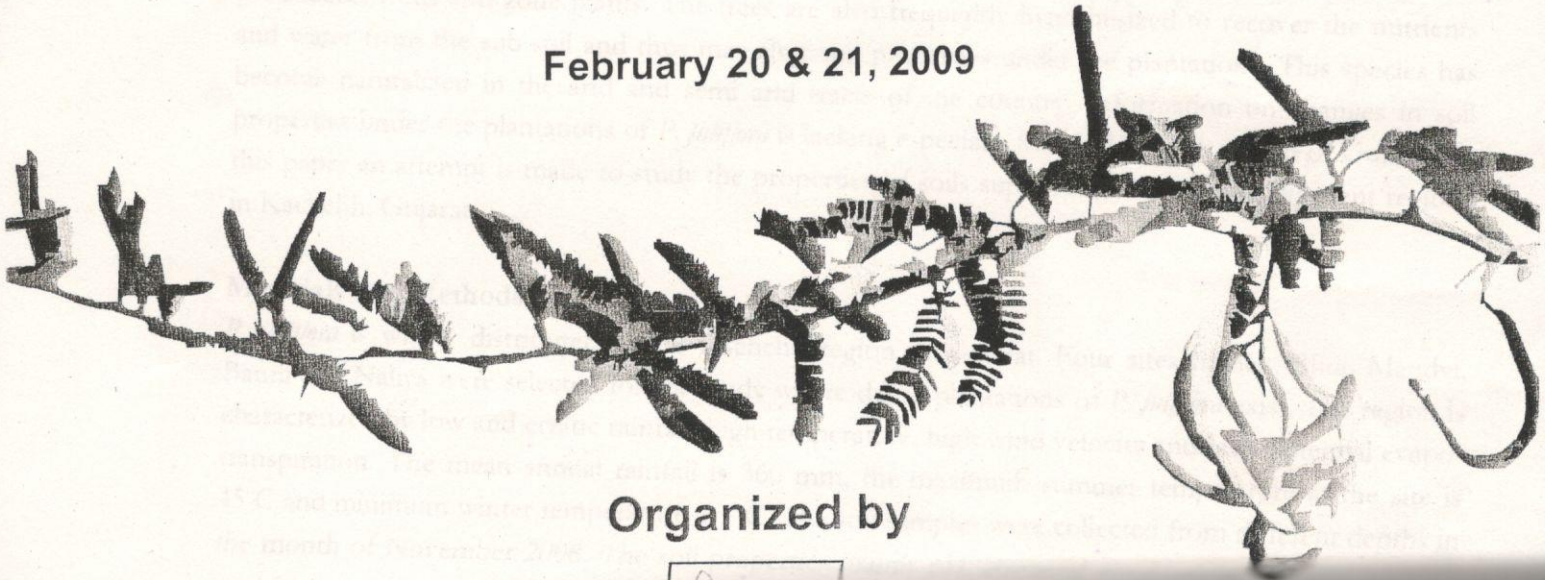




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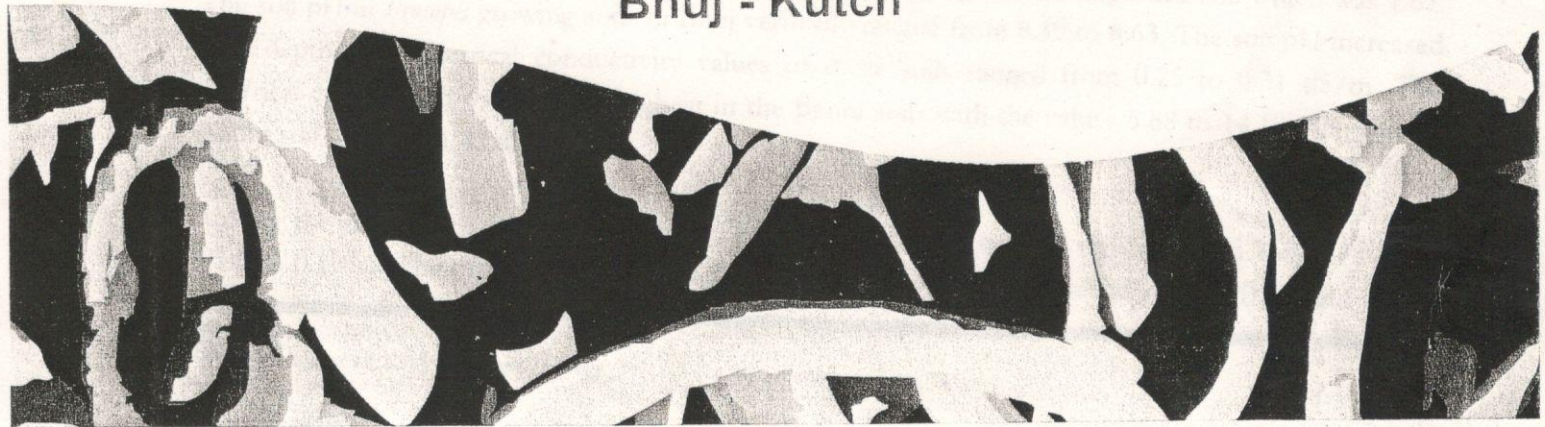
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Biomass Production of *Prosopis juliflora* and Associated Changes in Soil Organic Carbon in Degraded Soils of Kachchh Region of Gujarat

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Introduction

Prosopis juliflora was introduced to the Indian subcontinent at Sind province in Pakistan in 1877 from South America and later on it was introduced to other arid and semi arid regions of India (Muthan and Arora 1983). It is commonly known as mesquite (USA), vern or *nilayati babul* (India) and due to its wider adaptability to different soils and landscapes in arid environments, it became one of the most important species for reclamation of degraded lands in the desert (Saxena and Venkateswarlu, 1991). In Kachchh, it is widely distributed in almost all the talukas especially in cultivable/non cultivable waste land and is used for fuel and soft coke (twigs), and cattle feed (mainly pods). Information on biomass and its partitioning is extremely important for the better prediction and use in the food and energy production in fragile ecosystem of Kachchh. As scientific documentation is meager for biomass production and its associated change in soil organic carbon, especially for Kachchh region of Gujarat, this study was undertaken to generate required information.

Material and methods

The investigation was carried out at the research farm, Central Arid Zone Research Institute, Regional Research Station, Kukma, Bhuj, Gujarat, India (23° 12' to 23° 13' N latitude and 69° 47' to 69° 48' E longitude). The soil of the experimental site was gravelly sand in texture with shallow depth (21 cm), low in organic C (0.24%), available N (121 kg/ha), and P (3.21 kg/ha), and medium in available K (179 kg/ha) with a pH of 8.6. The region is characterized by low and erratic rainfall, high temperature, high wind velocity and high potential evapo-transpiration. The mean annual rainfall is 360 mm, the maximum summer temperature at the site is 45°C and minimum winter temperature is 1°C.

The experimental stands of *P. juliflora* (thorny) and *P. alba* (thorn less) were established in 1995 adopting a spacing of 3x3 m and were raised under rain fed conditions. In 2008, five trees were randomly selected each for thorny and thorn less species and observations on height, girth at 50 cm above ground, number of stems, diameter at breast height (DBH), canopy cover and dry matter production (above ground) were recorded. Soil samples from different depths were collected from *P. juliflora* and *P. alba* sites and analyzed for organic carbon, pH and EC and pooled values from both sites were discussed. Soil samples from degraded land (without plantation) were also analyzed for comparison.

Results and conclusion

The data on growth parameters presented in table I indicated that trees of *P. juliflora* were taller (3.75 m), had more girth at ground level (10.76 cm) and DBH (9.16 cm), more canopy cover (27.20 m²) and

produced greater dry matter (10.61 kg/tree) than those recorded by *P. alba*. The corresponding values for *P. alba* were 2.92 m, 10.16 cm, 4.26 cm, 19.16 m² and 11.3 kg/tree, respectively. The biomass production per ha was computed for *P. juliflora* as 11.79 t/ha and for *P. alba* as 10.55 t/ha. The growth parameters as well as dry matter production recorded by *P. juliflora* and *P. alba* were comparable.

Category	Height (m)	Girth at ground level (cm)	No of stems	DBH (cm)	Canopy cover (m ²)	Dry weight (kg/tree)	Biomass production (t/ha)
<i>P. juliflora</i> (Thorny)							
Mean	3.75	10.76	4.33	9.16	27.200	10.61	11.79
Range	3.1-4.25	8.3-15.5	4-5	8.5-10.5	12.81-50.24	8.84-15.50	9.82-17.22
<i>P. alba</i> (Thorn less)							
Mean	2.92	10.16	3	4.26	19.16	11.30	10.55
Range	2.48-3.40	7.5-12.0	2-4	3.7-5.2	18.24-20.26	9.40-17.28	9.44-19.20
Potential (<i>P. juliflora</i>)	8.4	140	1	112	221.76	31.59	35.10

Growth observations and dry matter production were also recorded from *P. juliflora* available at farm under undisturbed soil. The tree had a height of 8.40 m with girth at ground level of 140 cm and DBH of 112 cm. Its canopy spread was 221.76 m² and dry matter production was 31.59 kg/tree. Thus, the potential dry matter production was worked out as 35.10 t/ha under arid region of Kachchh.

The pH and EC (dS/m) values of soil ranged from 8.49 to 8.63 and 0.27 to 0.31, respectively, in different soil profiles under the plantation of *Prosopis* spp. The corresponding values for these parameters under degraded soil (without plantation) were 8.63 to 9.46 and 0.27 to 0.48, respectively. The organic carbon in the soil was higher (0.45 to 0.25%) under the plantation compared with that recorded under the degraded soil (0.24 to 0.13%). Thus, soil organic carbon improved considerably under the plantation of *Prosopis* spp, compared with that under degraded soils. It suggests that plantation of *Prosopis* spp in Kachchh region will not only provide much needed fuel wood and fodder for animal but will also improve the fertility status of the degraded soils.

References

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