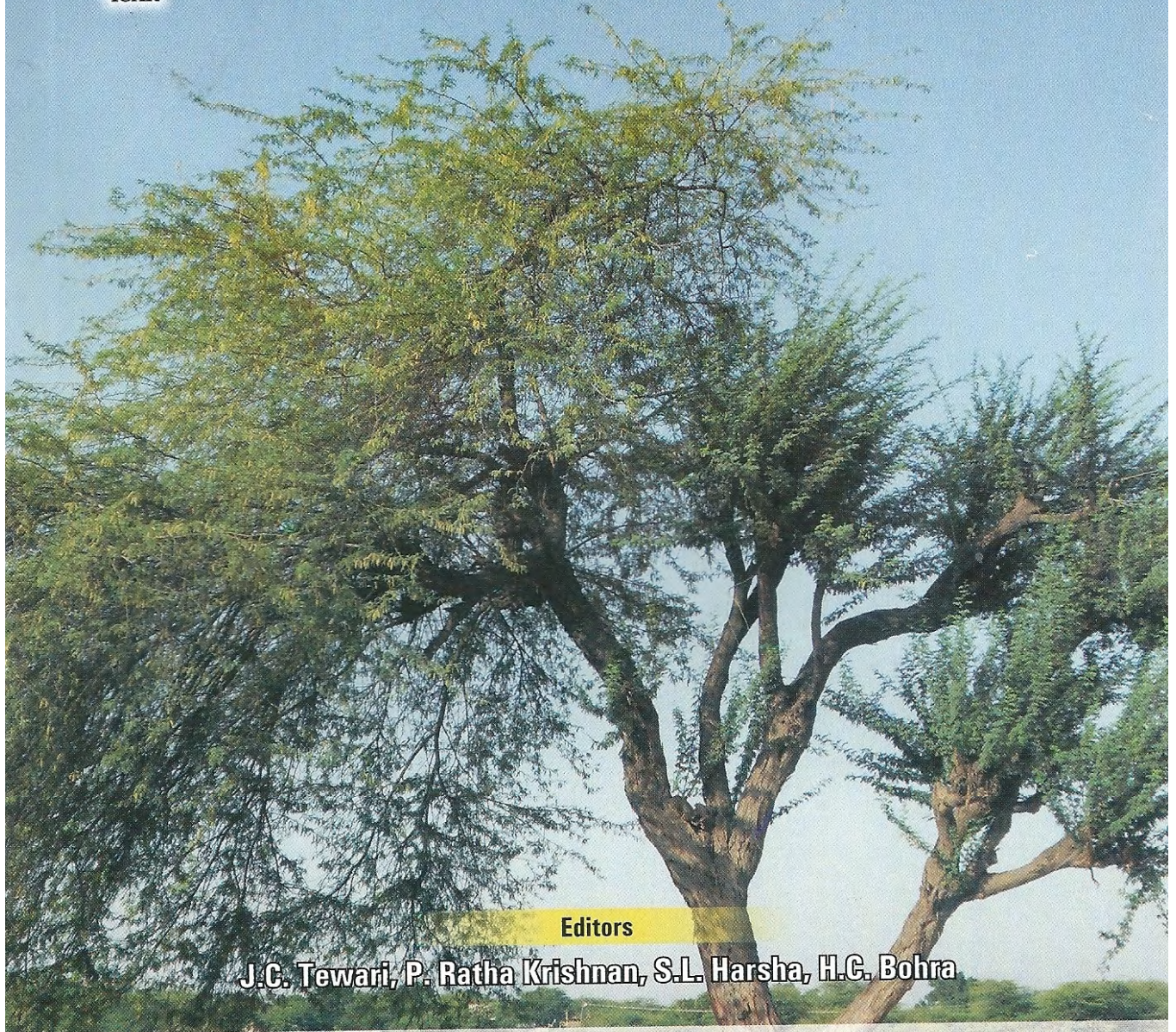




Prosopis juliflora Past, Present and Future



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***Prosopis juliflora*: From Royal Tree to Disaster and Beyond**

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The *Prosopis* Debate

P. juliflora- *P. pallida* complex often referred as *Prosopis*, is an important topic of discussion and policy in many parts of Africa, South Asia, Australia and America. Perhaps in South Asia, India and Pakistan are two countries, where farmers, ecologists, forest managers, NGOs and policy planners are alarmed by the invasion of *P. juliflora* in vast areas of land in last two decades. They have put pressure on governments, who in turn, have instructed related forest departments to stop planting of the species and even initiated eradication programmes (Tewari, 2009). In fact *P. juliflora* (Swartz) DC, a leguminous tree species, was first introduced in India approximately 135 years ago (Tewari *et al.*, 2006). Thus, history of the introduction of the species in the country is only 140 years old.

Owing to its fast growth and drought hardiness with extraordinary ecological amplitude, the species has been spread throughout the length and breadth of the country, from Haryana in north and down south upto Tamil Nadu, and from Kutch, Gujarat in west to drier parts of Orissa in east (Tewari *et al.*, 2000). The major concerns against the species are its thorny nature and its weedy spread. However, many researchers, farmers, artisans, and even thinking planners and politicians argue that the species is valuable resource. The debate is still continuing to see the species as a valuable resource or as a disaster. No one knows when this intensified debate will arrive to logical end.

The Royal Tree

P. juliflora, native to Central America and to the northern part of South America was introduced in Kutch area of Gujarat state during 1885-86 by then Maharao or ruler of the region. In arid western Rajasthan large scale aerial seeding of the species was done by then ruler of princely state of Jodhpur in early 1930s', and in 1940, the species was declared as "Royal tree" and officials were told to plant and protect it (Harsh *et al.*, 1996). Because of its exceptional drought tolerance ability and also tolerance of saline soil and water conditions, the species has been spread in larger parts of arid and semi-arid tropics of the country, which constitute 40% of the total geographical area of the country.

With its tremendous ability to adapt in tropical arid and semi-arid environments, and its fast growth and multiple utility, it has long been recognized by the foresters as a versatile species for the afforestation on various land forms of arid and semi-arid tropics

like, sand dunes, inter-dunal plains, saline-sodic soils, rocky and semi rocky areas, around agricultural farm boundaries, etc. However, rural population in arid and semi-arid tropics are little apprehensive of the species as they consider that species adversely affects crop production and fear it may become a weed. In fact, thorny stems and branches of the species, which often causes injuries to humans and animals, and hinder agricultural operations are primary reasons related to disliking of the species by the villagers. But one thing is beyond doubt that *P. juliflora* has become a prominent woody species in agroecosystems of arid and semi-arid tropics of India despite the disadvantages associated with it.

The Weedy Invader with Exceptional Value

P. juliflora often colonizes disturbed, eroded, over-grazed or drought/salt affected lands, forming dense thickets. In addition to providing a hard and heavy wood (specific gravity = 0.70) that makes excellent fire wood and superior charcoal (NAS, 1980). *P. juliflora* and other similar species of section – Algarobia of Burkart's (1976) classification schemes of genus *Prosopis* also provide quality timber from managed stands (Table 1). The pods are used as a livestock ration and also as human food, and seeds are processed to extract endosperm gum similar in properties like guar gum (NAS, 1980; Tewari *et al.*, 2000).

Table-1. Some physical and mechanical attributes of *P. juliflora*, *Delbergia latifolia* (Shisham) and *Tectona grandis* (Teak) timber

Attribute		<i>P. juliflora</i>	<i>D. latifolia</i>	<i>T. grandis</i>
Density (kg/m ³)		721	850	641
Bending Strength (MOE* X 10 ³)		97	125	102
Shrinkage (%)	Volumetric	4.7	8.5	7.0
	Tangential	2.2	5.8	5.8
	Radial	2.6	2.7	2.5

*MOE= Modules of elasticity

Great strides have been made in recent times in USA, Mexico, and Central and South American countries, where *P. juliflora* grows naturally to improve it using genetics and breeding to achieve gains in important traits, such as, rate of diameter and height growth, length of clear bole and pod production (Tewari and Harsh, 2009)

Certain scientists with vision predict that two plant genera will have major impact on man's survival: *Prosopis* and *Acacia* (Habit, 1985; Tewari *et al.*, 2001). In Indian context, *P. juliflora* is there in larger parts of arid and semi-arid tropics, providing

sustainable fuel wood to the tune of 70% to rural population, which in turn saving superior biomass in one way or other but, environmentalists, researchers, foresters, planners and even thinking politicians voice their opinion regarding the species without any scientific basis, which often send confused message to end users-the rural folk. In fact, all the parts of plants are useful in one way or other, use of abundantly available pods as animal feed after processing suitably can be able to change the scenario of fodder deficit in many parts of rural landscape in arid and semi-arid tropics of India.

Central Arid Zone Research Institute (CAZRI), Jodhpur, India is involved in *P. juliflora* R&D programme in big way since last more than two decades. Impressed by the CAZRI's research findings related to *P. juliflora*, Texas A&M University, Texas, USA and Henry Doubleday Research Association (HDRA, UK) completed three major collaborative research programmes on *P. juliflora* so successfully that they opened the gate to address the issue of economic succession in context of very close binding of *P. juliflora* with rural communities, which was observed as *P. juliflora*-human-livestock continuum, wherever species exist. It was found that whatever positive and negative views are advocated regarding the species, but the species is playing important role in socio-economic-cultural fabrics of rural life in arid and semi-arid tropics of India.

The Reasons Seeing the Species as a Disaster

P. juliflora is most extensively distributed woody species in arid and semi-arid tropics in India, but its spread is being proclaimed as disaster in some quarters (Tewari *et al.*, 2001). It would be appropriate to cite the advancement of *P. juliflora* in Kucch region of Gujarat. The state forest department of Gujarat initially planted *P. juliflora* on about 31,550 ha of Banni grasslands of Kucch to check the advancement of Rann. The prevailing conditions in Banni, including successive droughts, increasing salinity and excessive grazing pressure, provided highly suitable environment for the growth and spread of the species. Once the species found optimum soil and climatic condition for the growth and development, it rapidly increased in other parts of grasslands in very little time (Tewari *et al.*, 2000). The ecological succession changed the structure of vegetation complex and entire area dominated by *P. juliflora* in terms of distribution, abundance, basal cover, canopy cover, etc. It has been reported that area under *P. juliflora* increased from 378 to 684 km² (81% increase) in 12 years (i.e., 1980-1992).

The encroachment of species in productive grassland was the result of failure of management system. Before planting the species, no body looked into aggressive colonizing ability of the species and after introduction, the forest department never made any working plan for silviculture and management of this species. The species was left as

an orphan and this state of affair was most conducive for the species in successional gradient. The example of Banni indicates that before introducing the species on productive grassland, a precise working plan for management of the species must be there, which did not exist at all. Otherwise, the management of the species is very much possible, if proper care and set of management systems are employed from very beginning (HDRA, 2002).

In fact, the weedy growth of *P. juliflora* seen throughout the arid and semi-arid tropics of the country is resultant of two reasons, first absence of any silvicultural and management system, and second, unfortunately the seedlots came to India time to time, majority of them were Mexican forms, which have primarily short statured, multi-stemmed architecture. The un-managed expansion of *P. juliflora* stands also resulted due to cutting of young growth for fire-wood from second year onwards. The cumulative effect of all these led to development of weedy thickets in larger parts of domain of the species in the country, for which now species is blamed as disaster (Tewari *et al.*, 2006). Without going into positive aspects related to species, proponents of this school of thought emphasize the weedy nature, aggressive colonizing ability, presence of thorns, unconfirmed belief that the species utilizes too much water and responsible for lowering of ground water table as their tools against the species. Their voice opinion for eradication of the species and under their pressure state forest department of Rajasthan has initiated eradication programme of the species in some areas during last 7-8 years.

Is Eradication the Appropriate Solution?

In USA and Mexico for over 50 years ago efforts have been made to eradicate the species with range of herbicides and mechanical measures, but not much success is achieved. Smaller programmes of eradication in Argentina, Sudan, Australia and Pakistan met with same fate, because during initial years they were little bit effective for short time but *Prosopis* generally returns. During the course of such eradication programmes, millions of dollars have been spent but still no cost effective solution has been found.

In fact, once established *P. juliflora* becomes difficult to remove completely. Even in a seemingly *P. juliflora* eradicated area, their scattered seeds in soil germinate and tree spreads much faster than their original growth. Only recently authors encountered a small patch in Sanchores area of Rajasthan, where *Acacia* sp. was planted after removal of *P. juliflora*. However, new growth of *P. juliflora* has again started colonizing the area (Fig. 1). Thus, eradication does not provide optimum solution.

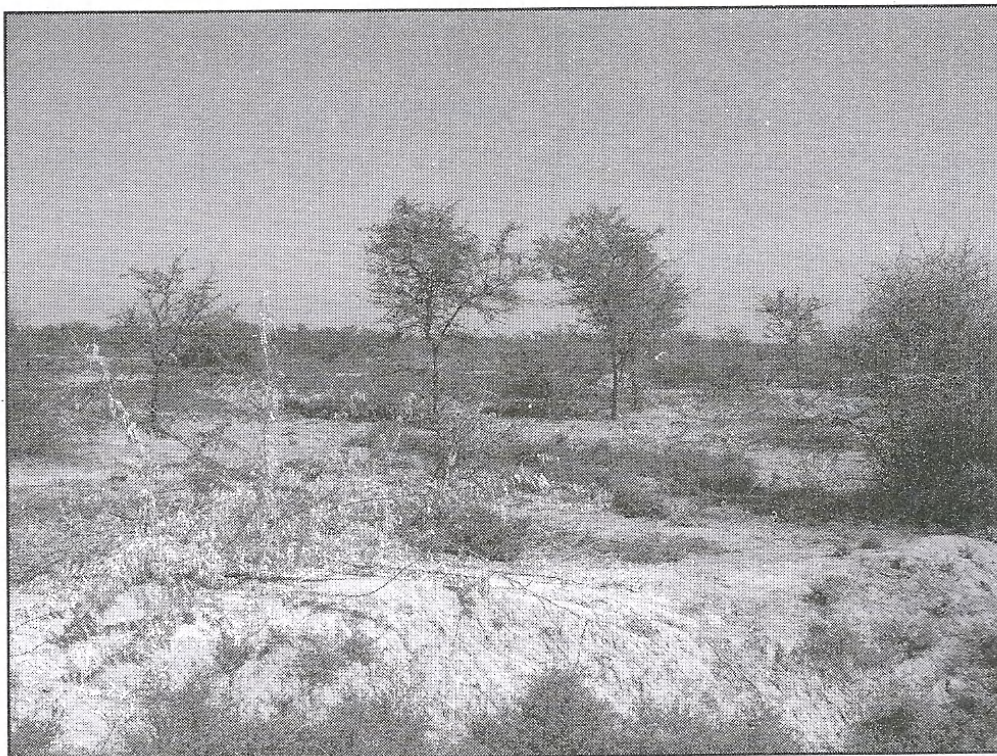


Fig. 1. New growth of *P. juliflora* in an area from which the species was removed and *Acacia* sp. was planted few years ago.

New Knowledge Applied

An international team led by HDRA, U.K. and CAZRI, Jodhpur, and funded by DFID, began a project in 1998 to gather the global knowledge on *P. juliflora* –*P. pallida* complex. An important conclusion of the project was that eradication is not a solution and there are many management and control technologies that can convert weedy stand into productive, profitable and sustainable agroforestry model (Pasiiecznik *et al.*, 2001).

Management by Exploitation in Appropriate Strategy

With the production of fuel wood, pods and straight boles for timber, exploitation of *P. juliflora* can be profitable use of otherwise un-productive lands. Markets are developing around the world but work is still required to promote the species as a valuable tree of the desert. Integrated development is needed from basic stand management to product processing and marketing. Beside the cost benefit analysis, state and national governments should strike a balance between containment of *P. juliflora* through current eradication programme and development of profitable agroforestry landuse system through improved management.

Value Chain for Value Added Products Derived from *Prosopis juliflora*-Production to Consumption System: A New Initiative

Under National Agricultural Innovation Project (NAIP), CAZRI has successfully developed a value chain for value added products involving farmers, NGO and Industry. Technologies for processing concentrate ration, multinutrient feed blocks and supplemental feed blocks using *P. juliflora* pods have been perfected and transferred to Industry. Industry is producing and marketing these commodities. *P. juliflora* coffee preparation technology has also been standardized and passed to partner industry. However, toxicity analysis for human consumption of *P. juliflora* pod flour is in progress at NIN, Hyderabad. Once a clean chit is obtained in this context, *P. juliflora* coffee will also be launched in the market. This value chain is providing win-win situation to all the stakeholders. Sustainability of this value chain will definitely change the prevailing perception of *P. juliflora* as a noxious weed of no use to multipurpose woody species of economic value for rural population of arid and semi-arid tropics of India.

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