PROVISIONAL YIELD ASSESSMENT OF QUICK GROWING SPECIES IN IRRIGATED PLANTATIONS

by

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SUMMARY

In 1967-68, seven tree species were planted in an irrigated plantation to assess their rate of growth. Although the experiment was not statistically designed due to some unavoidable circumstances and requisite silvicultural requirements of the species were not met either, a definite trend in the rate of growth is indicated. Reasons for poor performance of some of the species which otherwise are quite promising have been discussed pointing to the fact that every species has certain basic needs of its own which have to be provided for to get the best out of it.

Introduction

During sixties, with the introduction of exotic fast growing species such as hybrid poplars and eucalypts, an awareness arose among the foresters in general and those engaged in forestry research in particular to assess their performance vis-a-vis other fast growing species which already grew in the plains of Pakistan. Efforts were, therefore, made to introduce these exotics in irrigated plantations as a pure crop in patches. No comparative growth studies of both indigenous and exotics were, however, made. It was in 1966 that a start was made in this direction and a study was initiated in Bhagat Reservoir plantation of Lyallpur/Jhang Forest Division.

Review of literature

Not enough literature is available on the comparison of rate of growth of different tree species growing in the Indo-Pakistan sub-continent. While conducting research on

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the growth of *Broussonetia papyrifera* (Paper mulberry) which is indigenous to Burma, Siam and Japan, Krishnaswamy (2) has indicated that in Japan coppice rotation is fixed as 3 years and has suggested that since the tree starts deteriorating from within after 7-8 years, the stands should be worked on a rotation of 10 years. It has further been reported that as much as 836 cft. per acre can be obtained at an age of 13 years when volume is calculated upto 4 inches diameter from the top. The same author reports that the pulp wood studies on this tree have given a yield of 6 tons from 600 cft. of wood.

I. M. Qureshi (3) while comparing the rate of growth of different eucalypts has put *Eucalyptus grandis* at the top, which over a period of 4 years gained a height of 40 ft., diameter of 3.6 inches and MAI of 315 cft. per acre followed by *E. citriodora* (MAI 140 cft.) and Eucalyptus hybrid (MAI 44 cft.).

In a ten year old cotton wood spacing study (1) the researchers have reported that only the trees at the widest spacing (16′ × 18′) averaged an inch of diameter growth annually for ten years and it was progressively less for lower spacings (4′ × 9′ minimum).

Sheikh (4) with a view to comparing the rate of growth of *Populus euramericana* CV-I-214 with *Eucalyptus camaldulensis* and *Eucalyptus tereticornis* has reported that under intensive methods hybrid poplar gives much better performance both in height and diameter as compared to both the species of Eucalypts.

Establishment of the study

Centre-wise planting was done with a number of species at a uniform spacing of 6′×10′ in accordance with normal practice for raising shisham plantations in irrigated areas. Each centre was planted with one species. Planting continued till 1968. In all. seven species were used.

Albizzia procera (White siris)
Salmalia malabarica (Simal)
Melia Azedarach (Bakain)
Morus alba (Mulberry)
Broussonetia papyrifera (Paper mulberry)
Populus euramericana CV-I-214 (Hybrid poplar)
Eucalyptus camalduleneis (Eucalypt)

Due to non-availability of sufficient planting material all the species could not be represented on equal area. Also these could not be tried simultaneously in successive years. The study remained under close supervision till 1971. After that it received a set back as no cultural operations were carried out in the area. No thinnings were done with the result that crop remained thoroughly congested.

Collection of growth statistics—Method and procedure

In April/May, 1975 data to assess the yield of above species on acre basis was collected in order to get an idea about performance of individual species and their comparative rate of growth. Since the species were not tried according to a statistical design, the data could not be analysed as such. However, the crop of different years was differentiated for each species. Systematic sampling was carried out in each centre for a particular species by laying out a plot of size 100′ × 50′ at 300' interval along the length of the centre. D.B.H. of individual trees of the particular species plus shisham standards standing in the plot were recorded in the field. Since ultimate object was to evaluate the growing stock on acre basis and since volume tables of most of the species were not available, two trees in each 1-inch diameter class were felled for those species whose volume tables were not available. Full volume contents of each felled tree were calculated and average volume contents for each diameter class worked out. The volume estimates obtained through graphic technique are reproduced in Table 1 below:

TABLE 1

Volume Estimates (In Cubic Feet)

Diameter Class (Inches)	Bakain	White Siris	Eucalyptus camaldulensis	Simal	Paper mulberry	Hybrid[1] poplar	Mulberry[2]
2	0.50	0.40	0.50	0.30	0.20	0.03	0.373
3	1.00	0.90	1.00	0.70	0.40	0.22	0.564
4	1.80	2.05	2.05	1.70	2.20	0.74	1.03
5	2.70	3.25	3.10	2.80	4.05	1.71	1.88
6	3.80	4.60	4.30	4.10	6.10	3.20	2.90
7	5.00	6.10	5.80	5.60	8.40	5.22	4.46
8	6.45	7.80	7.65	7.35	11.10	7.74	6.25
9	8.10	9.80	9.95	9.45	14.15	10.7	8.30
10	9.95	12.05	12.80	12.00	17.90	14.0	10.7
11	—	16.10	16.10	14.95	22.10	17.7	13.6
12	—	17.10	19.90	18.35	26.45	21.5	16.9
13	—	—	—	—	—	25.5	20.4
14	—	—	—	—	—	29.6	24.7
15	—	—	—	—	—	33.8	29.1

1. Local Volume Tables for Changa Manga Canal side plantation (under print).
2. Local Volume Tables for Mulberry. Mensuration Branch Bulletin No. 3, P.F.I.

All the trees in each plot were categorised in 1-inch diameter classes and total volume for each plot was calculated.

Volume of shisham standards falling in the plot was also worked out using local volume tables of Chichawatni given in publication No. 26 of Forest Mensuration Branch, P.F.I., and added in the volume of the species. Average volume for plots of a particular species was calculated age-wise and the volume was estimated on acre basis by multiplying plot volume with.

$$\frac{\text{Area of acre in square feet}}{\text{Area of plot in square feet}} = \frac{43560}{100 \times 50} = 8.71$$

Since number of shisham standards in the plots varied considerably with varying contribution of volume on acre basis only the volume of trees of a particular species on acre basis was utilized for calculation of mean annual increment (MAI) with the assumption that 700 trees per acre should have provided us volume under normal conditions. M.A.I. therefore, was calculated on the basis of volume of 700 trees per acre for each species for comparison purposes. Details are given in Table 2 on next page.

Results

Table 2 gives the following information:

There is a wide variation in number of trees per acre between species and ages although initial planting was done at a uniform spacing i.e. $6' \times 10'$.

Mean annual increment for most of the species could not be ascertained for different ages due to insufficiency of data.

Current annual increment in case of species which were planted during successive years does not indicate a clear trend.

MAI based on 700 trees per acre of species provides the following estimates in order of merit.

Species	*Average MAI (Cft.)*
Broussonetia papyrifera (Paper mulberry)	472.6
Salmalia malabarica (Simal)	472.4
Albizzia procera (White Siris)	378.0
Eucalyptus camaldulensis (Eucalypts)	427.0
Melia azedarach (Bakain)	250.0
PXE CVI-214 (Hybrid poplar)	235.6
Morus alba (Mulberry)	115.1

TABLE 2

Yield per acre of different species

Sl. No.	Species	No. of plots taken	Average number of trees per plot		No. of trees per acre		Yield per acre (cft)		Yield of 700 trees per acre of species (cft)	Age of crop (year)	M.A.I. (cft)			Average M.A.I. (cft)
			species	shisham	species	shisham	species	shisham			6 yrs.	7 yrs.	8 yrs.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	White siris	4	42	1	364	11	1374.8	556.6	2646.0	7	—	378.0	—	378.0
2	Eucalyptus	3	26	2	226	17	1107.7	694.2	3430.0	6	571.7	—	—	
3	—do—	3	20	1	183	9	738.2	416.3	2821.0	7	—	403.0	—	427.0
4	—do—	4	40	3	353	22	1235.1	678.5	2450.0	8	—	—	306.2	
5	Poplar	3	40	1	348	9	703.6	475.6	1414.0	6	235.6	—	—	235.6
6	Mulberry	3	64	1	560	6	578.4	270.0	721.0	6	120.2	—	—	
7	—do—	3	59	1	514	9	564.8	439.0	770.0	7	—	110.0	—	115.1
8,9	Simal	4	37	1	320	11	1296.9	558.8	2835.0	6	472.4	—	—	472.4
10	P. mulberry	2	51	1	449	4	2010.7	96.7	3136.0	7	—	448.0	—	
11	—do—	6	60	—	523	—	2964.6	—	3969.0	8	—	—	497.2	472.6
12	Bakain	3	29	3	302	29	671.0	1108.7	1554.0	6	259.0	—	—	
13	—do—	3	39	3	343	23	825.9	1156.7	1687.0	7	—	241.0	—	250.0

Volume of shisham standards standing in the plots has been added to the species volume. These standards vary in number thus contributing different volumes to the total volume on acre basis. This volume has been excluded for calculation of M.A.I. which has been considered on the basis of 700 trees of the species standing on one acre.

Discussion

The following points merit discussion:

Although the planting of each species was done at a uniform spacing the ultimate large variation in volume occurred as no cultural/thinning operations were carried out in the crops.

Mulberry was badly lopped by nearby populace for sericulture purposes. This resulted in its poor volume growth.

Porcupine damaged almost all the bakain trees by gnawing and peeling the bark at the base. The number of trees on acre basis was thus reduced appreciably, even though no thinnings were done.

Eucalyptus camaldulensis suffered badly due to tough competition from weeds and undergrowth. Mortality in the plots was high.

P-x-E CV-I-214 which requires rather preferential treatment in the form of thorough soil preparation, elimination of all weed, early thinnings when planted at close spacing, timely pruning, no over head shade and of course comparatively more supply of water suffered the most. All these factors were instrumental in retardation of the growth. This further goes to prove that poplar crops have to be clean cultivated at least in early years of their growth and all competition totally eliminated to allow the trees to grow normally.

Conclusions

Although the study suffered from many setbacks as detailed above yet it has provided useful indicative results. In the absence of any reliable growth statistics it gives rough yield for these species for purpose of comparison. Given due allowance for the drawbacks, the study can serve as a useful guide.

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