
EVALUATION OF MULTIPURPOSE TREE SPECIES UNDER BARANI CONDITIONS AT DAGARKOTLI

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ABSTRACT

A study was laid out at Dagarkotli in February, 1982 to compare the survival, growth and biomass production of five multipurpose tree species under barani conditions planted in the roaded catchments with a trench. The experimental design was randomised complete block with six replications. The plot size was twenty seedlings.

In January, 1994 the survival, height, diameter at breast height (dbh) and biomass data were collected. There was no significant difference among the tree in survival. *Acacia albida* showed significantly greater growth in height dbh and biomass followed by *Prosopis cineraria*; *Acacia modesta* and *Tecoma undulata*. *Acacia albida* produced 75 kg/plant air dry biomass and out yielded all the other multipurpose tree species tested in the experiment. *Zizyphus mauritiana* had minimum height; dbh and also produced lowest airdry biomass (2 kg/plant).

INTRODUCTION

Pakistan is an arid country. Its 60 percent area receives less than 250 mm annual rainfall. Low and erratic rainfall, high evapotranspiration, extreme temperature and low soil fertility hinder the revegetation efforts in this tract. The arid and semi arid areas provide an opportunity to meet the ever increasing demand of fibre, food, fuelwood and feed for human and livestock population. The

selection of high yielding multipurpose tree species for harsh arid environment and water conservation techniques for their establishment will play a crucial role in the development of arid areas.

The afforestation programs in the arid parts of Pakistan are based on hand watering. A number of water conservation techniques i.e. micro catchments, roaded catchments, gradonii, contour trenches have been tested in the arid and semi-arid zones of the world (Shah, 1990). Roaded catchments, and roaded catchments with a trench enhanced the survival and height as compared with those of trench, pit and surface planting techniques at Dagar Kotli (Sheikh 1986). The published results on the performance of various multipurpose tree species under various water conservation techniques were based on the survival and height growth (Sheikh 1986; and Hussain and Sheikh 1986).

Recently the biomass estimation of tree species has gained importance in forestry due to increase in human and livestock population. The selection of high yielding multipurpose trees for arid environment can help in reducing the gap between demand and supply of fuelwood (Siddiqui 1989). The present study was conducted to find out the suitable multipurpose tree species having fast growth and can be established with water rainfed conditions using water harvesting system. Although the preliminary results of the experiment have been reported in the annual

progress report of the project as well as in its final technical report (Sheikh, 1986) but it was necessary to examine the performance of these trees for longer period. The growth data at 12 years age were taken processed, analysed and presented in the paper.

MATERIAL AND METHODS

Pakistan Forest Institute, Peshawar established a field station in 1980 in pasture 13-A at Rakh Dagar Kotli, Bhakkar Range Management Division in Thal desert to conduct the research on the dry zone afforestation using rainwater harvesting and water conservation techniques under PL-480 Assistance Programme. The study area have series of sand dunes with interdunal flats. The soil is sandy loam in the interdunal flats. The annual average precipitation is 200 mm, out of which 70% is received in monsoon season. The area experiences high velocity winds during summer and maximum temperature reaches upto 48°C during June. The area has arid conditions with high potential Evapotranspiration and low rainfall. The data on survival and height growth were collected annually and reported in the annual progress reports of the project. The final data on growth parameters was taken in January, 1994. Survival, height and diameter at breast height data were collected for each tree species. The data were analysed and tabulated. A sample plant of each tree species was felled to the ground level in each replication with a hand saw. The plant was cut into pieces and weighed in the field, using a spring balance. The airdry weight was recorded after two months of sun drying the felled material.

The data on survival, height growth, DBH and airdry biomass was analysed by applying analysis of variance (ANOVA). Least Significant Difference (LSD, 0.05) test was also

applied to evaluate the difference of average values (Steel and Torrie 1980).

RESULTS AND DISCUSSION

The average survival percent, height, diameter at breast height and airdry biomass (kg/plant) of all the trees species are shown in Table 1.

Analysis of variance of the survival data showed that all the five tree species did not differ in survival (LSD 0.05). *Acacia modesta* had appreciably higher survival of 72 percent followed by *Acacia albida* 68 percent. The *Prosopis cineraria* had minimum survival of 56 percent while *Zizyphus mauritiana* and *Tecoma undulata* has 65.8 and 62.5% survival respectively.

The average height gained by the five tree species varied from 5.6 m by *Acacia albida* to 2.36 meters by *Zizyphus mauritiana*. *Acacia albida* had significantly greater height growth (LSD 0.01) at twelve years age than those of other tree species under the study. *Prosopis cineraria* and *Acacia modesta* also gained significantly higher height (LSD 0.05) as compared to *Tecoma undulata* and *Zizyphus mauritiana* but there was no significant different in height between these two tree species. Similarly *Zizyphus mauritiana* and *Tecoma undulata* showed no significant difference in height growth being 2.36 and 2.65 m respectively.

The average diameter at breast height (cm) gained by the five tree species was also substantially different. *Acacia albida* had significantly higher diameter growth of 12.1 cm than those of other tree species (LSD 0.01). All other tree species differed in dbh among themselves (LSD 0.05). *Zizyphus mauritiana* had

the minimum diameter growth of 2.4 cm. While *Prosopis cineraria*, *A. modesta* and *Tecoma undulata* had 9.9, 5.2 and 4.5 cm respectively.

The average airdry biomass kg/plant revealed considerable variation among the multipurpose tree species. *Acacia albida* produced maximum airdry biomass of 75.2 kg/plant (LSD 0.05) and out yielded all other tree species under the study at Dagar Kotli. *Acacia modesta* and *prosopis cineraria* also produced substantially higher airdry biomass per plant being 30.2 and 20.3 kg respectively. *Zizyphus mauritiana* produced minimum airdry biomass of 2 kg/plant while *Tecoma undulata* has 7.07 kg per plant.

The height, diameter at breast height and biomass data revealed that *Acacia albida* showed better growth than other tree species in the arid environment at Dagar Kotli, while *Zizyphus mauritiana* proved to be slow growing tree species in Thal desert. *Acacia modesta* and *P. cineraria* also showed better performance in growth of height, diameter and biomass during the study. *Acacia albida*, *Prosopis cineraria* and *Acacia modesta* showed potential for planting in the Thal desert under rainfed conditions. *Prosopis cineraria* is an indigenous tree species and well adopted to desert environment. *Acacia modesta* although a species from scrub zone of Pakistan also performed well in Thal desert.

Table-1 Growth of Different tree species planted under rainfed conditions at Dagar Kotli

Species	Survival percent	Height (m)	dbh (cm)	Airdried biomass kg/plant.
<i>Acacia albida</i>	68.3	5.62a	12.1a	75.18a
<i>Acacia modesta</i>	72.5	3.52c	5.2c	30.2b
<i>Prosopis cineraria</i>	56.7	4.29b	9.9b	20.3b
<i>Tecoma undulata</i>	62.5	2.65d	4.5d	7.07b
<i>Zizyphus mauritiana</i>	65.8	2.36d	2.4c	2.01b

i. LSD 0.05 Height (m)	=	0.658
ii. dbh (cm)	=	1.172
iii. Biomass Kg/plant	=	35.69

Averages followed by the same letter are not significantly different (LSD = 0.05).

CONCLUSION

The results of the study revealed that *Acacia albida* is a promising high yielding tree species for a dry afforestation programs in arid

environment of Thal desert *Acacia modesta* and *Prosopis cineraria* ranked 2nd and 3rd in growth and biomass production but *prosopis cineraria* should be selected for plantation in mixture with *Acacia albida* because it is good fodder

tree and has got positive effect on ground vegetation. The performance of *Zizyphus mauritiana* was poor in Thal, although its growth is better on clayee soil in the adjacent area of D.I. Khan under the same climatic conditions.

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