

EFFECT OF DIFFERENT PLANTING TECHNIQUES ON SURVIVAL AND PERFORMANCE OF FODDER TREES

Mohammad Rafique Sardar, Range Management Officer, Pakistan Forest Institute, Peshawar.

ABSTRACT

Six fodder tree species namely *Acacia albida*, *A. cynophylla*, *A. modesta*, *A. tortilis*, *Leucaena leucocephala* and *Tecoma undulata* were planted under 5 planting methods viz; Surface planting, pit planting, trench planting, slope

planting and slope with trench planting* in Peshawar during August, 1983. The main objective of the study was to test the survival and growth performance of fodder trees under arid conditions. Results indicated that survival and establishment of *L. leucocephala* was highest (87%) of all other 5 trees species. *A. albida* had

second best survival with establishment rate of 76 percent. The growth rate of *A. albida* was highest of all fodder tree species. It attained the average height of 5.9 meters in 4 years with 1.3 meter average annual growth rate. Slope method of planting gave highest survival and establishment rates for all the species. *A. albida* based on its performance is recommended for planting under slope method of planting in areas having similar climatic conditions like Peshawar valley.

INTRODUCTION

Fodder tree leaves and twigs provide supplementary feed to livestock particularly during critical time of the year when no other green forage is available. Accordingly, most of the farmers traditionally plant a number of multipurpose tree species on their farms to meet their fodder need. This is true for irrigated farming as well those areas which receive enough rainfall for tree growth. However, arid to semiarid areas pose problems of survival, establishment and growth of trees. This situation requires to evolve special planting technique to ensure conservation of available moisture for plant growth. Accordingly this study was carried out to test different planting techniques to assess their effect on survival and growth performance of 6 fodder tree species in the Range Management Nursery, Pakistan Forest Institute, Peshawar.

MATERIAL AND METHODS

(i) **Study area:** A plot of Range Management Nursery was utilized for this study. PFI, Campus area received 511 mm average annual rainfall over a period of 6 years from 1983-1988. Rainfall is scanty and seasonal. Most of it is received in the spring. June being the driest month and March the wettest month. Temperatures vary from monthly mean minimum of 2.2°C in January to monthly mean maximum of 38.9°C in June. Annual mean

maximum and mean minimum temperature were 28.9°C and 13.3°C respectively (Table 1). Frost commonly occurs from mid December to mid January. The soil is of fine texture, clayey loam and calcareous in nature. It becomes hard and develops cracks on drying. It also becomes sticky on wetting. Obviously it has low infiltration capacity but high water retention capacity.

(ii) **Design:** The study was laid out during August 1983 in split-split design to assess the survival and growth of 6 fodder tree species. Planting methods were first split and trees as second split. Six fodder tree species were planted under 5 planting techniques. The study was replicated 5 times. Planting was done at 3x3 meters spacing. Six plants of each species were planted in each treatment in planting technique/method. Planting techniques and fodder tree species were as under:

a) Planting techniques:

- T₁ = Surface planting, Planting on flat ground (control).
- T₂ = Pit planting (0.3 m. dia x 0.3 m. deep).
- T₃ = Trench planting (0.3 m wide x 0.3 m deep).
- T₄ = Slope planting (1 in 3 m slope for water harvesting).
- T₅ = Slope with trench planting (1 in 3 m slope and 0.3 x 0.3 m. trench).

b) Fodder tree species:

- S₁ = *Acacia tortilis*
- S₂ = *Leucaena leucocephala*
- S₃ = *Acacia modesta*
- S₄ = *Tecoma undulata*
- S₅ = *Acacia albida*
- S₆ = *Acacia cynophylla*

One watering immediate after planting was given. Later on plants were allowed to grow under

natural climatic conditions. Restocking was carried out during second year. No other cultural

operations like weeding, cleaning, reopening of trenches/pits and slope dressing etc. were carried out.

Table 1: Average annual rainfall and mean monthly temperatures at PFI, Campus (six years average from 1983 to 1988).

Months	Average rainfall (mm)	Temperature (°C)	
		Mean maximum	Mean minimum
January	72.4	18.9	2.2
February	48.3	20.6	4.4
March	120.9	22.8	8.3
April	42.9	28.9	13.9
May	15.4	34.5	16.1
June	14.4	38.9	22.6
July	27.3	36.1	24.5
August	66.6	35.0	23.4
September	17.2	35.0	21.7
October	31.2	30.6	13.9
November	18.1	27.2	6.1
December	36.1	20.6	2.8
Total/Average	510.92	28.9	13.3

RESULTS AND DISCUSSION

The data of survival of fodder tree species was recorded after about one year of planting in May, 1984. Second time data on survival and growth (height) were collected in May, 1985. Afterwards data on survival and growth were collected in December every year upto December, 1989. All the data were computed into simple averages or percentages where required and are presented in two way tables.

Survival and establishment of plants:

Table 2 indicates that planting methods had no appreciably differential effects on survival of fodder trees species during first year of their growth. Highest (70%) survival was obtained both with trench and slope planting techniques. Lowest survival recorded was 60 percent with surface planting. However, considerable variation in survival rate of different tree species was found. *A. modesta* and *L. leucocephala* had highest (87%) survival rate followed by *A. albida* during first year of planting. *A. cynophylla* had lowest (17%) survival rate.

Table 2: Survival of plants under different planting techniques during 1984 and 1989 respectively.

(out of 30 plants)
(out of 30 plants)

Species Surface	Planting techniques											
	Pit 84	Trench 89	Slope 84	Slope 89	84	89	84	89	Slope with trench		Percent 84	89
1. <i>Acacia albida</i>	18	20	23	20	23	25	26	23	25	26	76	76
2. <i>A. cynophylla</i>	3	5	4	3	6	7	6	11	6	6	17	17
3. <i>A. modesta</i>	24	26	24	22	27	21	27	22	29	22	87	76
4. <i>A. tortilis</i>	18	0	20	0	19	4	17	6	17	2	61	6
5. <i>L. leucocephala</i>	25	24	26	22	27	26	29	29	25	29	87	87
6. <i>Tecoma undulata</i>	19	15	21	16	23	14	19	15	20	17	68	50
Average for technique												
No.	18	15	20	14	21	16	21	18	20	17	20	16
%	60	50	67	47	70	53	70	60	67	57	88	53

Results on species establishment after 4th years of their growth indicated that *A. tortilis* (6%) and *A. cynophylla* (17%) could not adapt to the hot and climatic conditions of Peshawar. *Leucaena leucocephala* had highest (87%) survival followed by *A. modesta* and *A. albida* which had 76% survival. Similarly, slope planting method gave highest (60%) survival followed by slope with trench method. Pit method gave lowest (47%) survival rate. It means that slope method harvested and conserved more moisture for growth of the fodder trees.

(ii) Height growth performance:

Height data, was recorded first time in May, 1985. Later on till 1989 it was recorded every year in December. The data for first year (1985) and last year (1989) are presented for comparison.

Table 2:

Growth performance of different fodder trees under different planting methods(Average height in m).

Species	Surface		Pit		Trench		Slope		Slope with trench		Avg. for species		Avg. growth per year
	85	89	85	89	85	89	85	89	85	89	85	89	
<i>Acacia albida</i>	0.6	5.3	0.6	5.7	0.7	6.2	1.0	5.7	1.1	6.6	.8	5.9	1.3
<i>Acacia cynophylla</i>	0.1	4.7	0.9	4.2	1.1	5.4	1.3	4.4	1.1	5.3	.9	4.8	1.0
<i>Acacia modesta</i>	0.9	4.2	0.7	3.6	1.2	4.4	1.3	4.0	1.2	4.6	1.1	4.2	0.8
<i>Acacia tortilis</i>	1.0	0	1.4	0	0.7	5.4	0.7	6.3	1.6	4.5	1.1	5.3	1.1
<i>Leucaena leucocephala</i>	0.7	4.3	1.1	4.9	1.0	5.4	1.1	5.3	1.8	5.9	1.1	5.2	1.0
<i>Tecoma undulata</i>	0.5	2.1	0.5	2.6	0.7	2.8	0.6	3.1	0.8	2.7	.6	2.7	0.51
Avg. for methods	0.6	3.4	0.9	3.5	0.9	4.9	1.0	4.8	1.3	4.9	.9	4.7	
Avg. growth per year		0.7		0.7		1.0		1.0		0.9		.97	0.94

According to the results *A. albida* has shown best growth performance of all the tested species. Its average annual growth rate was 1.3 meter followed by *A. tortilis* which attained 1.1 m/year. The lowest average annual growth of 0.5 m. was of *Tecoma undulata*. Further, trench and slope method of planting gave average annual growth of 1.0 m./year followed by slope with trench for all species. Both surface and pit planting methods gave lowest growth rate of 0.7 m./year.

CONCLUSION

Survival and establishment rates of *L. leucocephala* were highest of all the tested species. Second best species was *A. albida*. Its survival rate

was 76 percent; 10 percentage points less than the best species. *A. tortilis* (6% survival rate) had failed to establish in dry and hot condition of Peshawar valley. It was followed by *A. cynophylla* which had 17% survival rate. Overall establishment rates of all the species were highest, under slope planting technique.

The growth rate of *A. albida* was highest of all the tested species. This species has attained average height of 5.9 meters in 4 years. Accordingly its average annual growth rate was about 1.3 meter. This species seems best suited and well adapted to arid climatic conditions of Peshawar valley. *A. albida*, based on its performance, is recommended for planting in arid

climatic conditions similar to Peshawar area under slope method of planting both for fodder and fuelwood supply.

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