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Lampa grass: A resilient range grass for sustainable forage production and rangeland development

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Lampa grass is a C4 perennial range grass, indigenous to India and widely found in major grasslands. It can withstand abiotic stresses such as drought, high temperature, soil salinity and low soil fertility; therefore, it is considered the best candidate for rehabilitating degraded lands, carbon sequestration and phytoremediation. It has the highest nutritional value during the early vegetative phase, providing 5.5–7.0% crude protein on a dry matter basis, and provides 350–400 q/ha of green fodder if managed properly. It is best suited for rangeland improvement, particularly on poor and marginal lands where other crops are hard to grow.

Keywords: Green fodder, Phenological stages, Range grass, Vegetation restoration

LAMPA grass (*Heteropogon contortus*) also known as black or bunch spear grass, is a C4 perennial grass native to Africa, southern Asia, and parts of Oceania. It is widely distributed in tropical, subtropical and warm temperate regions of the world. *Heteropogon* is indigenous to India and widely found in major grasslands of India, such as *Sehima-Dichanthium*, *Dichanthium-Cenchrus-Lasiurus*, *Themeda-Arundinella*, and Peninsular grasslands. *Heteropogon* has footprints across several states of India, including Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu.

Lampa grass has the ability to withstand abiotic stresses such as salinity and nutrient-poor soils, making it an ideal candidate for rehabilitating degraded lands. During its vegetative phase, it is highly palatable and serves as valuable fodder, which can be conserved as hay or silage. Declining rangeland productivity under increasing climate variability, including drought and erratic rainfall, has become a major concern for sustainable livestock production and ecosystem stability. In this context, resilient forage grasses such as lampa grass are gaining importance because of their adaptability to drought, poor soils, and harsh environmental conditions, making them suitable for climate-resilient rangeland systems. It provides maximum fodder from July to November under rainfed conditions, while limited forage may remain available during the dry season as standing hay. Its better adaptability to harsh environments makes it a valuable component for rangelands, silvipastoral systems, wastelands, and soil conservation programmes in dryland ecosystems for sustainable livestock production in resource-poor regions.

Climate and soil

It demonstrates high adaptability to diverse climate and

Field view under rainfed condition

soil conditions. While it thrives in areas with average annual rainfall of 600–1,000 mm, it is notably drought-tolerant, although severe water stress limits its growth. It grows well across a wide soil type, ranging from pure gravel to sandy loam, but performs best in coarse-textured soils with a pH range of 6–8. Its robust nature allows it to dominate drier regions, often outcompeting other grasses. Furthermore, its ability to tolerate light shade enables it to form a dominant understorey layer in many tropical and subtropical ecosystems, making it a valuable species for vegetation restoration. It can thrive over a wide range of average annual temperatures ranging from 10–28°C, with the optimal temperature for germination between 30 and 35°C.

Plant morphology

Lampa grass is a densely tufted, perennial grass that grows up to 120 cm. It is primarily erect but can be decumbent, with glabrous nodes. The plant is leafy and often hairy, particularly at the base, with leaf blades measuring 3–60 cm in length and 2–5 mm in width; blades may be flat or folded. Inflorescence is solitary, terminal, 3–5 cm long, and bears prominent dark brown awns that twist together at maturity.

Genetic diversity

A thorough understanding of genetic variability is an essential requirement for any crop improvement programme. It is predominantly tetraploid, while other ploidy levels ranging from diploid (2n = 20) to nanoploid (2n = 90) are also reported. At the national level, its genetic diversity is being actively conserved. *Heteropogon* exhibits considerable morphological variation with six accepted species distributed from Europe to tropical and subtropical regions of the world including India. The ICAR-Indian Grassland and Fodder Research Institute (ICAR-IGFRI), Jhansi, has collected rich genetic diversity (>230 germplasm) through systematic exploration across various agro-climatic zones of India. This collection is maintained as a medium-term resource at ICAR-IGFRI and is also conserved for long term in the national gene bank at ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR), New Delhi.

Solitary inflorescence

Table 1. Comparison of forage yield and nutritional composition of major range grasses cultivated in India

Species	GFY (t/ha)	DMY (t/ha)	CP (%)	ADF (%)	NDF (%)	IVDMD (%)
Heteropogon contortus	25–40	8–10	5.5–7.0	54	80	45–55
Cenchrus ciliaris	35–40	9–10	7.0	51.2	71	60.8
Dichanthium annulatum	40–45	15–18	6.5	50.9	68.7	48.2
Sehima nervosum	18–20	4–5	6.8	54	72	45–52

GFY: Green fodder yield, DMY: Dry matter yield, CP: Crude protein, ADF: Acid detergent fibre, NDF: Neutral detergent fibre, IVDMD: *In vitro* dry matter digestibility.

Source: Ahmed *et al*. (2017)

Uses

Heteropogon serves multiple purposes across ecological, agricultural, and medicinal domains. It is a key species for erosion control and habitat restoration, with emerging potential for phytoremediation. While it is a promising fibre-rich material for thatch and woven mats, its primary value lies in its use as a seasonal fodder grass for cattle, leveraging its high nutritive value during the vegetative stage. Furthermore, it holds significant importance in traditional medicine, where it can be used to treat a range of ailments, including toothache, fever, muscular pain, and scorpion stings. However, upon maturation, its seeds develop sharp, barbed awns that can penetrate the skin, muscle tissue, and even internal organs of grazing animals such as sheep, leading to serious injuries and significant wool contamination.

Nutritive value

The nutritional quality of lampa grass is critically influenced by its phenological stage. Maximum palatability and nutritive value are achieved during the early vegetative phase. A significant decline occurs with maturation and flowering, compounded by the production of hard, sharp-pointed seeds, causing animal injury to the mouth, eyes, and skin. Nutritional analysis of *Heteropogon* on a dry matter basis at 50 per cent flowering stage shows crude protein (5.6%), organic matter (91.4%), ash (8.5%), neutral detergent fibre (81.7%), acid detergent fibre (48.0%), lignin (2.7%), and *in-vitro* dry matter digestibility (46.2%). Besides, it is rich in essential minerals such as calcium (Ca) and potassium (K), while providing moderate levels of other macro and trace elements. This adequate mineral supply is vital for maintaining the health, growth, and productivity of grazing animals.

Cultivation practices

***Varieties*:** One of the varieties of this grass is 'Bundel Lampa Ghas–1' (IGHC 03-4), released by ICAR-IGFRI, Jhansi, for semi-arid, tropical and sub-tropical areas of India. It is a perennial species developed for rangeland improvement, particularly on poor and marginal lands. The variety has an erect growth habit, profuse tillering, and a medium height (70–100 cm). It attains 50% flowering in 120–140

days and reaches full maturity in 160–170 days. The variety offers excellent nutritional quality, containing 6.8% crude protein, 54% acid detergent fibre, and 72% neutral detergent fibre, along with high digestibility. It is also free from major diseases and shows no seed shattering. Under moist conditions, the variety can persist for 5–6 years. It has a high yield potential, producing about 320 q/ha of green fodder and 64 q/ha of dry matter.

***Seed rate and sowing*:** Successful establishment of *Heteropogon* requires careful planning. Sowing can be done either directly on the seedbed (5–6 kg/ha) or through transplanting. For direct sowing, 5–6 kg of seeds per hectare is sown at the onset of the monsoon (June-July) in a well-prepared seedbed. Transplanting is generally recommended for better and more uniform plant establishment. Transplanting is typically done in July, following the first monsoon rains, ensuring that the soil is moist and conducive to root establishment. About 70,000 seedlings per hectare are required, with an optimal spacing of 50 cm between rows and 30 cm between plants to facilitate proper growth and management.

For rangeland restoration, direct sowing remains a practical, low-cost, and widely used method. Seed pelleting with clay and compost can further enhance seed handling, moisture retention, and early development. However, for high-yield, uniform pasture development or for cultivation on degraded lands, transplanting method is scientifically preferable due to its higher establishment success and better crop stand.

***Nutrient management*:** Proper nutrient management is crucial for maximising the yield and quality of *Heteropogon*. A basal application of 10 tonnes of farmyard manure (FYM) per hectare should be incorporated into the soil before sowing or transplanting as basal dose. Following this, a basal dose of 20 kg N/ha and 20 kg P_2O_5/ha should be applied at the time of establishment. Approximately one month after establishment, a top dressing of 20 kg N/ha is recommended to promote vigorous growth. In subsequent years, an annual top dressing of 20 kg N/ha and 20 kg P_2O_5/ha should be broadcasted at the beginning of the rainy season to sustain productivity.

***Harvesting and yield management*:** The timing and frequency of harvesting are key to optimising the yield and quality of *Heteropogon*. In the first year, a single cut at a height of 10 cm from ground level is recommended in mid-October, to allow the plants to establish a strong root system. In subsequent years, 3–4 cuts are possible. The first cutting can be taken after 60 days of growth, with subsequent cuttings every 30–45 days. For seed collection, the final cut of the season should be sacrificed, allowing the plants to mature and produce seeds. Generally, seeds mature during October-November in the peninsular region of India and slightly later in southern part of the country.

Challenges

Despite its wider adaptability under challenging conditions, several challenges are associated with its cultivation and utilisation. Low palatability and nutritional value at maturity, poor regrowth after grazing, asynchronous flowering, seed handling difficulties, seasonal production variation, invasive and dominant behaviour, and a fire hazard in arid and semi-arid regions, etc. affect its area expansion in rangelands. Concerted breeding efforts are needed to develop high-yielding and climate-resilient varieties.

SUMMARY

Lampa grass is an exceptionally adaptable and economically vital species, providing sustainable solutions for fodder and environmental restoration. Its resilience makes it a cornerstone of pasture management and rangeland rehabilitation efforts. Strategic application of proven practices, including optimised sowing, fertiliser, and harvesting schedules, can significantly boost its productivity and ecological benefits. To fully realise its potential, future efforts must focus on harnessing the species' extensive genetic diversity. Despite the challenge posed by its predominantly apomictic reproduction, targeted research and breeding initiatives are essential to develop improved varieties and unlock the untapped value of this remarkable grass.

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National Pest Surveillance System

Launched on 15th August 2024 to enhance the surveillance and management of pest diseases across the country. The system utilises latest digital technologies such as Artificial Intelligence and Machine Learning (AI and ML) to provide quick and instant solution regarding pest attacks, crop diseases, crop damages, etc. by issuing real time crop protection advisory to the farmers. It includes a user-friendly mobile app and a portal for identification of pests and disease mitigation through integrated pest management.

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