
A NOTE ON BIOMASS OF FODDER TREES

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ABSTRACT

Mechanical thinning was carried out in two experiments in Range Management Nursery, Pakistan Forest Institute, Peshawar for estimation of biomass of fodder tree species during December, 1991 to January, 1992. Selective parameters of growth of all the sample trees of different fodder tree species were measured. Green weight of stem wood, branchwood, leaves and pods were recorded separately for biomass calculation. Dry weight after 6 weeks was also measured. The results showed that 12 years old *Ceratonia siliqua* yielded the highest amongst all fodder trees. Its total air-dried biomass per plant was 184.4 kg. and was followed by *Acacia tortilis* which yielded 80.3 kg. per plant.

INTRODUCTION

Two studies to assess the survival and growth performance of different fodder tree species were laid out in Range Research Nursery at Pakistan Forest Institute (PFI), Peshawar. One study was laid out in July, 1981 wherein 4 fodder tree species namely; *Leucaena leucocephala*, *Robinia pseudoacacia*, *Ceratonia siliqua* and *Tecoma undulata* were planted in split-split designed with 4 watering frequencies. Planned watering treatments were applied till June, 1985. Afterwards watering was discontinued and plants were allowed to grow under rainfed conditions. The interim results of this study were reported by Sheikh and S.M. Khan in 1983. Second study was laid out in August, 1983. Five fodder trees species namely; *Acacia albida*, *A. cynophylla*, *A. tortilis*, *Leucaena leucocephala*, and *Tecoma undulata*

were planted under 5 different planting techniques. According there were 7 fodder tree species in both the studies. Two species were common in both the studies.

It was decided to maintain both the studies for seed multiplication after their proper cultural operations. Further it was also decided to evaluate the fodder trees for their biomass production. Biomass estimation was carried out during December, 1991 to January, 1992.

MATERIAL AND METHODS

Mechanical thinnings were alternate trees in each treatment and in each replication were felled, was carried out. In each replication 2 trees of each species where available, were selected randomly for biomass estimation. Each plant so selected was classified as multistemmed if there were more than one forks/stems below 1.4 meters (4.5 feet) stem height. The number of forks/stems were also counted. Each such stem was measured separately for different parameters. Those parameters included; DBH, height, length of clean bole, crown length and crown width. Green weight (fresh weight) and air-dried weight of stems, branches, leaves and pods (where available) of each sample tree were measured separately. For leaves and twigs current year's growth was clipped and measured for estimation of leaf fodder. Air dried weight of stems and branches were measured after about 6 weeks of air drying when weight of sample became constant dry. Similarly, leaves and twigs were weighed after 7 days for their air-dry weight.

RESULTS AND DISCUSSION

a) **Biomass:** It was designed to collect biomass data of two trees of each species from each replication. Table 1 indicated that all of the sample fodder tree species were not equally represented. It was to the fact that some of the fodder trees had failed to survive due to completion or adverse factors. Those include *Robinia pseudoacacia*,

Tecoma undulata, under irrigated conditions and *Acacia tortilis*, *Tecoma undulata*, and *Acacia cynophylla* under rainfed condition. Probably these trees could not survive and establish due to severe competition for light and moisture contents. Table 1 shows, air dried biomass (above ground) of fodder trees irrespective of the treatments provided in the studies.

Table 1: Biomass of 12 years old fodder trees growing under partial irrigated and air dried condition.

Species	No. of* plant measured	Average air dried weight per plant(kg)				Total biomass
		Wood		Fodder		
		Stem	Branch	Leaves	Pods	
Rainfed conditions						
1. <i>Acacia albida</i>	10	23.1	11.2	0.6	-	34.9
2. <i>A. cynophylla</i>	2	30.2	4.5	1.4	-	36.1
3. <i>A. modesta</i>	10	8.7	6.3	0.5	-	15.5
4. <i>A. tortilis</i>	1	49.9	29.5	0.9	-	80.3
5. <i>Ceratonia siliqua</i>						
- Irrigated condition	10	168.3	100.2	4.9	-	184.4
6. <i>Leucaena leucocephala</i>						
- Irrigated condition	10	37.0	11.0	1.2	1.2	50.4
- Rainfed condition	10	13.2	5.6	.01	0.8	19.6

* Here plant means entire tree irrespective of its multistemmed or single stem form. Multistems, where found were measured individually and are included in main data. (Table 2).

Above results indicate that 12 years old *Ceratonia siliqua* tree yielded more than all other fodder trees species of same age and growing under same conditions. Its total biomass was 184.4 Kg. followed by 80.3 kg. of *A. tortilis*. Since only one tree of *A. tortilis* was available for measurement so its reported biomass may be on the higher side. All other figures are average of at least 10 observations.

Majority of the sample plants measured for biomass estimates were multistemmed. Each such

stem, equal or larger than 5 cm. (DBH) and forked below 1.4 meter stem height above ground was measured separately. However, data regarding, biomass of all such forks were included in the data of main plant. Other parameters of plants measured were number of stems (forks) of each plant, DBH, total height, length of clean bole, length of crown of each stem and crown width of entire plant.

Table 2: Height, diameter, length of bole, Crown length and Crown width of measured sample plants

Species	Ave. No. of stems	Ave. dia (cm)	Ave. Height (m)	Ave. bole length (m)	Ave. crown length (m)	Ave. crown width of entire plant (m)
Rainfed conditions						
1. <i>Acacia albida</i>	1	11.2	8.8	1.8	7.0	1.9
2. <i>A. cynophylla</i>	1	15.2	7.3	3.4	4.0	2.8
3. <i>A. modesta</i>	2	4.6	5.6	1.3	4.3	2.4
4. <i>A. tortilis</i>	3	8.4	8.3	1.5	6.8	3.0
5. <i>Ceratonia siliqua</i> - Irrigated condition	3	11.7	10.7	2.3	8.4	8.6
6. <i>Leucaena leucocephala</i> - Irrigated conditions	4	6.9	8.4	3.5	4.9	2.8
- Rainfed conditions	2	6.4	8.6	3.8	4.8	2.3
7. <i>Tecoma undulata</i>	1	5.1	4.0	1.5	2.5	1.5

The results indicate that fodder trees of this study have differentiated growth form. Except *A. albida*, *A. cynophylla* and *T. undulata* all others trees were multistemmed. On the average *L. leucocephala* had 4 stems(forks) under partial irrigated condition followed by *Ceratonia siliqua* which had 3 forks. Average height and average crown width of *C. siliqua* were highest of all other tree species which was 10.7 m and 8.6 m, respectively. *Acacia albida* had average height of 8.8 meter (second largest tree) but had narrow crown width of 1.9 meter. *A. cynophylla* had attained maximum DBH of 15.2 cm but its height only 7.3m. All the measured parameters were lowest in case of *T. undulata* of all species. For this is attributed to their natural morphological characteristics.

CONCLUSION

The promising growth form and highest biomass production of *Ceratonia siliqua* indicated its well adaption in Peshawar valley. This tree species can be established with watering in initial stage in hard clayey soils.

This multipurpose tree species must be given preference over other species where both fuelwood and fodder leaves are required by the farmers. Under rainfed conditions, *Acacia albida* is most suitable multipurpose trees for farms. It would give minimum shade due to narrow crown.

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