
GROWTH COMPARISON OF FODDER TREE SPECIES UNDER RAINFED CONDITIONS AT DAGARKOTLI, THAL DESERT

MOHAMMAD NOOR, ASSISTANT SILVICULTURIST AND BASHIR HUSSAIN SHAH, DIRECTOR, FORESTRY RESEARCH DIVISION, PAKISTAN FOREST INSTITUTE, PESHAWAR

ABSTRACT

Growth and biomass of five tree species planted in 1983 in a roaded catchment under rainfed conditions at Dagarkotli, were compared. Twenty plants of each of the five fodder tree species were planted in each of 6 replications on RCB design. Survival, growth and airdried biomass data were collected in January, 1994 on each tree species, and analysed statistically. *Acacia modesta*, *Prosopis cineraria* and *Acacia albida* had substantially higher survival percent than *Acacia tortilis* and *Acacia victoriae*. *Acacia albida* and *Acacia tortilis* showed significantly higher growth than the other species. The airdried biomass of 65 kg/plant of *Acacia albida* was significantly greater than other tree species. *Acacia victoriae* gained minimum height, dbh growth, and produced minimum airdried biomass of 14 kg/tree. None of the other three tree species showed any significant difference in airdried biomass.

INTRODUCTION

About 60 percent land area of Pakistan is arid and receives less than 250 mm annual rainfall. The human and livestock population of the country is increasing rapidly. Arid parts provide promise for human settlement. To combat desertification and improve arid environment, large-scale afforestation will be needed to meet the fuelwood and fodder requirements of human beings and livestock.

Realizing the importance of arid areas, the Pakistan Forest Institute (PFI) Peshawar

established a field research station in pasture 13-A at Rakh Dagarkotli, Thal Desert in 1980 with the financial assistance of Pakistan Agriculture Research Council under PL-480 programme. Research was focused on:

- the selection of fast growing high yielding fodder tree species;
- efficient use of available rainfall through water conservation techniques for the establishment of tree species.

The afforestation programmes in the arid parts of Pakistan are based on hand watering. Micro-catchments, roaded catchments, gradonii and contour trench water conservation techniques are used to enhance the vegetal cover (Shah, 1990). At Dagarkotli roaded catchments, and roaded catchments with trench were found better than those of trench, pit and surface planting techniques because of higher survival of tree species (Sheikh 1985; Hussain and Sheikh, 1986).

The biomass estimation gained importance in forestry due to increase in human and livestock population. Tree species adapted to arid environment provide pods and leaves for livestock feed, and branches/stems for fuelwood and construction purposes (Hussain 1989). The selection of high-yielding multipurpose trees for arid environment can help in reducing the gap between demand and supply of fuelwood (Siddiqui, 1989). Shah and Noor (1994) reported that growth and biomass of *Acacia albida* was significantly higher than other tree species, planted in roaded

catchment with a trench water conservation technique. This study was conducted to select a fast growing tree species, suitable for growing under rainfed conditions using water conservation technique. The growth data of 11 year old plantation were taken, processed, analysed and the results are presented in this paper.

MATERIALS AND METHODS

The establishment of a field station by Pakistan Forest Institute, Peshawar in Rakh Dagarkotli, Bhakkar Range Management Division in Thal desert in 1980 under PL-480 Programme provided the opportunity to study various rainwater harvesting and conservation techniques for dry afforestation programmes. The area has a series of sand dunes with interdunal flats. The soil is sandy loam in the interdunal flats. About 70% of annual average precipitation of 200 mm occurs in summer monsoon season. High velocity winds during summer are common. Maximum temperature reaches upto 48°C in June causing accelerated evapotranspiration. This study was laidout in July 1983 in randomized complete block design with six replications, using roaded catchment water conservation technique. One-year-old tubed plants of five fodder tree species were planted in the study. The final data on survival, height, diameter (at breast height) and biomass were collected for each tree species in January 1994. A sampled plant of each tree species was felled in each replication. The tree was cut into pieces and weighed in the field with a spring balance. The airdry weight was recorded after two months of sun drying.

The survival, height growth, dbh and airdry biomass data were analysed. Least significant difference (LSD \geq 0.05) test was applied to evaluate differences of average values (Steel and Torrie 1980).

RESULTS AND DISCUSSIONS

The average survival percent, height (meters) diameter at breast height (cm) and airdry biomass (kg/plant) of all the fodder tree species are given in Table 1.

Survival percent

Acacia modesta was the best species in survival with 64 percent living plants while *acacia victoriae* had a poor survival of 19 percent.

Table 1. Growth comparison of tree species planted under rainfed conditions at Dagarkotli

Species	Survival (%)	Height (m)	dbh (cm)	Air-dried biomass kg/plant
<i>Acacia albida</i>	45.8	5.41a	11.36a	65.03a
<i>Acacia modesta</i>	64.2	3.05b	4.22c	15.95b
<i>Acacia tortilis</i>	25.2	5.53a	10.77a	51.65ab
<i>Acacia victoriae</i>	19.2	3.24b	4.57c	14.23b
<i>Prosopis cineraria</i>	58.3	3.81b	6.62b	16.42b

Average values followed by the same letter are not significantly different at LSD 0.05.

Height Growth

The average height attained by the five tree species was highest (5.53 m) for *Acacia tortilis* and lowest for *A.modesta* (3.05 m). The difference between *Prosopis cineraria*, *Acacia victoriae* and *Acacia modesta* were non-significant (LSD 0.05).

Diameter at breast height

The average diameter at breast height (cm) for the five tree species was also substantially different. *Acacia albida* and *Acacia totilis* had

significantly higher diameter growth of 11.4 and 10.77 cm, respectively. *Prosopis cineraria* had significantly better diameter growth than *Acacia modesta*.

Airdried biomass

The average airdried biomass data (kg/plant) revealed considerable variation among the five tree species. *Acacia albida* produced maximum airdry biomass of 65 kg/plant and out yielded all other tree species under the study.

The growth and airdried biomass, data indicated that *Acacia albida* and *Acacia tortilis* performed better than the other tree species. *Acacia victoriae* proved to be the slowest growing tree species in Thal desert environment. *Acacia modesta* and *Prosopis cineraria* although slow growing showed better performance in survival.

Protein content

The crude protein content in the leaves of *Acacia albida*, *Acacia tortilis* and *Prosopis cineraria* varies from 17-19, 13-19, and 15 percent, respectively. These fodder tree species can provide nutritious feed to livestock after establishment.

CONCLUSION

Results of the study revealed that *Acacia albida* was a promising high yield tree species for dry afforestation programmes in arid environment. *Acacia tortilis* was the 2nd best tree species in growth and biomass production although its survival was minimum and is frost-tender. *Prosopis cineraria*, *Acacia modesta* may be selected for plantation in mixture with *Acacia albida* and *Acacia tortilis* because these are good fodder trees and have got positive effect on ground vegetation.

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