

**Table 1.** Ethnobotanical uses of *Ensete superbum* in various sites

Locality	District	Vernacular name	Ethnic community	Part used	Medicinal/other uses
Attappady Kulathupuzha	Palakkad Kollam	Malavazha/Kalluvazha Kalluvazha	Kurumba/Irulas Kanni	Seed Seed	Diabetes and kidney stone Kidney stone, painful urination and leucorrhoea
Vithura Thazechuram	Thiruvananthapuram Kannur	Kalluvazha Kalluvazha	Kanni Paniyars	Seed Seed	Leucorrhoea Leucorrhoea and urinary calci
Kottiyur Tirunelli	Kannur Wayanad	Kalluvazha Kalluvazha	Kurichiyars	Leaves Seed	Religious rituals Leucorrhoea and kidney stone

seeds (harvest of fruits), which is the only means of natural propagation, endangers the native plant population. Our apprehensions were substantiated by the common concern of decline in wild population of the plant species at all locations surveyed.

Collected seeds, leaves, inflorescence and seedlings of *E. superbum* frequently appear for sale in the market and ornamental nurseries. Commercially marketed seeds, seedlings and leaves are exclusively collected from the wild. While leaves and pseudostems are collected throughout the year, trade in inflorescence and seeds takes place from December to April. Live seedling trade, which picks up in July–August, hastens the population cascade in the wild. Although lack of updated inventories impedes precise quantification of the volume of commerce, we estimate that around 20,000 seedlings are sold every year in Kerala. Very low natural germination of seeds complements the population cascade.

Preferred habitat is rocky outcrops and habitat loss is not the primary reason for threat to the plant. Harvesting of unripened fruits is the major threat to the existing wild population.

Seeds of *E. superbum* command a market price of Rs 200–450/kg and leaves Rs 2/unit. The species is still undomesticated. However, with stan-

dardization of agro-techniques, it is a potential candidate to realize sustainable economic returns from degraded barren lands and rocky outcrops<sup>5</sup>. Scientific ignorance on the ecological niche of *E. superbum* is the biggest impediment to its conservation. Unregulated harvest coupled with unique habitat preference can accelerate the slide of this species to extinction. The world conservation monitoring centres have estimated that as many as 25,000 species or about 10% of the world's flora are currently under some degree of threat<sup>6</sup>. Indiscriminate harvesting, and destruction of immature fruits by elephants and monkey have drastically reduced the populations of *E. superbum*, which is already reported as rare and endangered throughout India<sup>7–10</sup>. As a first step towards drawing interest and creating awareness, we recommend inclusion of *E. superbum* (Roxb.) Cheesman as an endangered species in the *Red Data Book of Indian Plants*.

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## ***Bt* brinjal, wild relatives and biodiversity**

In the commentary on *Bt* brinjal and GM crops, Banerji<sup>1</sup> has put forward valid recommendations, some of which relate to pressures on the physical environment. There is another issue that has potentially far-reaching consequences on the living environment. This relates to the release of transgenic crops such as *Bt* brinjal into their centre of origin.

This general concern was highlighted by the Cartagena Protocol on Biosafety to the Convention on Biological Diversity, to which India is a signatory<sup>2</sup>. In 2006, the Independent Expert Committee on *Bt* Brinjal<sup>2</sup> expressed concerns over the possibility of cross-transfer of genes from the GM crop to its wild relatives via hybridization. While conferring

additional pest resistance upon wild relatives, these genes might also induce a selective advantage, encouraging such plants to become overbearing weeds with negative effects on ecological balance and biodiversity. A 'precautionary approach' towards developing this crop variant was therefore recommended.

Several studies on the interfertility of brinjal with some of its wild relatives have been carried out. However, these have been rather limited in number. *Solanum incanum* L., one of the bitter tomatoes<sup>3</sup>, is the purported wild ancestor of the brinjal eggplant<sup>4,5</sup> and occurs naturally in some parts of India<sup>6</sup>. *S. incanum* is partially interfertile with cultivated *S. melongena*<sup>7</sup> and is also 'easily crossable' with *Bt* brinjal hybrids carrying the *CryIAC* gene<sup>8</sup>. Furthermore, in parts of India there are other wild, as well as semi-wild and weedy solanums, which are close relatives of *S. incanum* and brinjal, and tentatively names '*S. insanum* L.', '*S. cumingii* Dunal', etc. However, their precise taxonomic identities are, as yet, unclear and they are notoriously difficult to distinguish, both from each other and from *S. melongena* and *S. incanum*. Interfertility amongst *S. insanum*, *S. cumingii* and *S. melongena* has been demonstrated experimentally<sup>9</sup> and, along with *S. incanum*, these three taxa are therefore potentially successful acceptors of *Bt* brinjal pollen. Although the foregoing crosses were produced as a consequence of artificial cross-pollinations they are an indication of what may be possible in nature, where the naturally occurring relatives of brinjal often occur as adventives amongst or near cultivations. Although no instances of natural inter-specific hybridization with wild species have been reported for cultivated brinjal<sup>10</sup> this does not preclude the possibility of this phenomenon.

Wild relatives vary in their ability to form successful crosses with brinjal. For example, *S. kurzii* Brace ex Prain (= *S. sanitwongsei* Craib), a species of north eastern India, known as 'tita baigan', shows high crossing success with *S. melongena*<sup>11</sup>. *S. violaceum* Ortega (= *S. indicum* L.), found across much of India, shows some interfertility with

brinjal according to Behera and Singh<sup>12</sup>, but is also described elsewhere as being non-compatible with it<sup>7</sup>. There are still other wild species such as *S. barbisetum* Nees in need of study, which may show crossability with *S. melongena*.

On 9 February 2010, a moratorium on the commercialization of *Bt* brinjal was imposed in India. Scientists thus have a chance to develop a better understanding of the taxonomic inter-relationships of brinjal and its relatives, as well as furthering their knowledge of breeding behaviour. This would allow more accurate prediction of the likelihood of cross-transfer of genes, and may encourage the re-consideration of breeding strategies for untransformed brinjal involving wild relatives already possessing relevant pest and disease resistance.

A new ten-year strategic plan devised by the Parties to the Convention on Biological Diversity (COP10) will soon be put into action. It is comprised of 20 targets aimed at reducing pressures on biodiversity and taking urgent action to save and restore nature<sup>13</sup>. A certain number of these relate to the genetic diversity of crops and their wild relatives, and also to the management of biological invasions<sup>14</sup>. In this light, continued, careful consideration should be given to the study of the potential for cross-transference of genes between *Bt* brinjal and its wild and weedy relatives, and the possible implications.

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## A small number of larval survival and reproduction of *Helicoverpa armigera* on *Bt*-cotton is not unexpected

This has reference to the article entitled 'Survival and reproduction of natural populations of *Helicoverpa armigera* on *Bt*-cotton hybrids in Raichur, India' by Ranjith et al.<sup>1</sup>. The authors' observations have been misinterpreted and publicized

by certain NGOs and the media that this pest has already developed resistance to *Bt*-cotton and the technology is not effective! I wish to clarify the status.

It is known in plant protection practice that no matter what control measure is

adopted, be it chemical insecticides or *Bt*-proteins, a small proportion of target pests can escape mortality and complete their life cycle. These may represent rare tolerant individuals or they may be insects exposed to lower toxin levels