VETIVERIA ZIZANIOIDES (LINN.) NASH
A MULTIPURPOSE ECO-FRIENDLY GRASS OF INDIA

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Abstract

Vetiveria zizanioides is popularly known as *Khas Khas*, *Khas* or *Khus* grass in India. It is a densely tufted grass, found throughout the plains and lower hills of India, particularly on the riverbanks and in rich marshy soil. Vetiver has been known to India since ancient times. It has been considered as a high-class perfume and copper plate inscriptions list the perfume as one of the articles used by royalty. Two species of *Vetiveria* are found in India, of which *V. zizanioides* is the common source of the well-known oil of vetiver, which is used in medicine and in perfumery.

Khas grass grows wild in many states, namely Haryana, Uttar Pradesh, Rajasthan, Gujarat, Bihar, Orissa and Madhya Pradesh and throughout South India. It is systematically cultivated in the North Indian states of Rajasthan, Uttar Pradesh and Punjab and in the South Indian states of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. The yield from the cultivated crops, however, meets only a very small percentage of the requirements of the country. The bulk of the roots used for cooling purposes and for the extraction of the oil are obtained from the wild.

Khas grass plays an important role in the socio-economic life of rural India. In India, since ancient times, the roots have been used for making screens, mats, hand fans, and baskets. The screens are hung like curtains in the houses and when sprinkled with water, impart a fragrant coolness to the air; they are in great demand during the summer. In Kerala, the roots are woven along with bamboo splits and made into flat mattresses for use as under-beds to give a cooling effect. The roots have found increased use in electric room-coolers. In Madhya Pradesh and Maharashtra, the plant is used as anthelmintic for children. It is also used for boils, burns, epilepsy, fever, scorpion sting, snakebite, and sores in the mouth. Root extract is used for headache and toothache.

Vetiver oil is regarded as stimulant, diaphoretic and refrigerant. This oil is used in perfumery, cosmetics and soaps and for flavouring sherbets (Indian cool drinks). Local application of leaf paste for rheumatism, lumbago and sprain gives good relief. The dried roots are also used to perfume the linen clothes. The rachis is used in the manufacture of *moodas, sirkies*, etc. The young leaves are browsed by cattle and sheep. Dried culms are used for making brooms and thatching of huts. Pulp is suitable for manufacturing paper and straw board.

Details of *Khas* grass cultivation and uses of the grass in India are discussed and commercial cultivation is recommended.

Introduction

Vetiveria zizanioides (Linn.) Nash, a member of the family Poaceae commonly known as the *Khas-Khas, Khas* or *Khus* grass in India, is a perennial grass with thick fibrous adventitious roots which are aromatic and highly valued. This tufted grass grows throughout the plains of India ascending up to an elevation of 1 200 m. Having wide ecological amplitude, this grass grows in a wide variety of ecological habitats covering all bio-geographic provinces of India. No wonder that this is one grass which has been extensively used by almost all the tribes. Details of botany, its multifarious uses, cultivation and how this species can be exploited for eco-development programs are discussed in this paper.

Botany and Distribution

Vetiveria zizanioides is a densely tufted grass with the culms arising from an aromatic rhizome up to 2 m tall; the roots are stout, dense and aromatic; leaves are narrow, erect, keeled with scabrid margins; inflorescence is a panicle, up to 15-45 cm long of numerous slender racemes in whorls on a central axis;

spikelets are grey to purplish, 4-6 mm long, in pairs, one sessile the other pedicelled; 2-flowered; the lower floret is reduced to a lemma, upper bisexual in sessile, male in the pedicelled spikelet; glumes are armed with stout, tubercle-based spines, lemmas awnless, palea minute.

Khas grass grows wild in almost all plain states in India up to an elevation of 1 200 m. Only in some pockets of South India is the grass systematically cultivated but the yield from the cultivated crops meets only a small percentage of requirements. Therefore, there is great stress on the wild populations, which have already declined in many areas. The grass is known by several local names in different regions in India (Table 1).

Table 1. Some vernacular names for *Khas* grass in India

Dialect/language	Vernacular name
Hindi, Bengali	*Khas, Khas-Khas, Khus-Khus, Khus*
Gujarati	*Valo*
Marathi	*Vala*
Telugu	*Kuruveeru, Vettiveellu, Vettiveerum*
Tamil	*Vattiver*
Kannad	*Vattiveeru, Laamancha, Kaddu, Karidappasajje Hullu*
Malyalam	*Ramaccham, Vettiveru*
Ayurvedic name	*Ushira*

Although no systematic assessment of the infra-specific diversity of the grass is attempted, there are two distinct types of *Khas* that grow wild in India: flowering and non-flowering. The flowering type grows wildly in North India and both types occur in South India (Anon. 1976).

Cultivation

Although *Khas* grass has been extensively used for a variety of purposes, no systematic and large-scale cultivation appears to have been taken up particularly in North India where the use of the grass is quite extensive. There, most of the requirement for *Khas* is met by the wild populations. In South Indian states like Kerala, Tamil Nadu, Andhra Pradesh and Karnataka, *Khas* is cultivated mainly for vetiver oil obtained from distillation of the roots.

Although vetiver grows in almost all types of soils, a rich and well-drained sandy loamy soil is considered the best. The grass grows luxuriantly in areas with an annual rainfall of 1 000-2 000 mm and temperature ranging from 22 to 43^{o}C. Marshy riverbeds with sandy loam are best suited for this grass (Anon. 1976). The cultivation procedure adopted is also very simple. The land is cleared and through deep tilling ridges and furrows are made. Slips separated from the clumps with the rhizomes intact having 15-20 cm of shoot constitute the material for planting. Cultivation through seeds is normally done by raising nursery beds some time in early January and the seedlings are transplanted before the onset of the monsoon. The first method, however, is predominant.

In North India although the plants profusely set seeds, there is no organized nursery or systematic cultivation except in some botanical gardens and experimental plots. Weeding is also recommended for healthy and robust growth of the plant. Irrigation is done only when necessary. Although manuring is not very essential, some ash, compost, ammonium sulphate, groundnut cake, and brine manure can enhance the good growth of *Khas* grass.

Harvesting is usually done by uprooting the whole plants and then cutting roots and cleaning mud and other parts of the root system. In areas where *Khas* is systematically cultivated, the roots are harvested at the age of 10-12 months for manufacture of articles and for medicine. For extraction of oil, the harvesting is delayed by another three to four months.

Uses of *Khas*

A wide variety of uses are attributed to *Khas* grass. All parts of the plant are used in one way or another for the benefit of man. A few important uses/applications are narrated below:

Traditional Use

India is inhabited by a wide variety of tribal populations who dwell in forested areas and depend on surrounding resources for their livelihood. Among the several hundreds of plants which are gathered by tribal populations, *Khas* grass, particularly in North Indian plains, takes a leading role. Various tribes use the different parts of the grass for many of their ailments such as mouth ulcer, fever, boil, epilepsy, burn, snakebite, scorpion sting, rheumatism, fever, headache, etc. The Santhal tribes of Bihar and West Bengal use the paste of fresh roots for burn, snakebite and scorpion sting, and a decoction of the roots as a tonic for weakness; the Lodhas of West Bengal use the root paste for headache, rheumatism and sprain, and a stem decoction for urinary tract infection; the Mandla and Bastar tribes of Madhya Pradesh use the leaf juice as anthelmintic; the tribes of the Varanasi district inhale the root vapour for malarial fever. The root ash is given to patients for acidity by the Oraon tribe. Likewise, there are very many different applications of the plant for different ailments among different ethnic tribes (Jain 1991; Singh & Maheshwari 1983).

Apart from the medicinal uses, the culms along with the panicles form a good broom for sweeping. The culms and leaves are also extensively used by the tribes and villagers for thatching their huts, mud walls, etc. Some tribes (in Kerala) use the mats of the roots and leaves as bed for a cooling effect (Table 2 & 3).

Table 2. Multiple uses of *Khas* grass in India

- Traditional medicine
- Roots as water flavouring agent
- Root mats for door, window screens during summer for cooling effect
- For desert coolers in summer in North India
- As eco-friendly soil binders
- Roots for preparing *Sharbat* (sherbet) or soft drink during summer, especially in North India
- Socio-economic life of the rural population in India
- Dried roots for scenting clothes
- Dried culms as brooms and for thatching
- Pulp of the plant for paper and straw board

Table 3. Some traditional uses of *Vetiveria zizanioides*

Plant part	Tribe	Ailment
Root decoction	Santhals	As cooling in high fever, inflammation, sexual diseases, etc
Root paste	Lodhas	Headache, fever, Ayurvedic preparation "Brihat Kasturi", "Bhairava Rasa" for fever, diarrhoea, chronic dysentery
Root ash	Oraons	Acidity
Root juice	Tribes of M. P.	Anthelmintic
Root vapour	Tribes of Varanasi	Malarial fever
Vetiver oil	Most tribes	Stimulant, diaphoretic and refrigerant
Leaf paste	South Indian tribes	Rheumatism and sprain
Root and stem juice	South Indian tribes	Boil, burn, epilepsy, scorpion sting, snakebite, and mouth ulcer

Commercial Applications

The commercial applications of the grass mainly pertain to the extraction of vetiver oil through distillation of the roots. Vetiver oil is one of the most valuable and important raw materials in perfumery and has

extensive applications in the soap and cosmetic industries, for pharmaceutical companies and as anti-microbial and anti-fungal agent (Singh et al. 1978; Dikshit and Husain 1984). Over 150 compounds have been isolated and characterized from vetiver oil so far. A major portion of oil consists of sesquiterpene alcohol (Thakur et al. 1989).

A major application of the roots of vetiver particularly in North Indian plains pertains to the preparation and sale of mats/screens for windows, doors and desert coolers during summer months when the temperature goes up to as high as 45°C. As there is no systematic cultivation of the grass in North India, several villagers and rural folk collect the roots of the grass in large quantities from the wild growth and flock to the cities where they sell the root mats and also the loose roots (for fragmenting water) to city dwellers. Such temporary establishments of *Khas* root traders are a common sight along most roads in Lucknow, Delhi, Kanpur, etc. Three to four months of livelihood of several rural families is sustained extensively by the sale of roots of this grass, which thus plays a significant role in the socio-economic lives of village and rural folk. In view of its tremendous use and also in view of its declining wild populations, the authors strongly recommend the large-scale systematic cultivation of this grass in the plains of North India.

***Khas*: The Eco-Friendly Grass**

Vetiveria zizanioides has wide ecological amplitude and this trait of the species must be exploited for eco-development of the regions devoid of biodiversity. The grass with its tuft-forming habit and thick root system greatly helps in checking soil erosion. It can be recommended for fallow areas and waste places including sodic soils. However, efforts should be made to evolve suitable varieties for sodic soils. Work in this direction is already initiated at the field research stations of Banthra and Oraon under the National Botanical Research Institute at Lucknow. This will not only boost the economic conditions of local farmers but also improve the soil ecology.

Small-scale village-level industries based on *Khas* grass could be established for extraction of vetiver oil; for manufacture of straw board and handmade paper from pulp of the aerial parts of the grass. This can to some extent reduce the stress on bamboo resources, which are also declining. As this grass is invariably used by most of the tribes, the tribal and other village womenfolk should be encouraged (with suitable subsidies) to cultivate the species near the vicinity of their huts. Suitable arrangement can be made to collect the excess harvest left from these tribal pockets for trade or for local oil industries so that tribal families can also supplement their income. While this would bring the economy to the poor villagers, it would also help in the conservation and eco-development of the region.

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