



DELHI RIDGE

Invaded

We know it as the ubiquitous babul. Used extensively by the rural and urban poor for firewood, few can distinguish the non endemic vilayati variety from the native type. As branches are hacked away from the fast growing *Prosopis juliflora* little thought is given to why and how this plant has come to dominate extensive parts of arid and semi arid India. Policy makers' well intended concern about deforestation caused by fuelwood shortages, prompted introduction of

Prosopis juliflora into the arid and semi arid tracts of India in the early 1980s. Today its dangers are clear and *Prosopis juliflora* features prominently in the International Union for Conservation of Nature and Natural Resources (IUCN) new list of 100 world's worst invasive alien species.

BACKGROUND

The vilayati babul is an evergreen tree native to South and Central American region. It is fast growing tree and tolerant to arid conditions and saline soils. Under

the right conditions, *Prosopis juliflora* can produce a variety of valuable goods and services: construction materials, charcoal, soil conservation and rehabilitation of degraded and saline soils. Rapid deforestation, desertification and fuelwood shortages prompted a wave of projects in arid India that introduced the fast growing hardy species in Rajasthan. *Prosopis juliflora* (as documented by J.C.Tewari, P.J.C. Harris, L.N. Harsh, K. Cadoret and N.M. Pasiecznik in the DFID funded 'Managing *Prosopis juliflora* (Vilayati

babul): A Technical Manual’) survived where other tree species failed and was initially well accepted by farmers and villagers. At that time, it was welcomed as a field boundary marker and helped avert fuel wood shortage as even its freshly cut branches burn well. As the negative effects of the invasion, colonisation of agricultural land, its sharp thorns, suppression of grasses and crops, became more pronounced the farmers found it less useful. But by this time, apart from farm lands *Prosopis juliflora* invaded, and continues to invade, millions of hectares of arid land in semi arid regions of Gujarat, Punjab, Rajasthan, Madhya Pradesh, spreading rapidly to south and coastal India (as documented by Reetu Sharma and K. M. M. Oakshini in a paper ‘A Comparative Assessment of the Ecological Effects

temperatures reaching to even 40 degrees centigrade. The onset of monsoon is around July after which the temperatures gradually decline till September, after which the fall is rapid and winter sets in by end October. *Prosopis juliflora* invasions followed periods of high rainfall when conditions for germination and establishment are particularly favourable. The tree flowers twice a year - once during March-April and then again during September-October, coinciding with the change of season.

SURVEY METHOD

The Delhi Ridge was mapped from the Delhi University area to Qutab Minar. Ten locations were selected for specific purposes. The first criteria was to select soil samples and the second was to conduct open ended interviews of local

users. While selecting soil samples, care was taken to measure the girth of each tree so that the soil below (at 1 metre distance from the trunk of the tree) underwent similar cycles of growth to enable standardisation of samples. Six

Dr S S Singh (Principal Scientist, Indian Agricultural Research Institute, New Delhi) at the sampling site



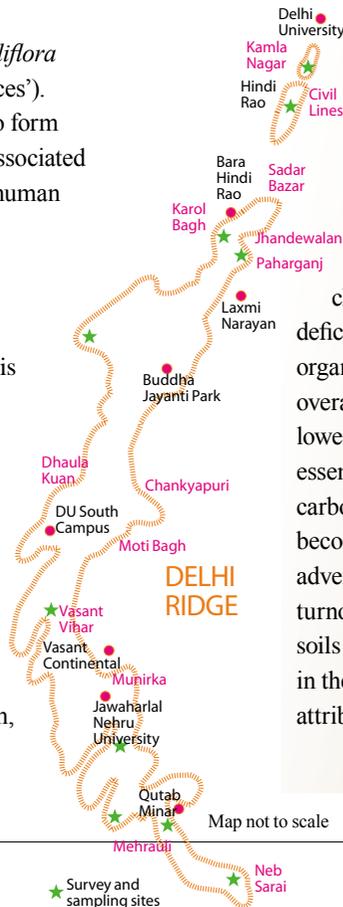
INFESTATION OF THE WEED-LIKE PROSOPIS JULIFLORA, IN THE RIDGE AREA OF DELHI IS NOT ONLY MAKING THE AREA NUTRIENT DEFICIENT, BUT ALSO ENHANCING STRESS ON SOIL MOISTURE AND FAUNAL DISTRIBUTION BESIDES ACTING AS A TRIGGER FOR ASTHMATICS.

■ Sulagna Chattopadhyay, Dr A L Ramanathan, Dr S S Singh

of *Prosopis cineraria* and *P. juliflora* on the Soil of Revegetated Spaces’). Invading vilayati babul tends to form dense, impenetrable thickets, associated with unfavourable impacts on human economic activities.

LOCATION OF SURVEY

The study area is located in southern outliers of the Aravallis (Delhi System). There are occurrences of large bodies of granite and amphibolite embedded in the light sandy soils that are generally deficient in nitrogen, phosphorous and potassium. The endemic species of the Delhi Ridge are jamun, neem, amaltas, babul, ber and shisham, among others. The summers in this region is dry and hot with



SOIL TESTING

Soil sample study revealed that with a continued higher nutrient demand, *Prosopis juliflora*, disturbs the physico-



chemical profile of the substratum, ultimately making it nutrient deficient. The components studied are moisture content in the soil, organic carbon, sodium, potassium, calcium, zinc and nickel. The overall data for the entire region revealed a depressed nutrient status, lower than what is normal for Delhi Ridge. Organic carbon is an essential nutrient for plant growth. As the proportion of organic carbon is on the lower side the growth of plants and their survival becomes difficult under the canopy of the non native babul. The adverse effects of sustained higher uptake of nutrients and faster turnover of the leaves are reflected in the altered nutrient status of soils under *Prosopis juliflora*. The significant alterations, especially in the soil major and minor nutrient concentrations could be attributed to the presence of this babul in many habitats.’

Dr A L Ramanathan

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soil samples underwent soil testing in the Environmental Science Laboratory, Jawaharlal Nehru University, under the able guidance of Dr Ramanathan, to establish whether the *Prosopis juliflora* had any detrimental effect on the soil of the Ridge. Unstructured interviews in usage for fuelwood and pasture were conducted for fifty persons, mostly living below the poverty line. The selection of the respondents was on the basis of years of stay in Delhi and proximity of less than two kilometres to the ridge. Women respondents in this survey were twenty eight. The interviews were conducted over a space of two weeks in Hindi. It is worth mentioning that many respondents were skeptical about answering the surveyors as most were unsure as to whether they were ‘government people’

reported fuel usage as it burns easily even when freshly cut. It produces high quality charcoal and its heartwood is strong and durable. Its branches are used as fencing posts. Eight respondents even claimed to have planted it around their hutments as it grows quickly and provides shade. Four respondents added that living close to the ridge, they found that over the years the intensity of dust storms much reduced.

Pastoralists, find the invasion of *Prosopis juliflora* irksome to their valuable pastures, but poorer goat and cow herders along the Delhi Ridge find it useful as fodder. Although the thick canopy of the tree discourages grass and other undergrowth making foraging difficult for livestock, the poor respondents use the pods of vilayati babul, which are high in protein and

sugars, for fodder. Most are however aware that a sole diet of these pods may be debilitating for the livestock. Being poor they have no alternative, but know that richer counterparts use the pods to augment only 20 to 40 percent of the livestock’s diet. The pods impact rumen and can cause constipation among livestock.

But apart from its positives, the negatives of *Prosopis juliflora* are indeed far reaching. Quizzed about the leaves, all the respondents reported that the leaves are unpalatable to livestock. In fact, analysed over the recall period, respondents noted that the Delhi Ridge which had the native slow growing babul as one of its characteristic trees is now devoid of this species. They also recall that the debilitating effects of the desi



Gender segregation in fuel collection regime: The female respondents harvested significantly more fuelwood than men and the women acknowledged that vilayati babul greatly reduced their fuelwood burden. Now the distances to fuelwood sources are much shorter, and trips can be made with less effort. The women were well aware that gas is a better alternative but preferred fuelwood as it came without any cost.

trying to catch them for using the Ridge, which is off bounds for exploitation. In most cases the usage data interpreted in economic terms was incorrect and lower than estimates but surveyors chose to ignore it as the thrust of our study is to highlight the environmental concerns of the Delhi Ridge. A recall period of twenty years was placed and political landmarks used to create associations.

FINDINGS

The Delhi Ridge is green. Yet it is a poisonous green. The most common use of this invasive plant is fuelwood. While most of the urban poor who cannot afford gas cylinders value it as a fuel tree, they are aware that their more affluent counterparts in rural India view vilayati babul negatively. All the respondents



babul (*prosopis cineraria*) opposed to the new variety were negligible. They note that it is now replaced by the vilayati babul that was of rather rare occurrence in these parts earlier. They also observed that the new babul suppresses the germination and growth of crops, weeds and other trees and the continuous all year round litter from the trees makes the water in wells bitter. Because of its deep rooting system the plant was also alleged to lower the water table, leading to a drying up of swamps and ponds in a generally water scarce environment.

EFFECTS ON HEALTH

When asked about their health needs over the recall period what was noteworthy that the women, unlike their male

counterparts reported a rise in allergic inflammations and respiratory ailments. They attributed the rise to the rising levels of pollution in the city. However it is well documented fact that prolific pollen from *Prosopis juliflora* is known to cause bronchial and lung inflammations and is a proved trigger for asthmatics who suffer during the flowering period of the plant. Other adverse effects reported are the extensive thickets that not only choke other plants but also hinder movement causing deep scratches with its poisonous needles that allegedly take weeks to heal. The female respondents also reported that they found the dense stands of invading babul a favoured mosquito habitat. Also the women were more sensitive towards faunal distribution. Of the twenty eight female respondents, over fifteen found no monkeys in the areas of invasive *Prosopis juliflora*, along with smaller species of rodents, squirrels and even foxes. Respondents claimed that with no fruiting

trees around the faunal distribution is skewed along the Delhi Ridge. In view of the above facts, structured evaluation of the ecological impact of direct or indirect replacement of the native tree species by the alien should be very crucial for any future plant introduction or revegetation programmes

RECOMMENDATIONS

How does one distinguish an invasive species? Theorists add that apart from studying how damaging the species is to property and natural ecosystems, allied understanding of whether or not the species is physically appealing, opinions of influential individuals, media's portrayal and the costs of managing the species is also pertinent in eliminating the unwanted species.

health of the women who cook food in ill ventilated kitchens, besides of course freeing them of the chore of fuelwood collection.

To prevent undesired *Prosopis juliflora* propagation in the Ridge area animals may be fed ground pods, either alone or combined with other fodder, so that the seeds are totally destroyed and plants do not proliferate through seeds embedded in animal droppings.

Although a cost effective programme for eradication is yet to be found in other affected areas of the world and India, South Africa and Australia are experimenting with biological control methods, using seed eating beetles. In a fund scarce country like ours, biological or chemical interventions may not be technically successful. Thus the

THE NEGATIVE IMPACTS OF VILAYATI BABUL

- Displaces native vegetation
- Degrades wildlife habitat
- Depletes soil nutrients
- Increases allergens
- Alters natural water flows
- Difficult to control, once established
- Heavy seed production
- Rapid growth
- Aggressive seed dispersal
- Reproduction without pollination
- Tolerance to a wide range of soils
- Leaves toxic or unpalatable to wildlife



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Although individual owners of property will be more likely to engage in vilayati babul mitigation when they are made adequately aware, however, accounts of invasive species management elsewhere in the world suggest that private interventions may not be sufficient to check the spread of invasive species. The spread of the invasive babul across the protected forest area of Delhi's Ridge and beyond, falls under the jurisdiction of the Delhi Government. A concerted involvement based on collective responsibility on the lines of 'Food for Work' programme by these departments can bring about a control of this non native species. The government can create incentives, for example providing cheaper gas for the people below poverty line, to reduce their dependence on *Prosopis juliflora*. This will not only ensure a reduction in air pollutants contributed by the burning of the fuelwood but also enhance the

best option might be to adopt land use management and reduce stocking rates which can encourage good grass cover and prevent seedling establishment. Existing dense stands may be pruned, cut stumps treated and fuelwood, charcoal and timber harvested from existing stands.

A new erect variety of *Prosopis* clones with small thorns and high production of highly palatable pods, even for humans, have been identified in Peruvian field trials. Scientists may conduct further studies to establish the efficacy of this species in the Ridge area.

In 1997 Sudan has passed a law to eradicate *Prosopis juliflora*. India should also take stringent action to wage a war against this invasive species. Respondents of the survey favoured complete eradication of *Prosopis juliflora*, if replacement was made with other trees that would be less invasive and thornless. ■