Parkia roxburghii: an underutilized but multipurpose tree species for reclamation of jhum land

North East (NE) India, commonly known as the 'land of seven sisters', is a territory of diverse ethnic groups, tribes and culture. Shifting cultivation, locally known as 'jhum' or 'jhumming', is a way of life for many of these tribes since time immemorial[1]. The percentage utilization of cultivable area in this region (62.04) is less than the national average (73.05). It has been reported that about 80% of the farmers in the region are small (<1.44 ha) and marginal (<0.40 ha) landholders. In most of the hilly states of NE India, the forest lands are becoming barren due to the practice of jhum cultivation. About 19% of the total area under shifting cultivation in the hills accounts for 0.76 m ha (current jhum – 0.39 m ha and abandoned jhum – 0.36 m ha)[2] that supports 4.43 lakh families for their livelihood[3]. The jhum system as practised earlier with a fallow period of 10–15 years appeared to be sustainable. However, it has significantly reduced to 1–3 years in the present situation, which has made the land vulnerable to ecological degradation and resulted into limited production[4]. Considering the present practice of cultivation in this region, it is the need of the hour to improve the jhum lands by adopting suitable soil and water conservation measures, viz. bench terracing, contour bunding, contour trenching, half-moon terrace, catch pits, hedge rows, agroforestry, etc. Introduction of fast-growing trees with multiple uses is one of the viable options for conserving valuable natural resources as well as to uplift the socio-economic status of the jhumias.

Figure 1. Tree bean, *Parkia roxburgii* in bloom.

Tree bean, *Parkia roxburghii* (Mimosaceae), a lesser known nutritious, leguminous tree grows luxuriantly in NE India and South East Asia. It is distributed in India, Bangladesh, Burma (Myanmar), Thailand and the Malaysian region. It is a large tree (up to 25 m height) with spreading branches[5], generally found in lowland rainforests and often along streams. Several vernacular names are available for this species, viz. Supota, Kharial (Hindi); Manipur-urohi, Khorial (Assamese); Manipuri seem (Bengali); Zongto (Mizo); Yongchak (Manipuri); Aoelgap (Garo); Bire-phang (Kachari); Themuk-arang (Mikir); Unkamn-pinching (Naga); Shivalingada mara (Kannada) and Unkampinching (Marathi)[6]. The inflorescence head or capitulum arises terminally with clusters of yellowish-white tiny flowers, hanging at the top of long stalks from the branches (Figure 1). The fruits in early stages are soft, tender and bright green in colour. They turn blackish when fully mature in March–April. Pods are formed in clusters of 10–15, each measuring 25–40 cm in length and 2–4 cm in breadth. At the age of 6 years the plant starts its production; however, full bearing stage is only after 10 years. The lifespan of this tree may be 80–90 years or more. During favourable season a full-grown plant bears 10,000–15,000 pods. Thus a single plant can yield approximately Rs 30,000 to 40,000 per annum.

In NE India, it is considered as the most costly vegetable fetching a market value of Rs 70–120/kg. Ethnobotanically, this tree species is highly important[5]. Flowers, tender pods and seeds of this plant are edible and are a good source of proteins, fats, carbohydrates, vitamins and minerals compared to other legumes[7,8]. Tree bean is a multipurpose tree species having a variety of uses, viz. medicine[5,6,9–11], insecticide[12–17], piscicide[18], antibacterial[19], alleopathy[20], human food[21], tanning, face wash and shampoo, firewood and paper pulp[5]. Despite a variety of uses, unfortunately the tree bean plants are under threat and there is vast decline in their population in some parts of NE India, especially in the valley of Manipur. This could be due to changing climate, *Verticillium* wilt disease, mobile radiation, etc., but the real cause is still unknown[22].

The tree bean being a fast-growing leguminous species with multiple uses will be suitable for reclamation of abandoned jhum land. It can be easily propagated through seeds. One- or two-year old seedlings can be transplanted in the field. Being a legume it would also help enrich the soil through nitrogen fixation. Hence, the planting of these trees should be promoted in all the NE states of India for conservation of natural resources and improving the livelihood of hill farmers in the region.

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Pseudovivipary in *Isachne globosa*, family Poaceae

The precocious and continuous growth of offspring on the maternal parent is defined as the 'vivipary'[1], which has been reported from at least 40 genera and 23 families[2]. Pseudovivipary is observed in apomictically or asexually reproducing plants, which may be natural or induced, and confined to terrestrial habitat due to teratology, mechanical injuries, pathogenecity or abrupt environmental changes[3,4].

Beetle[1] has described vivipary and proliferation along with phyllody in grasses and its possible causes. The phenomenon is known from over 100 species of grasses worldwide[1,4]. Most of these references were from the cold–wet, temperate–pastural or alpine region[1,5–8] and very few from the tropical world[9,10]. In Poaceous species it has been considered as an ecological phenomenon, which depends on environmental influences to complete the cycle of offspring production, germination and establishment during the brief periods favourable to growth and reproduction in markedly seasonal environments[2,9].

During field visits of September 2011, we were able to notice pseudovivipary in *Isachne globosa* (Thunb.) Kuntze from the rocky river bed of River Purna, Dangs, Gujarat. This species occurs in areas where the soils are usually shallow, with rocky outcroppings (Figure 1 *a*). River beds are usually dry all year round, but flash flood occur following heavy rain. Pseudoviviparous and normal inflorescences were collected and dissected under stereo-microscope. *I. globosa* has an annual or perennial lifecycle and ascending to decumbent culms which vary according to available nutritional and environmental conditions. Inflorescence is generally panicle and spikelets are arranged solitary. During the observations, presence of leafy structures with prominent ligule at the junction of leaf sheath and blade was noticed on some inflorescences – characters of pseudovivipary (Figure 1 *b*). Although, all parts of the spikelet (i.e. glumes, lemmas and paleas) depicted the pseudoviviparous characters, it is found to be pronounced in case of lemmas (Figure 1 *c*).

Earlier reports[3,8,11] suggest that pseudovivipary can be induced even due to drought conditions followed by availability of optimal water, but detailed studies in the field and laboratory are needed. In addition, pseudovivipary is known from several tribes of the subfamily Panicoideae[4,9–12], but not from Isachneae.

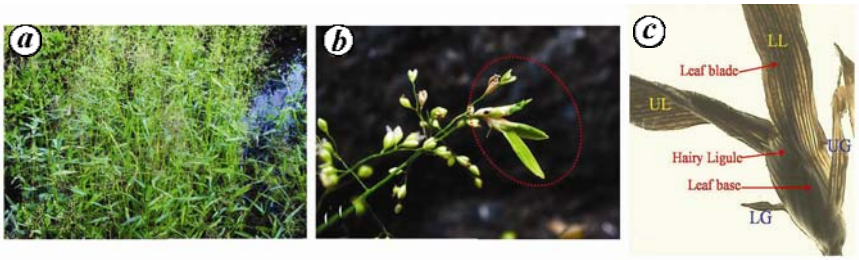

Figure 1. ***a***, Pseudoviviparous population of *Isachne globosa*. ***b***, Part of panicle showing normal and pseudoviviparous spikelets (red circle). ***c***, Close-up of pseudoviviparous spikelet. LG, Lower glume; UG, Upper glume; LL, Lower lemma; UL, Upper lemma.

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