

Response of *Atriplex lentiformis* to Management Practices on an Arid Salt Land

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Abstract : A field experiment was conducted on an arid salt land to study the performance of *Atriplex lentiformis* in response to different treatments such as gypsum, drainage, replacement of pit soil with good soil, FYM, nitrogen and zinc applications. Untreated bushes of *A. lentiformis* attained an average height of 99 cm, and crown diameter of 88 cm within 9 months of planting. Gypsum + drainage + urea + zinc applications (T₄) was the best treatment increasing the average height of bushes to 133 cm and crown diameter to 135 cm. Even in second year its performance was consistent attaining impressive growth despite the bushes being subjected to 30-40% pruning at the age of 21 months. Total biomass production of *A. lentiformis* in T₄ treatment was 1830 kg ha⁻¹ as compared to 238 kg ha⁻¹ in control. Water use efficiency of *A. lentiformis* increased to 27.2 kg ha⁻¹ cm⁻¹ in T₄ from 3.5 kg ha⁻¹ cm⁻¹ in the control.

Keywords : *Atriplex lentiformis*, arid salt land, growth, biomass.

In arid region of Rajasthan, about 0.44 million ha of land is affected by primary salinity, most of which lies in the area where good quality irrigation water is not available (Jain *et al.*, 1988). In view of the acute shortage of fodder and fuel, there is need to utilize these arid salt lands by revegetating them with useful species and by adopting suitable site specific reclamation measures. Research efforts for establishing tree and shrub species on arid salt lands are few and scattered (Yadav, 1980, Jain *et al.*, 1985, Maliwal and Nadiadara, 1990; Singh *et al.*, 1993). Saltbushes of genus *Atriplex* have been reported to produce adequate good quality forage on salt lands in different countries (Tarrad *et al.*, 1991; Warren and Casson, 1992). In India, *Atriplex lentiformis* (salt bush of south west USA origin where it is called quail bush) was introduced in 1967 (Chopra *et al.*, 1982). However, field experiments on *Atriplex* on arid salt lands are lacking. Therefore, a field trial was laid to study the growth performance of *A. len-*

tiformis in response to different soil management practices in Indian arid zone.

Materials and Methods

An experiment was conducted at Kaparda village, 50 km from Jodhpur town, where the soil has both salinity and alkalinity problems having soil pH: 8.9 to 9.3 and EC: 12 to 17 dS m⁻¹. The upper soil layer is compact due to water logging during rainy season and there is a concretion below 40 cm. The highly brackish water table is 15-20 m below the surface. Experiment was initiated in July 1992 which was a normal monsoon year, 1993 was drought year while 1994 was above average monsoon year. Five soil reclamation treatments were, viz., T₁ : gypsum application (10 t ha⁻¹), T₂ : gypsum + drainage channels (along plant rows, 40 cm deep and 40 cm wide), T₃ : filling of pit with good soil + 5 kg farm yard manure (FYM), T₄ : gypsum

Table 1. Performance of *Atriplex lentiformis* on an arid salt land after 9, 12, 24 and 27 months after planting

Treatments	Survival (%)		Height (cm)			Crown diameter (cm)			Green fodder yield of pruned matter (kg ha ⁻¹)
	12	24	9	12	27*	9	12	27*	
T ₁	80	45	93	92	65	84	108	85	262
T ₂	78	90	127	114	77	129	131	114	577
T ₃	76	80	96	92	75	100	96	117	399
T ₄	90	50	133	119	78	135	144	120	996
T ₅	71	75	99	81	69	88	105	90	253
C.D. 5%	NS	NS	33	14	NS	14	35	24	

* Subjected to 30-40% pruning at the age of 21 months (April 1994).

+ drainage channel + 5 kg FYM + nitrogen (15 g urea plant⁻¹) + Zn (7 g ZnSO₄ plant⁻¹) and T₅ : control. Each treatment was triplicated. Thus, 15 rows of 25 plants each were laid randomly for *A. lentiformis*. Pits (50cm x 50cm x 50cm) were at 4m x 2m spacing. Gypsum, FYM, urea and ZnSO₄ were mixed with pit soil, which was refilled after planting six-month-old seedlings in July 1992. There was no watering from July to November, there after bushes were watered monthly until June 1993 and at 40 day interval during the second year from November onwards till the onset of the monsoon. Per cent survival was recorded 12 months after planting and mortality replaced. Again survival was recorded annually. Growth observations were recorded at 9 and 12 months after planting. At 21 months of age. (April 1994) bushes were pruned to uniform size and weight of green fodder recorded. At 27 months growth of bushes was again recorded.

Results and Discussion

A. lentiformis attained appreciable height and crown diameter in 9 month time and exhibited favourable response to different treatments (Table 1). T₄ and T₂ treatments registered significantly higher height (127 and 133 cm) and crown diameter (131 and 144 cm), respectively. Highest increase of 34% in height and 37% in crown diameter was recorded due to T₄ treatment. The maximum bush height and crown diameter attained by a shrub at 9-month-stage were 205 and 210 cm, respectively, due to the T₄ treatment. In the subsequent three summer months bushes showed no increase in growth. Bushes were pruned to 30-40% of their size in the month of April 1994 at 21 months of age. Green fodder yield was four times (996 kg ha⁻¹) higher in T₄ than in the control (253 kg ha⁻¹). The untreated bushes regained 69 cm height and 90 cm crown diameter; whereas, T₄ treated bushes were 78 cm tall with 120

Table 2. Biomass production (kg ha⁻¹) of one-year-old *A. lentiformis* due to different treatments

Treatments	Fresh weight			Dry weight		
	Leaf	Branch	Total	Leaf	Branch	Total
T ₁	243	488	731	99	447	546
T ₂	619	1400	2019	312	1114	1426
T ₃	293	450	743	123	387	479
T ₄	863	1850	2713	366	1464	1830
T ₅	89	204	293	41	197	238

cm crown diameter in October 1994 (27 months after planting).

Some of the three-month-old bushes flowered in the month of October 1992. However, seed setting did not take place. In 1993, flowering was observed in 90% of the bushes with seed setting in about 60% bushes.

Total dry biomass yield of one-year-old *A. lentiformis* under T₄ treatment was increased 7.6-fold (1830 kg ha⁻¹) as compared to 238 kg ha⁻¹ in the control (Table 2). The magnitude of increase was higher (9-fold) in the foliage mass than the wood mass (7 times). Application of gypsum alone (T₁) resulted in 2-fold increase in total dry biomass, whereas, gypsum plus drainage (T₂) increased the total dry biomass 6-fold. Replacement of saline soil from pit with good soil doubled the dry biomass of one-year-old *A. lentiformis*. This performance was observed in a drought year when rainfall was 265.5 mm with long dry spell of 47 days. Thus, *A. lentiformis* has good potential as alternative fodder species on saline lands where nothing else can grow.

Water-use efficiency (WUE) of *A. lentiformis* was computed on the basis of total amount of rainfall received and water applied (64.9 + 2.25 cm) between July 1992 to September 1993. Effect of different treatments on WUE was well pronounced with T₄ treatment showing a WUE of 27.2 kg ha⁻¹ cm⁻¹ as compared to 3.5 kg ha⁻¹ cm⁻¹ in control. WUE for other treatments varied between 7.1 to 21.2 kg ha⁻¹ cm⁻¹.

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