site.

B. Age of Planting Stock

A trial was taken up in the year 1970 at Amarkantak to determine the age of seedlings of *P. caribaea* which will be successful in the field. There were 3 treatments, namely :

T1- Planting of 6 months old seedlings.

T2- Planting of 15 months old seedlings.

T3- Planting of 18 months old seedlings.

The observations showed that in 6 months old seedlings, the rate of growth was faster than that in the 15 and 18 months old seedlings.

C. Provenance Trial

(i) A trial was taken up in the year 1970 near Amarkantak (Kabir chabutra) to find out the best provenance of *P. caribaea* for planting in the locality. The provenances tried were, (1) Dehradun (2) British Andrew Island and (3) Honduras. The results showed that plants of Honduras origin performed the best.

(ii) Another trial was taken up in the year 1972 near Amarkantak (Bhundakona) to find out the best provenance of *Pinus caribaea* for the locality. In this, three provenances of *Pinus caribaea* were tried. Those were: *P. caribaea* of Bahamas, *P. caribaea* of Oxen Bahamas and *P. caribaea* of Cuba. The best performance in terms of growth parameters was shown by *P. caribaea* of Oxen Bahamas.

D. Species Trial on Mined Out Site

The trial was taken up in the year 1984 on bauxite mined out area near Amarkantak to find out the most suitable exotic species for afforestation of OB dumps. The species tried were; *Grevillia robusta*, *G. pteridifolia*, *Pinus caribaea*, *P. oocarpa* and *P. kesiya*. The growth data were recorded in June 1987. *Pinus caribaea* showed a moderate growth performance. Similar results were obtained from a trial conducted in the year 1982.

E. Species Trial

This trial was taken up.in the year 1974 at Tamia (Chhindwara district). Performance of the species was found quite good.

F. Spacement Trial

The trial was taken up in the year 1972 at jagatpur near Amarkantak. There were three treatments in this experiment. Those were, planting spacement of 2m x 2m, planting spacement of 2.5m x 2.5m and planting spacement of 3m x 3m. The observations recorded showed that with regard to the survival and growth of the plants the spacement of 2.5m x 2.5m was most beneficial.

71. PINUS ROXBURGHII

A. Comparative Growth Performance

A trial was taken up near Amarkantak (Jagatpur) in the year 1971 to compare the performance of *Pinus roxburghii*, in terms of growth and survival, with that of *P. insularis*. The data showed that the survival of plants observed was more in case of *P. roxburghii*.

B. Comparative Growth Performance on Minedout Site

(i) A trial was taken up in the year 1981 near Amarkantak to compare the growth performance of some species of pines. The species tried were, *Pinus caribaea*, and *P. roxburghii*. The results indicated that *P. caribaea* and *P. roxburghii* had better performance as compared to other species.

(ii) One more trial was started in the year 1974 at Supkhar (Balaghat). Five species of pines were planted to compare their growth. Those were, *P. caribaea*, *P. oocarpa*, *P. petula*, *P. taeda* and *P. roxburghii*. The growth performance of *P. roxburghii* was observed to be poor.

(iii) Another trial was taken up in the year 1974 near Tamia (Chhindwara). In this *P. roxburghii* was planted with *P. caribaea*. Observations recorded showed that the growth of *P. roxburghii* was inferior to that of *P. caribaea*.

(iv) One more trial was taken up in the year 1978 at matighat (Sarguja). Three species namely. *Pinus caribaea*, *P. roxburghii* and *P. kesiya* were planted at 2m x 2m. The results showed that the survival of *P. roxburghii* was more than that of *P. caribaea*.

(v) An experiment was started in the year 1988 in coal mines, Dhanpuri to compare the growth behaviour of *Pinus roxburghii* and *P. kesiya* planted on the OB dumps. Planting was done at the spacement of 2m x 2m. The growth data recorded showed that the growth of *P. roxburghii* was better than that of *P. kesiya*.

C. Fertilizer Trial

(i) A fertilizer trial was taken up in the year 1973 at Bhundakona near Amarkantak. In this, the effect of application of different combinations of N and P (Urea and super phosphate) on the growth of *P. roxburghii* was studied. In all 9 treatments were tried. The results Indicated that maximum height growth was recorded from the treatment consisting of application of 20 gm of superphosphate only (per plant dose).

(ii) Another trial was taken up in the year 1974 at Bhundakona near Amarkantak, in which comparative growth of tropical pines raised with and without mycorrhizal inoculation and planted in an area occupied by Sal forest was studied. Five species including *P. roxburghii* were included in the study. The results showed that inoculation with mycorrihza did not contribute to the growth of *P. roxburghii*.

This trial was started in the year 1980 near Bhundakona (Amarkantak) to study the effect of Agromin and N.P.K. fertilizer on the survival and height growth of *Pinus roxburghii* The treatments were, control, application of 25 gm of NPK fertilizer per plant and spray of solution of Agromin (32 gm/litre concentration). The results showed that there was no effect of fertilizer application on the growth of *P. roxburghii*.

D. Spacement Trial

A trial was taken up in the year 1974 at Bhundakona near Amarkantak. In this, effectiveness of four different panting spacements, namely, 1.5 x 1.5m 2m x 2m, 2.5 x 2.5m and 3m x 3m was studied with regard to the growth of *P. roxburghii*. The observations recorded showed that 2.5 x 2.5 spacement was beneficial for the growth of *P. roxburghii*.

E. Pit Size cum Pit Mixture Trial on a Minedout Site

The trial was started in the year 1983 in a Bauxite minedout area near Amarkantak. The growth pattern of *P. roxburghii* planted in the pits of different sizes having different pit mixtures was studied. The treatments included were. T1- Local

soil + Mycorrhizal soil in 30 cm^3 sized pit, T2-Half local soil + half sal forest soil in 45 cm^3 sized pit, T3- Sal forest soil in 30 cm^3 sized pit, T4- Half local soil + half sal forest soil in 30 cm^3 sized pit, T5 - Sal forest soil in 45^3 cm sized pit, T6-2/3 sal forest soil + 1/3 local in 45 cm^3 sized pit. The observations showed that the treatment T4 with half local soil & half sal forest soil in 30 cm^3 sized pit was the best in respect of height and collar girth of plants.

72. PINUS KESIYA

A. Comparative Growth

(i) This trial was started in the year 1972 near Amarkantak (Bhundakona) to compare the growth behaviour of various pine species. The species tried were, *P. oocarpa* (Honduras), *P. pseudostrobis* (Mexico), *P. elliotii* (S. Mississippi), *P. kesiya* (Shillong), *P. petula* (Kenya), *P. caribaea* (Cuba), and *P. roxburghii* (Supkhar). The observations recorded showed that the growth of *P. kesiya* (shillong) was inferior.

(ii) One more trial was taken in the year 1978 at matighat (Sarguja). In this, the growth of *P. kesiya* was compared with that of *P. roxburghii* and *P. caribaea*. The growth of *P. kesiya* was inferior to that of the other two species.

B. Comparative Growth Performance In Mine Areas

(i) A trial was taken up in the year 1984 in a Bauxite mined out area near Amarkantak to study the growth behaviour of *P. kesiya* in comparison to that of four other species planted on such a site. The species tried were. T1- *Grevillia robusta*, T2- *G. pteridifolia*, T3- *Pinus caribaea*. T4- *P. oocarpa* and T5- *P. kesiya*. The growth data was recorded in June 1987. The observations showed that the performance of *P. kesiya* was inferior.

(ii) An experiment was started in the year 1988 in opencast coal mines, Dhanpuri near Shahdol. This intended to compare the growth behaviour of *P. roxburghii* and *P. kesiya* on the mined out area of coal. Planting was done at the spacement of 2m x 2m. There were 2 treatments namely planting of *P. kesiya* (T1) and planting of pinus roxburghii. The results showed that the growth performance *P. kesiya* was inferior to that of *P. roxburghii*.

C. FertiliserTrial

This trial was taken up in the year 1973 at Bhundakona near Amarkantak. This intended to study the effect of inorganic fertilizer (Urea & superphosphate) on

the survival and height growth of *P. kesiya* using 8 to 9 months old seedlings. There were 9 treatments consisting of different combinations of Urea and super phosphate (N and P) The observations indicated that highest survival and maximum growth were seen with application of 20 gm of urea and no super phosphate.

D. Spacement Trial

This trial was taken up in the year 1985 on Bauxite mined out area near Amarkantak to find out the most suitable spacement for planting of *Grevillia pteridifolia*, *G. robusta*, *Eucalyptus cameldulensis*, *Pinus kesiya* and *Shorea robusta*. There were 4 treatments namely, T1- 1m x 1m, T2- 1m x 2m, T3- 1.5m x 1.5m and T4- 2m x 2m spacement for planting. The observations recorded in June 1988 indicated that no differential effect was produced by any treatment on the growth of *P. kesiya*.

73. PINUS OOCARPA

A. Comparative growth performance

(i) The trial was taken up in the year 1972 near Amarkantak (Bhundakona). This aimed at finding out the best tropical pines for plantation in the locality. The species tried were, *P. caribaea* (Nicaragua), *P. caribaea* (Oxen Bahamenasis), *P. caribaea* (Cuba), *P. petula* (Kenya), *P. roxburghii* (Supkhar), *P. oocarpa* (Honduras) and *P. pseudostrobis* (USA). The observations indicated that the best survival and GBH were recorded from *P. oocarpa*.

(ii) This trial was started in the year 1974 at Supkhar near Balaghat. Six species of tropical pines were planted to compare their growth in the given agroclimatic conditions. The species tried were; *P. oocarpa*, *P. petula*, *P. caribaea*, *P. taeda* and *P. roxburghii*. The observations recorded showed that the growth performance of *Pinus oocarpa* was poor.

B. Provenance Trial In Minedout Areas

This experiment was started in the year 1984 in Bauxite mined out area near Amarkantak. Five provenances of *P. oocarpa* formed 5 treatments. Planting was done at the spacement of 2m x 2m. The five provenances tried were, T1- 1059/82, T2- 1118/83, T3- 1022/82, T4- 1057/82 and T5- 1021/82. The most suitable provenance of *P. oocarpa* was found to be T5- (KTPRC No. 1021/82) showing best height and collar girth.

C. Fertilizer Trial

This trial was taken up in the year 1974 at Bhundakona near Amarkantak. The object was to study the comparative growth of tropical pines raised with and without mycorrhizal inoculation and planted in an area occupied by sal forest. The species tried were: (1) *Pinus caribaea* (Var. British Honduras seed lot no. FRI/145/1973), (2) *P. oocarpa* (Gwatemala origin, seed lot no. FRI/ 106/1973), (3) *Pinus gregii* (Origin Mexico, seed lot no FRI/123/1973), (4) *P. petula* (Origin sume Tanzania seed lot no. RRI/188/1973) and (5) *P. roxburghii* (Supkhar of N. Balaghat origin) as control species. The results showed that the growth performance of *P. oocarpa* (Origin Gwatemala, seed lot no. FRI/106/1973) was inferior.

D. Species Trial

This trial was started in the year 1979 at Kamleshwarpur (Sarguja) to compare the suitability of various species of pines when grown on a barren land of Manpat area (Distt. Sarguja). The results showed that the suitable pine species for the area was *Pinus oocarpa* with highest average height.

74. PINUS GREGII

A. Fertilizer Trial

This trial was taken up in the year 1974 at Bhundakona near Amarkantak to study the comparative growth of tropical pines raised with and without mycorrhizal inoculation and planted in an area occupied by Sal forest. The species tried were: (1) *Pinus caribaea*. (Var. British Honduras. Seed lot No. FRI/ 145/1973). (2) *P. oocarpa* (Origin Gwatemala). (3) *P. gregii* (Origin Mexico. Seed lot No. FRI/106/1973). (4) *P. petula* (Origin sume Tanzania, seed lot No. FRI/188/1973), and (5) *P. roxburghii* (Supkhar of N. Balaghat) as control. The overall best performance was observed in the treatment (T5) i.e. *Pinus gregii* ((Origin Mexico), seed lot no. FRI/123/1973, with mycorrhizal inoculation.

B. Spacement Trial

The trial was taken up in the year 1974 at Bhundakona near Amarkantak. There were 3 treatments in this trial namely; spacing of 2m x 3m (T1), spacing of 2.5m x 2.5 (T2) and spacing of 3m x 3m (T3). The observations showed that the best growth performance is obtained from the spacement of 3m x 3m (T3).

75. PINUS ELLIOTII

A. Species Trial

A trial was conducted near Amarkantak in the year 1971 for studying the growth performance of *P. elliotii*. The observations recorded showed that the performance of the species was not very good.

B. Comparative Growth Performance

(i) A trial was taken up near Amarkantak (Bhunadakona) in the year 1972 to observe the comparative growth performance of some species of pines. The species tried were; (1) *P. caribaea* (Nicaragua), (2) *P. caribaea* (Oxen Bahamensis), (3) *P. caribaea* (Cuba), (4) *P. petula* (Kenya), (5) *P. roxburghii* (Supkhar), (6) *P. oocarpa* (Honduras), (7) *P. pseudostrobis* (Mexico), (8) *P. elliotii* (Mississippi) and (9) *P. elliotii* (USA). The observations recorded showed that the performance of *P. elliotii* was not appreciable.

(ii) Another trial was started in 1972 at Bhundakona near Amarkantak. In this, 7 species were included. Those were; (1) *P. oocarpa* (Honduras), (2) *P. pseudostrobis* (Mexico), (3) *P. elliotii* (Mississippi), (4) *P. kesiya* (Shillong), 5) *P. petula* (Kenya), (6) *P. caribaea* (Cuba) and (7) *P. roxburghii* (Supkhar). The results showed that the growth performance of *P. elliotii* was poor.

76. PINUS TAEDA

A. Species Trial

A trial was taken up near Amarkantak for studying the growth behaviour of *Pinus taeda* in that locality. The observations recorded showed that growth of *P. taeda* was not appreciable.

B. Comparative Growth Performance

A trial was taken up in the year 1971 near Amarkantak to study the survival and growth of various pines in that locality. In this, 4 species of pines were tried. The species tried were; *Pinus caribaea*, *P. taeda*, *P. elliotii* and *P. roxburghii*. The results showed that the growth of *P. taeda* was not appreciable.

77. PTEROCARPUS MARSUPIUM

A. Species Trial

The trial was taken up in the year 1971 near Seoni. The survival and growth of the planted seedlings were not good because a long gap of dry weather followed the planting. There was a termite attack also.

B. Best Planting Stock

The trial was taken up in the year 1973 at Jabalpur. Naked plants of 8 months age and 14 months age and Dona plants of 8 months and 14 months ages were planted in the field. Dona plants 14 months age gave maximum survival percent.

78. SANTALUM ALBUM

A. Best Host

This trial was taken up near Seoni in the year 1979. *Carrisa opaca*, *Cassia fistula*, *Pongamia pinnata*, *Cajanus cajan*, *Cassia siamea* and *Vinca rosea* were used as six different host species. Observations recorded after 7 years indicated that *C. cajan* is the best host followed by *P. pinnata*, *C. opaca* and *Vinca rosea* proved to be not good host.

B. Planting spacement

This trial was also taken up in Seoni centre in the year 1981. 1.5 x 1.5, 2.5m x 2.5, and 3m x 3m spacements were tried. Observations recorded after 5 years showed that 2.5m x 2.5m is the best planting spacement for the growth of *S. album* followed by 2m x 2m.

79. STERCULIA URENS

A. Species Trial

A trial was taken up near Nepanagar in the year 1974. Polypotted plants were planted in the pits of 30 cm^3 size. To get the growth of the plants stimulated, fertiliser doses were also given but the survival percent of the plants was found to be only 10% i.e. very poor.

B. Fertilizer Trial

(i) This trial was taken up in Nepanagar centre in the year 1975. Sixteen different combinations of urea and super phosphate were tried. Fertilizer was applied

in a ring around the plant made 10 cm away from the plant at the time of first dose and 20 cm away from the plant later. The observations recorded after two years showed that among all the treatment plots, the highest survival was 35 only and the maximum average height was 9.9 cm. Application of 10 gm urea per plant was the best treatment followed by application of 10 gm Urea plus 40 gm of super phosphate. Application of 20 gm and more Urea was observed to be detrimental to the plants.

(ii) In the year 1974-75 studies were made in Nepanagar, Bilaspur and Seoni on the effect of fertiliser on the growth of *Sterculia urens* plants. It was observed that there was no significant change in survival percent and growth of plants. However, in Bilaspur region positive effect of fertilizer on the survival of plants was observed.

C. Planting Stock

(i) A trial was taken up near Jabalpur to findout the best planting stock. The three treatments applied were, planting of 12 months old polypotted plants, planting of 12 months old naked seedlings and planting of 6 months old polypotted seedlings. Observations recorded showed that 12 months old polypotted plants showed the best results.

(ii) Another trial on planting stock was conducted in the year 1971 near Nepanagar in which 6 months old polypotted plants and 8 months old polypotted plants were tried. It was concluded that growth and survival of 6 months old polypotted plants were better.

(iii) A trial was taken up near Seoni in the year 1971 by planting 2 months old Dona plants and 4 months old Dona plants. It was observed that the growth and survival percent of the two types of plants were almost the same.

(iv) One more trial was taken up near Bilaspur on Bhataland in the year 1971 in which there were three treatments namely, (i) planting of polypotted seedlings of 15 months age (ii) planting of bare rooted seedlings of 15 months age and (iii) planting of polypotted plants of 3 months age at a spacing of 2m x 2m. It was observed that 3 months old seedlings gave highest survival percent.

80. SHOREA ROBUSTA

A. Species Trial on a Minedout Site

(i) In the year 1979, a species trial was taken up on the OB dumps of Bauxite mines. The species showed 95% survival.

(ii) Another trial was taken up near Amarkantak on the OB dumps of a Bauxite mine in the year 1984 to findout the most suitable indigenous species for the afforestation of such sites. It was observed that the species performed very well in its initial stage (95% survival).

(iii) Another trial was taken up in the year 1986 on the OB dumps in Dhanpuri Coalmines. Here also the species showed good performance.

B. Mixed Plantation

In the year 1984 a trial was taken up on the OB dumps of a Bauxite mine near Amarkantak, to study the growth of *Shorea robusta* interplanted with Bamboo and *Grevillia pteridifolia* in bauxite mined area. It was observed that in comparison to pure crop interplantation of *Shorea robusta* with *Grevillia pteridifolia* was beneficial.

C. Spacement Trial

In the year 1988, studies were made for finding out the best spacement for plantation of *S. robusta* on the overburden dumps of coalmines. It was observed that the spacement of 2m x 2m was the most beneficial for plantation of Sal.

D. Pit Size Trial

In Dhanpuri opencast coal mines, in the period 1986-91, a study was conducted to findout the effective pit size for plantation of *Shorea robusta*. It was observed that the pit size have no appreciable effect on plant growth.

E. Cultural Operation

An experiment was started in the year 1934 in Balaghat division. It had two sub-plots A and B. In sub plot A, all the weeds were cut back and piled outside the plot. In B, weeds were not cut. All sal reproduction was enumerated in 3 feet height classes as under.

(a) up to 3 feet

(b) up to 5 feet and

(c) over 5 feet in two strips in each of the sub-plots.

The data recorded Indicated that :

(i) There was 5.7 percent more survival in the cut plots as compared to uncut plots.

(ii) The cutting of Bamboo did not in any way improve the height of the seedling regeneration or coppice.

81. SESBANIA GRANDIFLORA

A. Species Trial

The trial was taken up in the year 1985 at Jabalpur. In this, polypotted plants of *Sesbania grandiflora* were planted in the pits of 30 cm^3 size. The species performed very well (100% survival).

B. Irrigation Trial

This trial was taken up near Seoni in the year 1985 to study the effects of irrigation. The observations recorded showed that irrigation had positive effect on the growth of *S. grandiflora* plants.

82. SOYAMIDA FABRIFUJA

Species Trial

In the year 1974, the trial was taken up at Pendaribhata (Bilaspur). The species had 88% survival.

83. SCHLEICHERA TRIJUGA

Irrigation-cum-Pit size Trial

(i) This trial was taken up in the year 1987 near Raipur. In this, irrigation and pit sizes were combined. Pits of 30 cm^3, 45^3 cm and 60^3 cm size were tried. The observations recorded showed that irrigation produced positive effect on the survival of plants while bigger pit size was beneficial for growth of the plants.

(ii) A similar study was made in the year 1987 near Bilaspur. It was observed that there was no perceptible change in the growth of the plants but pit size responded positively in terms of growth as well as survival percent.

84. SYZYZIUM CUMINI

Species Trial in a Waterlogged Area

(i) In Morena area in 1984, this species was tried for afforestation of ravines of Chambal. The species was found successful.

(ii) Study for evolving the technology for afforestation of waterlogged areas was taken up near Hoshangabad (Nimasadia) in the year 1986. In this, planting of polypotted seedlings was done on the mounds. Based on the observations, the response of the species was moderate.

85. TECTONA GRANDIS

A. Provenance Trial

(i) A trial was taken up near Seoni in the year 1973. This was an international provenance trial. The best results were shown by Orissa and Thailand provenances.

(ii) In the year 1981, a national trial of Teak was conducted near Seoni. In all, eight provenances were tried. The growth data recorded Indicated that the Neelambur provenance was the best one.

B. FertilizerTrial

(i) A fertilizer trial was taken up near Seoni in the year 1975. The trial period was 5 years. Effect of 80 gm of Ammonium sulphate and 20 gm of super phosphate per plant was studied in comparison to the control. The observations recorded showed that the given dose of fertilizer did not produce any differential effect on the growth of Teak plants.

(ii) Another experiment was started in the year 1986 at Jabalpur. The growth performance of Teak under irrigated and non irrigated conditions coupled with the application of different doses of fertilizer was studied for the initial five years only. It had two main treatments viz; application of irrigation (I) and control (Io), and 3 sub treatments viz; application of no fertiliser (Fo), application of 25 gm of fertiliser (F1) and application of 50 gm fertiliser (F2) .Root shoots of teak were planted at 2m x 2m spacement. The data recorded in Dec-1992 showed that irrigated conditions with application of 50 gm of fertilizers was beneficial to the Teak plants for their growth.

(iii) The trial was repeated in Morena and Betul regions also, in Morena region, similar effects were observed while in Betul area the treatments were found effective for the survival of the plants only.

(iv) One more trial was conducted in Dhanpuri Coalmine area in the period 1986 to 1991. In this case, the growth was better where 10 gm of NPK were given to the plants continuously for 5 yeas than where the same doses were given only in the first three years.

C. Method of Felling

(i) This experiment was started in the year 1940 in Chhindwara Division to study the effect of stool dressing after felling on the coppice production. The area was clearfelled and treatments applied. The observations recorded showed that shoot dressing induces more coppice production from the teak stools.

(ii) Another trial was taken up near Betul in the period 1991-92. In this, the treatments were, felling of trees with axe, felling of tress with saws and felling of Teak trees with saw plus dressing of stump with axe. Trees falling in the girth classes starting from 21-30 cm. to 91-120 were felled. The observations recorded showed that felling with axe and dressing the stump and felling with saw plus dressing of stump were the beneficial treatments to get more coppice from the stumps of felled trees.

D. Planting Stock

(i) A trial was taken up near Seoni in the year 1966. In this, Teak stumps, presprouted Teak stumps and Dona plants were used for planting. The observations recorded showed that best survival percent was given by the Dona plants while the best height growth was obtained from stumps origin plantation.

(ii) The same trial was repeated in the year 1947 near Bilaspur. There also. Dona plants gave the best results.

(iii) A trial was taken up near Seoni in the year 1971 to determine the best planting stock so as to get highest survival percent of the plantation. The observations recorded showed that 3 months old Dona plants gave the best results in respect of survival and growth.

E. Mixed Plantation

This trial was taken up near Seoni (Rukhar) in the year 1974. Inter planting of *D. strictus* was done in old teak plantation. The growth data recorded indicated that interplantation of Bamboo in the Teak plantation had some negative effect on the growth of Teak.

F. Afforestation of Ravines

This trial was taken up near Morena in the ravines of Chambal in the year 1984. Planting of Root Shoots of Teak was done on the blank slopes of the ravines. *Tectona grandis* was found quite successful in the ravines.

G. IrrigationTrial

(i) A trial was conducted near Bilaspur in the year 1987. In this, the effect of irrigation and pit size on Teak and four other species was studied. Irrigation was found beneficial to the growth of Teak plants.

(ii) This trial was taken up near Raipur in the year 1993. In this, effect of irrigation on the growth of Teak plants as compared to the control was studied. The data recorded showed that irrigation had positive effect on the growth and survival of *T. grandis* plants.

H. Afforestation of Mine OB dumps

This trial was taken up near Raipur (Konde mine) in the year 1986. In this, plantation of teak was done on the OB dumps of an Iron ore mine. The species showed quite good performance on the OB dumps.

I. Time for Seed Sowing

This trial was taken up near Seoni in the year 1967 to know the best time for sowing teak seed in the nursery. It was found to be March to June.

J. Best Plantpot Size

In the year 1967, a trial was taken up at Bilaspur to know the best size of polythene bags. The observation data showed that the best size of container for raising teak seedlings was 9" x 5" (22 cm x 12 cm).

K. Irrigation-cum Pit Size Trial

(i) This experiment was started in the year 1987 near parsada Bhata (Bilaspur). There were two main treatments, namely; application of irrigation (I), no irrigation (Io). The subtreatments were pits of 30 cm^3 size (P1), pits of 45 cm^3 size (P2) and pits of 60 cm^3 size (P3). Five timber and fuelwood species were planted on the lateritic soil (Bhataland). The growth data indicated that *T. grandis* gave better performance under irrigated conditions and in bigger sized pits.

(ii) Another experiment was taken up in the year 1987 near Raipur. There were two treatments namely; irrigation (I) and no irrigation (Io). Planting was done in 45 cm^3 sized pits made at a spacement of 2m x 2m. The growth data indicated that *T. grandis* had better average height and survival percent under irrigated conditions.

86. TERMINALIA BELLERICA

A. Species Trial

(i) A trial plantation of the species was done near Jabalpur in the year 1971. The initial performance of the species was found quite good.

(ii) Another trial was taken up near Seoni in the year 1993-94. The performance of the species was found to be poor.

B. Afforestation of Minedout Area

This trial was taken up near Amarkantak in Dhanpuri Coalmines in the year 1990. The growth of the species was not found satisfactory.

C. Depth of Sowing

An experiment was taken up in Jabalpur centre in the year 1988 to test the effects of depth of dibbling of seed on the germination of seed. The data recorded indicated that *T. bellerica* gives highest germination percent at 3 cm depth.

D. Inoculation of Seed with Culture

This experiment was taken up in Jabalpur centre in the year 1988 to study the effects of inoculation of seed with Rhizobium culture on the germination percent

of seed and growth of the seedlings. The observations recorded indicated that inoculation of seed with Rhizobium culture did not produce any positive effect on the germination of *T. bellerica* seed and growth of seedlings.

E. Fertilizer Trial

(i) In the year 1974, a fertilizer trial was conducted in Pendaribhata (Bilaspur) In this, effect of different doses of fertilizer on the growth of *T. bellerica* was studied. The data recorded showed that (T3) treatment with 25 gm of Urea and 25 gm of super phosphate induced the highest (99) survival percentage of plants.

(ii) In the year 1975, a fertilizer trial was conducted at Pendaribhata near Bilaspur to know the correct dose of fertilizer for the growth of *T. bellerica*. The data recorded in the year 1981 showed that 25 gm of Urea and 25 gm of super phosphate was a correct dose of fertilizer for the growth of seedlings.

87. TERMINALIA ARJUNA

A. Planting Stock

This trial was taken up near Bilaspur in the year 1967-68 in which planting stock of various types was tried. The data indicated that polypotted seedlings gave the best performance.

B. Species Trial

A trial was taken up at Jabalpur centre in the year 1984. The observations recorded have shown that the species performed well on the site.

C. Afforestation of Minedout Area

A trial was taken up near Raipur (Nandini) in the year 1986 to findout the suitable species for the afforestation of lime stone mined out area (OB dumps). The growth data recorded showed that *T. arjuna* performed quite well.

88. TAMARINDUS INDICA

A. Species Trial

This experiment was taken up near Bilaspur in the year 1970. Polypotted seedlings were planted in pits and 20 gm of Urea and 20 gm of super phosphate

were mixed with the soil of pit at the time of planting. The species did not perform well.

B. Afforestation of Minedout Area

This trial was taken up near Durg (at Dalli Rajhara) in the year 1986 for finding out the suitable species for the afforestation fo Iron ore mined out site. The data indicated that the species did not perform well.

89. TERMINALIA TOMENTOSA

Mixed Plantation.

This trial was taken up near Seoni in the year 1993-94. Polypotted seedlings of *Terminalia tomentosa* were planted in mixture with some other species. The data recorded showed that the species performed quite well.

90. TAXODIUM MUCRONATUM

Species Trial

The species trial was taken up in the year 1970 near Amarkantak. In January 1971, 54 cm height growth was recorded.

91. ZYZYPHUS JUJUBA

Mixed Plantation

(i) A trial was taken up near Nepanagar in the year 1991 in which planting of species of different canopies was done in mixture to create vertical diversity. It was noted that *Zyzyphus jujuba* showed good performance.

(ii) In a similar trial conducted near Seoni in the year 1991 it was observed that *Zyzyphus jujuba* had responded well.