

Black ginger: Importance, cultivation and prospects for Mizoram

Black ginger (*Kaempferia parviflora*) is an emerging crop, highly prized for its medicinal and industrial uses. It is a rich source of methoxy flavones which have huge potential for pharmaceutical uses such as anti-allergen, anti-cancer, anti-inflammatory, and also enhance sexual performance. In Mizoram, it is locally used by chewing a small piece of fresh rhizome for the treatment of stomachache and dysentery. It is predominantly found in the Northeastern part of India and its cultivation is favoured by pleasant climate throughout the year. Black ginger is found scattered in forested areas under partial shade and cultivation is mainly done for domestic uses and not for commercial purpose. Despite its globally recognized importance, the crop remains underutilized. Two key factors contributing to this underutilization are limited scientific understanding of optimal cultivation methods and lack of suitable genotypes for commercial cultivation. In order to harness the full potential of this crop, the development and implementation of standardized cultivation protocols are imperative for its successful commercialization in the region. Furthermore, conducting surveys, collecting germplasm, and evaluating accessions are essential steps in identifying superior genotypes with desirable traits.

BLACK ginger (*Kaempferia parviflora*), which is commonly known as *Aidum* (in Mizo); *Kala Adrak* (in Hindi); Black galangal, Black galingale, Thai Black ginger or Thai ginseng or *Kra-chai Dam* or *Kra-chai Dum* (in Thai); and *Na-Nwin-Net* (in Burmese) is an important underutilized rhizomatous medicinal plant belonging to the family Zingiberaceae. It is a perennial herbaceous crop with chromosome number $2n = 22$, usually grown as annual for its rhizomes. The genus *Kaempferia* consist of several species (about 60 species) of which *Kaempferia galanga*, *Kaempferia parviflora*, *Kaempferia rotunda*, *Kaempferia angustifolia* and *Kaempferia pulchra* are considered as the most widespread species. Black ginger is native to Southeast Asia, particularly Thailand and is widely distributed in India, Bangladesh, Bhutan and Myanmar. It has attracted the attention of many researchers since the past two decades for its active phytochemicals which have huge potential for pharmaceutical industries. It is proved to have potential for treatment of allergy, breast cancer, inflammatory - related diseases and enhance sexual performance. Apart from its medicinal uses, it is also used in cosmetic composition to prevent skin-aging and improve skin-whitening. It can be used in fresh form or processed into different products. There is a great scope for export in the form of dried rhizomes, black ginger powder, oleoresin, etc. The significance and importance of the crop have been mainly focused in South

East Asian countries while in India, research is still at a budding stage. The rhizomes are found to possess various health promoting compounds that have been utilized in traditional medicines for centuries. Several studies have found methoxy flavones to be the main component of black ginger rhizome extract. There are also some benefits attributed to the other plant parts, such as the leaves, flowers, and stalk, which could be used as valuable alternative sources for extracting bioactive compounds.

Black ginger is predominantly cultivated in Northeast India, however, in small quantity. Up till now, it has remained underutilized in most regions. It is found across Mizoram in moist environment under partial shade in forested areas. The importance of this crop needs to be addressed among the masses for crop exploitation, commercialization as well as for conservation. However, the crop receives little attention and remains underutilized due to ignorance. Moreover, standard scientific cultivation practices using suitable genotype is important for good growth and yield of crop.

Botanical description

Black ginger is a short stature, erect herbaceous plant that can grow up to a height of 20-25 cm. Some genotypes can reach a height of 90 cm. The rhizomes are sub-globose to globose, small in size, grayish to grayish brown in colour, fleshy with deep violet to dark purplish



Morphological features of black ginger plant, rhizomes, leaves and flowers

colour, thus popularly called black ginger. The rhizome has buds that will grow into an individual plant. The leaves are erect, glabrous, 7-15 cm long, 5-10 cm wide, ovate in shape, rounded at the base, wavy margin, green in colour with dark red leaf margin, which is the specific characteristic of black ginger. The length of petioles ranges from 1-10 cm. The inflorescence appears on the terminal of the stem between the leaves. Flowers are small, irregular or bilaterally symmetrical, few in a stalkless central cluster, white in colour with labellum which is purple colour and darker in the middle. Flowering time starts from May – June.

Importance and traditional uses

Black ginger is an important source for naturally derived medicines, which is preferred now-a-days. It is used as a spice and medicine to treat a variety of ailments and is rich in antioxidants. It also has anti-allergenic, anti-cholinesterase, anti-inflammatory, anti-obesity, anti-cancer, anti-pyretic, anti-hypertensive, anti-mutagenic, anti-plasmodial, anti-osteoarthritis, anti-gastric, anti-microbial, anti-fungal, anti-acne, anti-diabetic, aphrodisiac, neuroprotective and anti-coagulant properties. It has been used traditionally for treatment of ulcers, stomachache, colic disorder, inflammation, diarrhoea, dysentery and as a tonic. In Mizoram, only few people have knowledge about the crop and majority are not aware of the

medicinal potential of the crop. The rhizomes are eaten fresh by chewing small rhizome piece or consumed after crushing and extracting the juice to relieve stomach ache and chronic ulcers. The rhizomes are also processed into powder form and stored in jars for treatment of dysentery. It is grown mainly in kitchen garden and small areas in *jhum* lands with other crops, solely for domestic consumption and use.

Cultivation

Climate: The crop prefers tropical climate with a temperature range of 21-30°C. It requires warm and humid climate for cultivation. It prefers shaded areas and performs exceptionally well under partial sunshine in net houses. Although it is a shade loving crop, it can be grown in open fields with good yield. The Northeastern states of India provide an optimal climatic environment, characterized by a pleasant temperature regime throughout the year, which facilitates the vigorous growth and cultivation of this crop.

Soil: The soil should be well drained, friable, aerated and rich in organic matter. Sandy loam soil with pH ranging from 4.5-6.5 is best for the crop. The crop cannot withstand water stagnation or water logging, which is a pre-disposing factor for rhizome rot. However, it is more tolerant to rhizome rot and leaf spot diseases when compared to ginger crop. Proper drainage should be

maintained especially during rainy season (June-August). Compact soils are not suitable for cultivation as it hinders rhizome development.

Land preparation: Land preparation should be carried out during summer months (March-April). The field should be ploughed 2-3 times thoroughly to bring the soil to fine tilth. Raised beds of 1 m width, 30 cm high and of convenient length should be prepared. A drain of 50-60 cm should be maintained between the beds. Stones and gravels should be removed from the field. Farmyard manure at the rate of 10-15 t/ha should be applied to soil during land preparation. Application of 400 g of neem cake/m² of raised bed 15 days before sowing, and watering at 3-5 days interval also helps in killing soil insects and pathogens.

Seed treatment: The crop is propagated by cutting rhizomes weighing about 25-30 g, having 2-3 healthy buds. The seed rhizome has a dormancy of about 5 or 6 months. A shoot appears from the bud, once the dormancy is broken. Studies have found that BAP (150 mg/L) and Ethephon (600-750 mg/L) are optimum concentrations to promote dormancy breaking in black ginger. The seed rhizomes are treated with carbendazim (2 g/L) or Carbendazim 12% + mancozeb 63% WP @ 2 g/L for 30 minutes and shade-dried for 24 hours before sowing. In organic farms, seed treatment can be done by mixing seed rhizomes with *T. viride* @ 6-10 g/kg of rhizome.

Planting: The best time for planting is summer season with the onset of monsoon. In Mizoram, seed rhizomes are sown during April-May. Small pits are dug to which Carbofuran 3G @ 5 g/pit and farmyard manure @ 100 g are added. The crop spacing should be maintained at 30 cm × 25 cm. After planting, light irrigation is given and care should be taken when using bioagents. The soil should be kept moist as moisture is an essential factor for the growth and survival of the fungus.

Intercultural operations: In Mizoram, black ginger is generally cultivated as a rainfed crop. Supplementary irrigation is given in case of delayed rainfall. Weeding is an important intercultural operation and frequent weeding is required especially during rainy season. Generally, 2-3 hand weeding are recommended during sprouting, rhizome formation and development stage.

Cultivars or varieties: Although this crop is very popular among the Southeast Asian countries with many

superior varieties, no variety has been released for this crop in India till date. However, among the local cultivars, accession no. IC-0647186 (JKS/BL/SD/221) gives better rhizome yield.

Manures and fertilizers: During land preparation, 15-20 tonnes of FYM is required for healthy crop growth. A fertilizer dose of 80:50:50 kg/ha of NPK in the form of Urea, Diammonium phosphate and Muriate of potash is sufficient for healthy crop.

Pest and diseases

No pests and diseases have been reported so far under Mizoram condition. However, it has been found to be more tolerant to leaf spot and rhizome rot.

Cropping system

It is mainly grown as a sole crop; however, it is also suitable for intercropping due to its short stature, slow growing nature and partial shade preference.

Harvesting

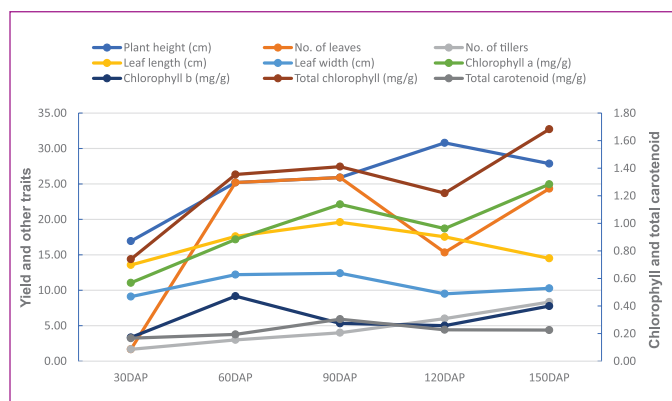
The crop is ready for harvesting in about 7-8 months. Harvesting can be done from the month of December to mid-January using a hand hoe. The soil is moistened before digging the rhizomes to avoid rhizome injury. The soiled rhizomes are then washed thoroughly with clean water. After washing, the rhizomes are sun dried and graded. The growth rate of rhizomes is low, the crop under good agronomic practices can yield 5-7 t/ha of fresh rhizomes having a dry matter of 15-17%.

Processing and value-addition

Black ginger rhizomes can be processed into powder form after harvesting from field within three days. Soil debris and rootlets are removed from the rhizomes and washed thoroughly. After washing, the rhizomes are kept for air drying in a clean room. Rhizomes sliced at 5 mm thick are then dried in hot air oven at 50°C for 48 hours. The dried rhizomes can be packed in air tight container or can be grounded into powdered form. Oleoresin is also an important processed product of international trade. Black ginger oleoresin can be extracted through Soxhlet apparatus using different solvents like ethanol, acetone and petroleum ether, etc. The oleoresin yield of black ginger ranges from 7-11%. The presence of diverse



Maintenance of weed free plots using hand-hoe at crucial crop stages.



Performance of the best performing genotype (IC-0647186) for growth, yield and quality traits

bioactive compounds in Black ginger presents significant opportunities for its application in the pharmaceutical and cosmetic industries.

Future prospects of cultivation in Mizoram

Although the importance of black ginger has been studied enormously in other countries, this crop remained underutilized in our country. Although there is a wide array of black ginger germplasm in Northeastern part of India, little to no research has been done on the crop. Mizoram is home to a variety of underutilized crops, of which black ginger presents great potential for exploitation. Thus, extensive survey, collection, characterization and evaluation of germplasm and further selection of high yielding genotypes with good quality parameters are important. Prior to the genetic diversity of crops being lost, germplasm conservation must be done. The scientific potential of this crop has to be fully explored in order to increase production and create opportunities for it for cultivation on a national level.

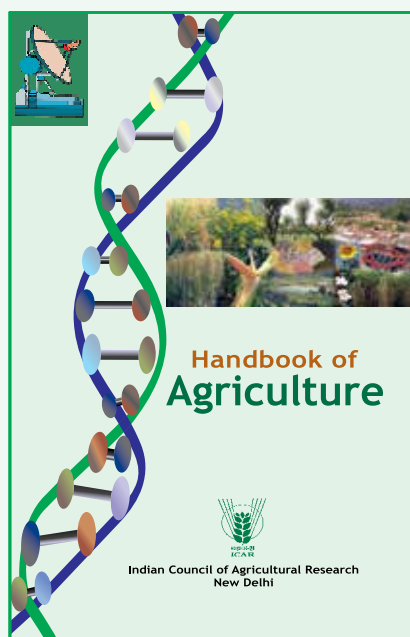
SUMMARY

The climate of Mizoram is ideal for growing black ginger. The crop is mostly restricted to kitchen garden and is used medicinally by some Mizos. The crop remains underutilized and the potential of this crop is still unknown to many. Scientific agronomic practices for cultivation of this crop are necessary for good cropping and higher production. Crop exploitation begins with a comprehensive investigation, the collection of germplasm, characterization, and evaluation. Development of high yielding genotypes with good quality traits is necessary for commercialization of this crop. This crop is thought to be the next significant medicinal plant because of its bioactive compounds, considering its importance and therapeutic potential.

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TECHNICAL SPECIFICATIONS

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