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The 23rd International Grassland Congress (Sustainable use of Grassland Resources for Forage Production, Biodiversity and Environmental Protection) took place in New Delhi, India from November 20 through November 24, 2015.

Proceedings Editors: M. M. Roy, D. R. Malaviya, V. K. Yadav, Tejveer Singh, R. P. Sah, D. Vijay, and A. Radhakrishna

Published by Range Management Society of India

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Role of *Panicum turgidum* dominated rangelands in conservation of *Caralluma edulis* in Thar Desert, India

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Keywords: Rangelands, *Panicum turgidum*, *Caralluma edulis*, nurse plant, arid environment

Introduction

Rangelands are colonized vast natural landscapes in the form of grasslands. These are mostly dominated by native grass species. Once a patch is colonized by a pioneer species, complex interactions may develop among plants of different species. The frequency of positive interactions has been shown to be high in harsh environments, particular in arid environments, where it has been identified as a driving mechanism of vegetation dynamics (Bruno *et al.*, 2003). These processes commonly involve nurse plants (Niering *et al.*, 1963) that facilitate the establishment of other plants species beneath their canopies (Franco and Nobel, 1988). Based on this principle we hypothesized that *Panicum turgidum*, Forssk., may act as a potential nurse plant for a number of other plant species in the Thar Desert. In this region, this plant is one of the main component of vegetation patches surrounded by a bare soil matrix, in association with a restricted number of other species. Our objective was to characterize the positive associations of *P. turgidum* with *Caralluma edulis* in the Thar Desert. The Thar Desert is characterized by high velocity wind, huge shifting and rolling sand dunes; high diurnal variation of temperature; scarce rainfall; intense solar radiation and high rate of evaporation. Thar Desert receives between 100 to 500 mm of rainfall every year, 90% of which is received between July and September. The sandy soils of the desert have a rapid infiltration rate of water, poor fertility, low humus content due to rapid oxidation and high salinity. Though, all conditions are very hostile for the existence of life, some grasses like *Lasiurus indicus*, *Panicum turgidum*, *Dichanthium annulatum*, *Ochthochloa compressa* (syn. *Eleusine compressa*), *Cenchrus ciliaris* and *Cenchrus setigerus* perform well in desert. Among these grasses *Panicum turgidum* is major component of vegetation on sand dunes.

Worldwide, the distribution of *P. turgidum* extends in the Sahara from Mauritania across North Africa with extensions into the Sahel, and through the Arabian Peninsula to Pakistan and India (Poilecot, 1999). It is a perennial Saharan species of family Poaceae, growing as dense tussocks up to 1.5m in height, and creating dense hillocks up to 0.4m high. *P. turgidum* is highly resistant to water stress, and is a major component of the vegetation of the inter-mountain zones of the Thar (Poilecot, 1996). The seeds serve as a grain substitute in the diet of the Tuareg inhabitants and the straw as fodder for livestock and as roofing material. *P. turgidum* is also a component of the diet of wild animals of high conservation value such as *Addax nasomaculatus*, Blainville, *Oryx dammah*, Cretzschmar and *Struthio camelus*, L. (Poilecot, 1999).

P. turgidum has the merit of being resistant to drought and also an effective sand-binding xerophyte. Wind-borne sand usually accumulates around the bushes of *P. turgidum* forming isolated mounds that gradually enlarge and eventually coalesce and form sandy patches.

Materials and Methods

Based on interaction with local peoples of Jaisalmer district and literature survey we assessed the occurrence of *Caralluma edulis* in the *P. turgidum* dominated rangelands. Those *P. turgidum* rangeland sites having *C. edulis* were sampled in 5 to 10 quadrats of 10 m X 10 m placed beside each other. Presence, density, height and cover of *C. edulis* and all associated species were recorded. Height and cover of canopy were used to infer plant health.

Results and Discussion

Most common associates included *Aerva persica*, *Cenchrus biflorus*, *Dipterygium glaucum*, *Lasiurus indicus* and *Ochthochloa compressa*. *C. edulis* was recorded at five new sites in district of Jaisalmer and was co-dominant at each site. Maximum RIV of *P. turgidum* was recorded at Deva-II (56.39) followed by Brahmsar site (49.08) (Table 1). General trend was as dominance (RIV) of *P. turgidum* increases co-dominance status of *C. edulis* also increases. Similar trend was found in case of height and canopy also. More the height and canopy of *P. turgidum*, better was the vigour of *C. edulis* (Table 2). This indicated that it requires nurturing host plant for its survival. Nurse-plant, *P. turgidum* modifies the abiotic

environment in such a way that it becomes more suitable for the establishment, growth and survival of other species. Thus *P. turgidum* dominated rangelands plays vital role in conservation of *C. edulis* in Thar Desert.

Table 1: Dominance of *C. edulis* vis-à-vis *P. turgidum*

| Site Name | <i>P. turgidum</i> (RIV) | <i>C. edulis</i> (RIV) |
|---------------|--------------------------|------------------------|
| Khuyiyala | 25.39 | 13.91 |
| Chandan | 43.46 | 23.58 |
| Brahmsar Dham | 49.08 | 31.63 |
| Deva-II | 56.39 | 22.78 |
| Ranavu* | 22.04 | 2.78 |

**Caralluma edulis* found only in single tussock of *Panicum turgidum*

Table 2: Vigour of *C. edulis* in *P. turgidum* grassland in Jaisalmer

| Site Name | Height (cm) | | Canopy (m ²) | |
|---------------|--------------------|------------------|--------------------------|------------------|
| | <i>P. turgidum</i> | <i>C. edulis</i> | <i>P. turgidum</i> | <i>C. edulis</i> |
| Khuyiyala | 52.26 | 36.31 | 0.38 | 0.17 |
| | 41-66 | 28.33-42 | 0.15-0.97 | 0.08-0.29 |
| Chandan | 86.80 | 25.64 | 0.41 | 0.24 |
| | 79-96 | 22-32.8 | 0.11-0.86 | 0.18-0.29 |
| Brahmsar Dham | 90.00 | 45.00 | 1.68 | 0.40 |
| | 70-140 | 35-60 | 0.82-2.98 | 0.19-1.76 |
| Deva-II | 65.00 | 42.00 | 1.05 | 0.64 |
| | 50-85 | 25-50 | 0.15-2.26 | 0.23-0.94 |
| Ranavu* | 80.00 | 40 | 0.81 | 1.03 |
| | 60-120 | | 0.38-1.65 | |

**Caralluma edulis* found only in single tussock of *Panicum turgidum*

Conclusion

P. turgidum dominated rangelands plays vital role in conservation of *C. edulis* in Thar Desert. Hence it is needed to protect and conserve rangelands to prevent loss of some threatened plants of desert.

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Acknowledgement

The authors are grateful to Director, Central Arid Zone Research Institute, Jodhpur for facilitation. We thank Department of Biotechnology, New Delhi for their financial support through All India Co-ordinated Project on “Preventing Extinction and Improving Conservation Status of Threatened Plants through Application of Biotechnological Tools”. We appreciate the moral support and encouragement by Dr. S. K. Barik, Professor, NEHU and National Coordinator of this project.