

Brahma Kamal – the spiritually revered, scientifically ignored medicinal plant

Bestowed with rich botanical wealth, the people of India have probably the oldest, richest and most diverse cultural traditions in the use of medicinal plants¹. At higher altitudes of the Western Himalayan ranges (extending from ca. 500 m to snow-clad peaks), a variety of important and endemic medicinal plants are found, making it a biodiversity-rich region². Records indicate that these medicinal herbs have been in use for treating diseases since ancient times. The advent of herbal renaissance in recent times has led to heavy extraction of these medicinal plants from the wild. This, aided by loss of habitat by deforestation and excessive grazing pressure in high-altitude pastures in the entire Himalayan region threatens the survival of some important medicinal plants, one of them being Brahma Kamal.

Brahma Kamal (*Saussurea obvallata*), the state flower of Uttarakhand, is an endemic herb of the Himalayan region (encompassing the Indian Himalayan Region, northern Burma and Southwest China). The plant is distributed at an altitudinal range of 3000–4800 m. It is a hermaphrodite herb which achieves an average height of about 5–10 cm. Flowers bloom in mid-monsoon (July–August) amongst the rocks and grasses of the hillside. Flower heads are purple, hidden from view in layers of yellowish-green papery bracts, which provide protection from the cold mountain environment. The flowers can be seen till mid-October, after which the plant perishes, becoming visible again in April.

In Uttarakhand, Brahma Kamal is found in the regions of Kedarnath, the Valley of Flowers, Hemkund Sahib and Tungnath³. The plant holds immense sacred value in the region. Being regarded as a spiritual flower, it is offered to Lord Vishnu at Badrinath shrine and Lord Shiva at Kedarnath shrine. In September/October, during the festival of Nanda Ashtami, Brahma Kamal is offered in temples and also distributed as 'prasada'. According to folklore in Hindu mythology, Brahma Kamal was created by Lord Brahma to help Lord Shiva place the head of an elephant on the body of Lord Ganesha. The flower dropped 'Amruta' – the elixir of life from its petals on the

body. It is also believed that on the revival of Lakshmana using Sanjeevani, the Gods showered Brahma Kamal from heaven in celebration. Hence, Brahma Kamal fell to earth and took root in the Valley of Flowers. Besides religious value, the plant is extensively harvested by local people for preparation of traditional ayurvedic medicines. The flowers, rhizomes and leaves are used for treatment of bone ache, intestinal ailments, cough/cold and urinary tract problems. The rhizomes in particular are used as antiseptic and for healing cuts and bruises^{4–6}. In the Tibetan system of medicine, the plant is used in the treatment of paralysis of limbs and cerebral ischaemia⁷. However, no pharmacological and pharmaceutical studies have been made till date creating a lacunae in scientific verification of the medicinal use of the species.

Despite its traditional medicinal use, the plant has a neglected status in the scientific community. Till date there has been neither an effort to conserve the germplasms of Brahma Kamal nor a focused research approach to document and evaluate true clinical potential of the species. Consequently, illicit and unscientific harvesting, constraints in conven-



Figure 1. Brahma Kamal plant in flowering.

tional methods of propagation, climate change, anthropogenic activities (construction of houses, roads, etc.) and lack of scientific interventions have resulted in the plant being categorized as 'endangered' by the Conservation Assessment Management Plan (CAMP). As the whole plant of Brahma Kamal is used for medicine, it becomes more prone to extinction, calling for immediate conservation strategies for this top-ranking priority species^{8,9}.

Conservation measures should begin with the establishment of nurseries in areas adjoining natural habitats wherein conventional methods of propagation can be tried. This has to be done in conjunction with sensitization of local people to control overexploitation of the species. Simultaneous efforts in the R&D sector to establish pharmaceutical potential of the species can hence be utilized to make the local people aware of the commercial value of Brahma Kamal. The role of tissue culture technology needs to be stressed to preserve this medicinal herb for two reasons. First, large-scale multiplication of the species can be done without harming the whole plant. Secondly, religious sentiments of the local population would not be hurt in collecting small plant parts to establish tissue cultures compared to collection (eventually leading to mishandling) of the sacred plant. Besides, ecological studies dedicated to habit and distribution of Brahma Kamal have to be conducted to supplement designing of suitable conservation strategies.

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Kashmir saffron in crisis

Saffron (*Crocus sativus*; Iridaceae), originating from the Arabic word ‘zafaran’ meaning yellow, is a fascinating spice steeped in rich history¹. Its secrets stem from the dried red stigmas which accumulate large amounts of three glucosylated apocarotenoids², namely crocin, picrocrocin and safranal, which, among the more than 150 volatile and aroma-yielding compounds, contribute to the colour, bitter flavour and aroma so typical of saffron. The spice is used as a flavouring and colouring agent in food and is a vital part of the dye, perfumery and flavouring industries. Saffron also has countless biological properties like anticancer, antimutagenic and antioxidant³. As a result, saffron fetches the highest price as a spice in the world, at approx. US\$ 1100–11,000/kg (<http://en.wikipedia.org/wiki/Saffron>), depending upon the country of its production⁴. Its production is typically favoured in countries where labour is cheap, such as Iran and Azerbaijan, but is also produced in countries like Greece, Spain, Argentina or the USA with global production exceeding 200 tonnes⁵ and newer areas being brought under its cultivation, viz. China and Japan.

One of the key centres of saffron production that has painted the face of this ‘golden’ spice throughout history has been in the plateaus of Pampore in Indian Kashmir (India), where saffron has been cultivated since AD 750 (Figure 1). Kashmir, despite being one of the oldest historical saffron-producing areas, is now facing a rapid decline of saffron industry. The total area under saffron in Kashmir in 2009 was 2667 ha with a production of 5.61 tonnes while almost a decade earlier, in 1997, these were 5707 ha and 15.95 tonnes respectively. This shows a decrease of 114% in area and 184% in production in just a short span of 12 years⁶ (Figure 2).

Major factors responsible for decline of saffron industry in Kashmir include the lack of availability of good-quality corms as seed material, poor soil fertility, lack of assured irrigation, infestation by rodents and diseases, poor post-harvest management, and improper marketing facilities, increased urbanization on saffron land, helplessness of the Government in checking adulteration and clandestine smuggling of cheap saffron (allegedly from Iran), which is then sold in the name of Kashmir saffron⁶. In view of the limited scope of laws like Prevention of Food Adulteration Act 1954 and Saffron Act 2007, coupled with poor implementation of Saffron Quality Standards like ISO 3632 and BIS 5453, the initiative of launching ‘Brand Kashmir’ saffron has remained a difficult dream. The most serious challenge is to check the adulteration of saffron by way of adding some nature-based adulterants like maize silk, saffron stamens, ray florets of marigold, dyed tender roots of *Salix* sp. (willow), fibrous roots of various grasses, fibres of shredded meat coloured with saffron water, or synthetic adulterants like liquid glycerine, codeine phosphate (cough syrup), dyed newspaper clips, nylon fibres, etc. (pers. commun.).

Here, we propose some steps to bring saffron back to its former levels of grandeur in Kashmir: (i) Prevent clandestine smuggling of cheaper (allegedly Iranian) saffron and its use as adulterant. (ii) Adopt modern, mechanized production and post-harvest management technologies, while minimizing the use of chemicals to only when indispensable⁷, as saffron has a preformed innate passive defence system⁸, and employ efficient biocontrol agents like antibiotic-producing *Pseudomonas* strains to reduce input of chemicals. (iii) Implement biotechno-

logical approaches for enhancement of its odour, taste, colour and aroma⁹, and set up tissue culture facilities for clonal mass propagation of disease-free, good quality corms of uniform size and genetic consistency for field planting¹⁰. In future, this could also lead to mass production of stigma-like structures under *in vitro* conditions¹¹, and mass production of crocin, picrocrocin, crocetin and safranal for industrial use, which would be of uniform quality and not subject to fluctuations caused by environmental factors. (iv) Identify pockets for ‘organic farming’ of saffron and setting up of government machinery for its subsequent certification, as this would fetch higher price in the international market. (v) Promulgate and implement laws specific to Kashmir saffron, like declaring Kashmir saffron as geographic indication, preventing use of traditional saffron land for purposes other than saffron cultivation (i.e. construction or conversion to horticulture/agriculture), strict punishment for those indulging in saffron adulteration, and devising a mechanism of certification for saffron purity, analogous to seed certification mechanism followed for vegetables and cereals¹². One such law which was promulgated in 2007, the Saffron Act 2007, has to be made more



Figure 1. Saffron in full bloom at Pampore, the Food and Agriculture Organization identified Saffron Heritage Site in India.