SKUAST-KASHMIR NATIONAL MISSION ON HIMALAYAN STUDIES

Ministry of Environment, Forest and Climate Change
Government of India

*A policy document on*

# STRATEGIES FOR REVIVAL OF GUREZ- ZEERA TO ENSURE LIVELIHOOD SECURITY OF TRIBAL FARMERS OF GUREZ


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## Rationale

Kala zeera (*Bunium persicum* Bioss.) is an important herbaceous plant species mostly used for culinary, flowering, perfumery and carminative purposes. It grows wild in north-western Himalayan states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand, in forests and grasslands, at higher elevations including arid zones ranging from 1800 m to 3300 m amsl (Khan *et al* 2022). Its wild populations are mostly endemic to high altitude regions of Gurez, Tulail and Kishtiwar regions of Jammu and Kashmir; Kinnaur, Lahaul Spiti, Pang and Bharmour in Himachal Pradesh and Uttarakhand (Panwar *et al*., 1993; Khan *et al.,* 2022). In Jammu and Kashmir, Kala zeera grows in forests, open hills, grassy slopes, low alpine and table lands, mostly across the hilly areas of Gurez, Tulail, Keran, Machil, Tangdar, Kargil, Kishtwar Paddar, Khrew and Char-e-sharief. The sub-populations across UT of Jammu and Kashmir represent a great range of diversity of this plant species, which have been naturally maintained as germplasm repositories/ banks and are the sources of high genetic variability for further improvement of this crop species (Gupta *et al*., 2013; Khan *et al.,* 2022). Kala zeera has found a significant place in the indigenous system of medicine and is used as stimulant, carminative, curing of diarrhea, dyspepsia, fever, flatulence, stomach ache, hemorrhoids and obstinate hiccups (Hanelt *et al*., 2001; Peter, 2004). The zeera seeds contain essential oil which is used for seasoning pickles, meat sauce, soups, candies, etc. Seeds are also a source of essential oils rich in terpenoids and phenylpropanoids, polyene and phototoxic furanocoumarins.

## Conservation of Kala zeera

Across different Kala zeera growing areas, high morphological variability has been observed for yield attributing and quality traits, but the people from these hilly areas often lift immature plants along with tubers for their immediate benefits. This has restricted propagation of Kala zeera and has also led to its exploitation and genetic erosion. Hence the crop is becoming an immediate conservation concern in north-western Himalayan hills (Khan *et al* 2022). Although, some efforts to curb uncontrolled lifting of immature zeera have been initiated by SKUAST-K through local administration in these areas (Plate-1), more needs to be done through awareness camps and domestication of this crop. Such efforts of conservation of genetic resources and breeding interventions could contribute towards enhancement of its production and productivity.

Government of Jammu & Kashmir
Department of Revenue
OFFICE OF THE EXECUTIVE MAGISTRATE 1ST CLASS (TEHSILDAR) GUREZ

PUBLIC NOTICE

Very often complaints are being received by this office regarding **Early Harvesting of KALA ZEERA (black Cumin)** by locals especially from Nayi, Khopri, Khandiyal, Chorwan, Chuntiwari, Achoora, Dawar, Mastan, Markoot, Badwan Wanpora etc and this early harvesting of kala zeera before fruits ( seeds) attain maturity has lead to a decrease in its productivity in recent times. Kala zeera is precious, the identity, & heritage crop of Gurez & also Kala zeera is indigenous to Gurez.

Thus public of Gurez in general & public of Nayi, Khopri, Khandiyal, Chorwan, Chuntiwari, Achoora, Dawar, Mastan, Badwan – Wanpora etc. in particular are informed via this notice to restraint from early harvesting of kaala zeera & failure to do so shall tantamount to wilful negligence and action as warranted under rules shall be initiated against defaulters/violators.

(TARIQ AHMAD BHAT, JKAS)
Executive Magistrate 1st Class
(Tehsildar) Gurez

Copy for information to the:-
1. Deputy Commissioner Bandipora.
2. Deputy Director Press & Public Relations Kashmir Srinagar with the request to publish the notice in two leading dailies.
3. Sub Divisional Magistrate Gurez
4. Incharge MARBES Izmarg to generate the public awareness regarding the matter in the locality.
5. **Block Development Officers –All of Gurez Subdivision for wide publicity of this Notice in all Panchayat Halqas of your respective jurisdictions & to initiate Public awareness via PRIs.**
6. **Naib Tehsildar Bagtore for necessary action. This is in reference to your No.NTG/11-12 dated 21/06/2021.**
7. **SHO Gurez for immediate necessary action.**
8. **DO Police post Izmarg with the direction to keep strict vigil during the upcoming season.**

THURSDAY 24th June 2021

نارواویار ہمولہ میں غیر قانونی عمارتی لکڑی ضبط

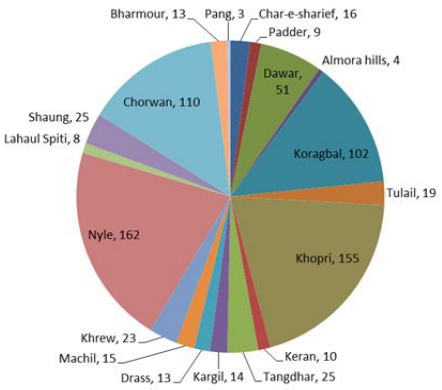
گریز میں ٹنگی سے قبل کالا زیرا کی کٹائی پر پابندی

Edited by Incharge
MARBES IZMARG GUREZ
SKUAST KASHMIR

**Plate- 1. Efforts of SKUAST-K with local administration towards banning of immature kala zeera harvest in**

The area under kala zeera has reduced drastically particularly, since last few decades, in view of the fact that inhabitants of nearby areas usually go for harvesting of immature zeera. Kala zeera seed when harvested before maturity can be used as spice, but such zeera seeds are unable to germinate. This has contributed not only to low productivity but also lowering the genetic base of this crop (Khan *et al.*, 2021). The genetic diversity of the crop represents the heritable variation that exists within and between populations. Exploration and evaluation of genetic diversity is a prerequisite for identifying the suitable genotypes, which can further be utilized for Kala zeera improvement programmes. Such long term breeding programmes can result in development of elite genetic stocks for commercial cultivation. The success of a plant breeding programme depends on the availability of genetic variation, knowledge about desired traits and efficient selection strategies that makes it possible to exploit existing genetic resources. In spite of being a prized herb with many therapeutic uses, the information on genetic diversity present among the different populations of *B. persicum*, especially in North-western Himalayan region is severely lacking. Urgent and timely efforts are required to be taken for conservation of genetic diversity and identification of kala zeera genotypes with economically desired traits.

Under National Mission on Himalayan Studies (NMHS) funded research project on Kala Zeera, a set of two hundred fifty two (252) diverse kala zeera germplasm accessions were collected during an exploration mission (Plate 2 a & b) from hot-spot regions /hills dividing two neighboring countries (India-Pakistan) on line of control (LOC) and hills near line of actual control (LAC) with China. The germplasm accessions collected from Gurez valley, Tulail, Kashtiwar, Keran, Machil Tangdhar, Machil, Drass, Paddar, Khrew, Char-e-Sharief, Pang, Lahaul spiti, Shaung, Bharmour and Almora hills of Indian Western Himalayas have been characterized for morpho-agronomic traits and the analysis of trait data revealed significant variability in number of branches plant$^{-1}$, number of umbelets umbel$^{-1}$, number of seeds plant$^{-1}$, 1000 seed weight and seed yield per plant. Out of 252 diverse accessions 102 accessions were submitted for registration in national germplasm repository National Bureau of Plant Genetic Resources (NBPGR), New Delhi for allotment of IC numbers. Such efforts of collection, characterization and conservation of Kala zeera germplasm accessions being taken at SKUAST-K are useful in future Kala zeera improvement programs in the country as this is first such comprehensive report of the crop from Western Himalayan region of India.




a)

b)

**Plate 2. Collection of kala zeera germplasm accessions a) areas covered with number of samples collected b) exploration mission for collection of diverse zeera**

**Domestication of the crop on scientific lines**

The Kala zeera growing areas are mostly organic. As this crop can be cultivated well in temperate climates on soils with high organic matter content, high water holding capacity and a neutral pH. Although excessive soil moisture is detrimental to the crop, rainfall in April and May are beneficial for vegetative development, umbel production and seed set. At the blossoming stage, the crop is quite vulnerable to moisture stress. Kala zeera can be grown both by tubers and seed. Raised beds are ideal for sowing tubers of the kala zeera crop. The area should be ploughed 12-15 cm deep and well mixed with highly decomposed farm yard manure (FYM) or compost @15 to 20 tonnes per hectare.

Seed should be sown in the month of October at 16kg/ha to raise vegetative propagules from mature seed. The planting cycle is recommended to be four years long. Tubers should be dug up after four years for repeat sowing with a 20 x 20 cm spacing for maximum seed yields. To acquire the good seed yield per plant, zeera tubers weighing more than 2 g should be separated out for space planted on raised beds. To ensure good seedling growth and vigour, seed should be sown 1cm deep. The seed must be pre-chilled to break dormancy (seed being a mericarp).

Despite the fact that the kala zeera crop is economically important to the UT of Jammu and Kashmir's exchequer, its domestication and production still faces numerous challenges, including: the crop grows exclusively in a wild and scattered form; there are no genetic studies on its sub-populations; prevalence of long seed to seed cycles; low germination percentage of seeds; low production and unassured quality; lack of trade standards and post-harvest technology and lack of adequate irrigation.

Efforts have been made by SKUAST-K under NMHS funded research project on Kala zeera under which initially 25 Frontline Demonstration (FLD) trials of improved kala zeera germplasm have been given during year 2021-22 to tribal farmers from different villages of Gurez (Plate 3). The performance of the FLDs were time to time monitored by the team of scientists of SKUAST-K at Gurez, so that the farmers could harvest a good crop from their own field (Plate 4). The innovative farmers of the area that took a lead in domestication of Kala zeera in Gurez were time to time felicitated by Prof. Nazir Ahmad Ganaie, Vice Chancellor SKUAST-K. Mrs. Khatija

Begum (Plate 5), an innovative farmer who took a lead in not only cultivating zeera on her field but also in herself adopting a piece of land on hill for conservation.


**Plate 3. Twenty Five Front Line Demonstrations (FLDs) were given in different tribal villages of Gurez**


**Plate 4. Women farmers on fore front in Domestication of Kala zeera in Gurez**

**Plate 5. Women farmers on fore front in Domestication of Kala zeera in Gurez**





**Criteria of Selection**

- **Growth Habit**
- **Pigmentation**
- **1000 Seed Weight**
- **Seed Yield per Plant**

**Plate 6. Morphological diversity and establishment of Kala zeera germplasm bank at Gurez**

**Plate 7. Awareness and training programmes for scientific cultivation of Kala zeera in Gurez**

## POLICY TOOLS TO PROMOTE KALA ZEERA CULTIVATION

### a. Area expansion

The selected altitude places in the north-western Himalayas of J&K State are thought to harbour genetic diversity in Kala zeera (Plate 6) in the form of land races. Harvesting of immature zeera has posed a threat to this diversity, as such, concrete efforts are desired towards conservation viz., establishment of Kala zeera germplasm bank, to raise awareness about the importance of local biodiversity conservation and harvesting at full maturity of crop (Plate 7). Immediate information could be provided on how to increase the area under the crop and domesticate this spice so that it could be grown on a scientific lines for optimal yields. It is critical that the government agencies work in coordination for the betterment of farming community of the area before any possibility of extinction of this crucial cash crop. Although, the Mountain Agriculture Research and Extension Station (MAR&ES), SKUAST-K Gurez, has established a Kala zeera Germplasm Bank with 252 diverse accessions. The purpose of which is to identify the promising high yielding genotypes for further multiplication and their availability for area expansion. Currently, around 30 crop specific molecular markers are being used to study the diversity of these accessions at molecular level. The efforts of the University

### b. Value addition and medicinal value

Black cumin is commonly known for its scent and therapeutic benefits, it has anti-inflammatory antioxidants, antibacterial and antiseptic properties. The oil extracted from zeera seeds is used to flavour liqueurs and cordials, as well as in perfumery. Kala zeera seeds are also utilized in ayurvedic-herbal medications for stomach pain, obesity, digestion, and dyspepsia, among other ailments. It is also used to treat piles, asthma, sleeplessness, skin problems, respiratory problems like bronchitis and the common cold, breastfeeding, anemia, skin boils and cancer. Zeera seeds have a pungent scent and a bitter flavour. It is a condiment that is also found in curry powders, bread, cake, and cheese spices. It can be used to make value added products like zeera powder, roasted powder, oil, drinks and food ingredients like zeera ladoo, zeera goli, zeera roasted powder, zeera sweet, aaloo zeera, zeera poli, zeera chicken, zeera puffs, roasted zeera bread sticks, zeera bhakhri, zeera cookie, zeera cheese pakooda, Sergio *et al.* (2013) found

zeera essential oil (ZEO) to be an active agent against *Mycobacterium tuberculosis*, with minimum inhibitory concentrations (MICs) of 6.25–12.5 g/mL, implying that the agent could be used in ethnomedicine as an alternative remedy for tuberculosis.

**c. Marketing**

Due to the lack of efficient marketing channels, branding and use of traditional post-harvest procedures, Kala zeera in Kashmir, particularly in Gurez, is experiencing marketing difficulties. There are technologies available that can ensure the highest quality of Gurez zeera, for which it is famous not only in Kashmir but throughout the country. The J&K government's creation of a spice park at Pampore is a step in the right direction to facilitate marketing of indigenous low volume high value spice crops like zeera. The activities carried out as part of an NMHS-funded research project on Kala zeera are expected to increase overall kala zeera production from 129 kg per ha to 300 kg per ha. The policy makers might design a Kala zeera improvement policy to spread Kala zeera farming to non-traditional areas using SKUAST-K technologies that will not only maintain the crop's indigenous germplasm but also improve its overall production and productivity. As a result, there is a need to boost zeera farming with better marketing solutions. Improving the kala zeera marketing value chain with structured marketing channels, implementing measures to prevent adulteration, value addition and introducing Gurez zeera branding will undoubtedly improve the livelihood security of over 2000 farm families of Gurez which are directly or indirectly involved in this trade. This report is an attempt to report indigenous crop diversity in kala zeera germplasm, value addition and to highlight the problems of kala zeera marketing in Kashmir valley so that remedial measures can be taken to benefit growers and to encourage their participation in the kala zeera value chain. Growers of kala zeera in Gurez could be encouraged to form Farmers' cooperatives, which could be linked to small-scale industries that could produce value-added products with the help of rural youth. Such cooperatives could eventually be linked to national and International markets to boost farm economy and improve livelihood security of tribal farmers of Gurez.

**Economic importance of Kala zeera**

The economic importance of Gurez zeera can be understood by its price. Which is local market is around INR7000 to 8000 per Kg. Because of such market value it is often subjected to fraudulent substitutions and adulteration with grass seeds coloured with charcoal dust and strikingly similar seeds of *Cuminum cyminum* (*safed zeera*) another flowering plant of family *Apiaceae* native to Middle East, India, China and several Mediterranean countries (Mnif and Aifa 2015). It is also sold as *kala zeera* powder thus losing any distinctive morphological features of the species, making fraudulent substitutions or adulteration is easier. Adulterant detection and authentication of raw materials for food quality and safety assurance is important for regulatory agencies, processing industries and even consumers (Lees 2003; Che Man *et al*. 2005).

**Conservation of Indigenous Biodiversity**

- Tribal farmers of Gurez could be taken on board to promote on-farm conservation activities. Such farmers could be aided with crop incentives to decrease resource loss to agro-biodiversity.
- Survey of kala zeera growing areas of Gurez for identification of local biodiversity hotspots and inclusion of those area under Agro-Biodiversity Index (ABI) to safeguarded the diversity of the crop. Such efforts shall assist policy decision-makers, investors, consumers and farmers in ensuring the long term sustainability and protecting the diversity of this crop.
- The germplasm banks/ gene sanctuaries/agro-biodiversity hotspots can be established for *in situ* crop conservation, establishment of agro-biodiversity-related business in these hotspots that may result into opening of more job prospects for young people.
- The biodiversity rich areas in kala zeera could be documented under People's Biodiversity Registers (PBRs) which could support certification/ branding of zeera, such as organic certification and Geographical Indications (GI), is important for better monetary benefits. GI tagging of Gurez-zeera and its organic certification could be a priority for Government agencies.

- It is critical to create a national database on crucial crop plants. These resources, as well as their associated traditional knowledge, must be mapped by agro-climatic zone, which is required for their conservation.
- To ensure constant availability of good quality seed materials, traditional farmer's varieties/landraces should be conserved using both in-situ/ on-farm and ex-situ approaches.

**Conservation of wild relatives (CWR)**

- It is necessary to record, conserve and characterize crop wild relative with high economic and medicinal value. The core gene pool must also be prioritized for mapping of highly significant crop wild relatives.
- It is important to emphasize the cryopreservation of CWR and endangered plants; alternate conservation strategies like DNA and pollen must also be cryopreserved.
- In addition to creating international, national and regional networks and discovering CWR traits, inventories and checklists should be carried out for *in situ* conservation of CWR.

**Institutional and policy improvement**

Agro-biodiversity hotspots must be designated as Biodiversity Heritage Sites (BHSs) by the responsible State in accordance with Section 37 of the Biodiversity Act. About 22 agro-biodiversity hotspots have been recognized by the Plant Variety Protection and Farmers Right (PPV & FR) Authority, and state governments may consider designating them as Biodiversity Heritage Sites.

i The forest tribes' farmers must be compensated for their efforts in preserving the crop wild related in the forest areas.

ii As a key priority, provide a thorough note for traditional breeding.

iii Guidelines for the utilization of Local Biodiversity Funds, State Biodiversity Funds and National Biodiversity Funds, as well as processes for transferring benefits to benefit applicants, must be developed.

iv A single network integrating PPV&FRA, State Biodiversity Boards, National Biodiversity Authority, Biodiversity Management Committee, Patent Office, and others must be developed in order to make the entire process of processing Access and Benefit Sharing (ABS) application forms transparent and simple.

**Policies of Government of Jammu &Kashmir towards conservation of local diversity in Kala zeera**:

The natural legacy of Jammu and Kashmir comprises of lovely landscapes, treasure houses of significant genetic and ecological variation and endemic biodiversity hotspots. Our wetlands and biodiversity zones, particularly those in altered climatic regimes, serve as nature's laboratory for wild species' adaptation to changing environmental conditions. As a consequence, the government may profit from this unique resource base as long as proper Intellectual Property Rights (IPRS) for ethno-biological knowledge are granted to local communities and genetic resources are protected. Our state is seeing an alarming pace of biodiversity loss, particularly the danger to local germplasm. Leading causes of this issue include climate change, land degradation, the spread of invasive and alien species, unsustainable patterns of production and consumption, and the extraction of natural resources.

**The following techniques should be used to offer feedback about the loss of genetic diversity as part of a large exercise to establish state policy:**

- ❖ Preservation of areas with abundant indigenous genetic resources, facilitating these resources and offering other livelihoods for the local population.
- ❖ Kala Zeera local accessions/ genetic material must be preserved across the area/ locality/ state. In addition, in-situ and ex-situ genetic resource conservation should be adopted in gene banks.
- ❖ Establish mechanisms to guarantee that the advantages of facilitating access to genetic resources, such as conventional knowledge, technology and intellectual property rights are distributed evenly among Gurez's communities where the genetic material is sourced.
- ❖ The knowledge of local communities should be safeguarded, respected, mutually benefitted and they should be encouraged to participate in protection of local germplasm assets.