



GINGER

Advanced Package of Practices of Ginger



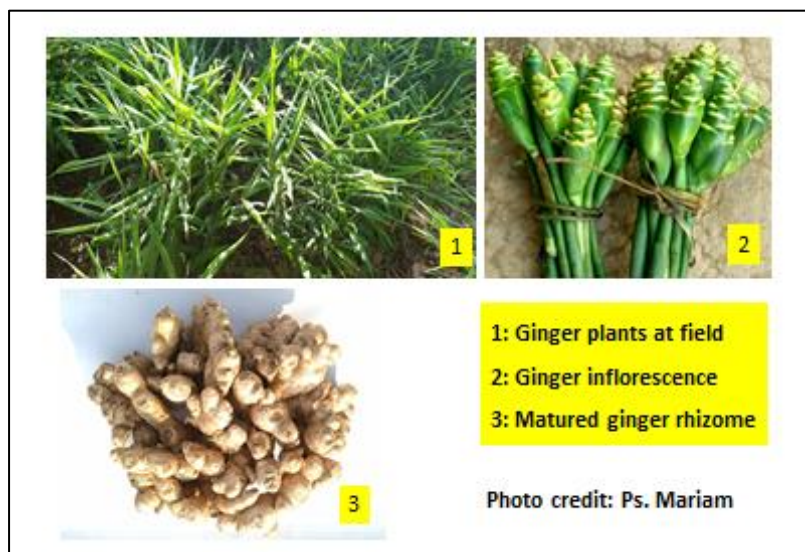
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Spices and condiments are one of the main agricultural commodities of north east region of India, which have distinct taste and flavour in the culinary art. Northeast is home to a very unique range of spices and condiments from underutilized to commercial spices such as ginger, turmeric, large cardamom, Naga king chilli, dried pepper long, tejpat, cinnamon, chinese chive, hooker chive, winged prickly ash, bird's eye chilli, star anise, basil, etc. The important spices under commercial or large-scale cultivation in the region are large cardamom, turmeric, ginger, black pepper, chillies, including king chilli. Among the spices and condiments, ginger is the most important spice crop in the states of north east region and accounted for more than half of the total area under all spices and condiments followed by chilli and turmeric. Soil and climatic conditions of the region are congenial for large scale cultivation of a variety of spices. Ginger is a high value and low volume commodity of commerce in the world market if cured and processed (e.g. Oleoresin, essential oil, powder, dried flakes, etc.). Thus, adoption of advanced production technology for enhancing the production of ginger will be a route to increase farmers' income, thereby accelerating the overall economic growth of the region and marketability of produce from this region.

Ginger (*Zingiber officinale* Roscoe) belongs to the family Zingiberaceae. It comes under major spices and is ranked as the fifth important spices grown in the country after black pepper, small cardamom, chilli and turmeric respectively. It is commercially grown

in all the states of north eastern region of the country. Originated in South East Asia, ginger has been cultivated in India and China since ancient times. It is a herbaceous perennial plant but largely cultivated as annual crop. Ginger rhizome is used as spice for flavouring food, beverages and other products. It is also used in pharmaceutical as carminative, stimulant and flavourant. It can be used to cure arthritis, sore throat and vomiting. It has medicinal properties like anti-cancer, anti-microbial, anti-oxidant, spasmolytic, immune booster, etc.



Ginger rhizome can be used as fresh or cured form. The main economic part of ginger is the underground rhizome. However, the tribal people of the region used its leaves and inflorescence as vegetables for culinary purposes. From fresh ginger different value added products are prepared and commercialised, e.g. ginger paste,

ginger tea (flavoring), dried powder, preserved slices, candy, oleoresin, essential volatile, etc.

Ginger is cultivated in most of the states in India. However, it is mainly grown in the states of Karnataka, Orissa, Gujarat, Assam, Meghalaya, Arunachal Pradesh and other parts of North East hill region. The production in these states together contributes 65 per cent to the country's total production.

Table 1: State-wise area, production & productivity of ginger in North East India

State-wise	Area (‘000 hectare)	Production (‘000 tonnes)	Productivity (t/ha)
Arunachal Pradesh	7.70	56.60	7.35
Assam	18.70	166.50	8.90
Manipur	2.40	3.80	1.58
Meghalaya	9.90	66.40	6.71
Mizoram	8.20	60.00	7.32
Nagaland	3.70	50.20	13.57
Sikkim	12.30	55.90	4.54
Tripura	1.80	7.60	4.22
Total	64.70	467.00	7.22

(Source: Horticulture Statistic at a glance, DAC & FW, 2017)

India is the largest producer of ginger in the world. In the country, Assam is the largest producer of ginger in NER, Assam ranks first in ginger acreage as well as production (Table 1) but productivity is highest in Nagaland (13.57 t/ha) followed by Assam (8.90 t/ha) and Arunachal Pradesh (7.35 t/ha). Meghalaya is the second largest ginger producing state (66,400 t from 9,900 ha area). The ginger production (3,800 t) and productivity (1.58 t/ha) is lowest in Manipur.

Climate and soil

Ginger grows well in warm humid climate. It can grow up to 1500 m above mean sea level. In the north eastern region, it is grown mainly as rainfed, from moderate sloppy land to plain area. The crop grows well in areas with an annual rainfall between 125 to 250 cm. However, it is sensitive to water logging condition. The crop requires moderate rainfall from sowing to sprouting however prevalence of high humidity and well distributed rains with partial shade during crop growth followed by dry weather for about a month before harvesting are desirable. It requires dry weather with a temperature ranges from 28-30°C for about a month before harvesting. It grows well in sandy loam, clay loam, red or laterite loam soil rich in humus, light, loose, friable and well drained. However, it is not suitable to grow ginger in the same soil year after year as it is an exhaustive crop. The suitable soil pH ranges from 6.0 - 6.5.

Varieties

The region has rich diversity of ginger which are grown and maintained by the farmers. The local cultivars found in the region are small, fibrous and very pungent known as Shingkha (Manipur) and

Adi Kekir (Arunachal Pradesh) which is mainly used for medicinal and rituals purpose. In Arunachal Pradesh mainly two local cultivars are grown, lemon yellow flesh and the other is bluish core of rhizome. These local cultivars are more preferred by the indigenous people of the region due to pungency and good flavour even though they are fibrous in texture. The local varieties of ginger contain higher quantity of gingerol.

A large number of local cultivars such as Bola ada, Maranada, Jatia ada, Kekir, Bazar Local, Naga Shing, Thingouri, Shing Bhoi, Shing Bhukir, Khasi Local, Tura, Thinglaidum, Thingpuidum, Thingria, Jugijan, Vichii, Nagaland Local, Bhaisey, etc. are grown in the region.

Based on the quantity and quality requirement, selection of suitable variety for higher production is of prime important. Varieties suitable for high yield are Surabhi, Maran, Mahim, Suprabha; for high dry recovery are Surabhi, Surachi, Nadia, Maran, Tura; for less fibre are Mahima, China, Thingpuri; high oleoresin: Surachi and China; High volatile oil: Rejatha, Sleeva local, Narasapattam, Emad and for high altitude are Suprabha, Surachi, Suravi, etc.

Advanced proved Production Technology

Improved production technology is required for higher production of ginger.

Land preparation:

The land should plough 4 to 5 times or dig thoroughly with onset of early summer showers to bring the soil to fine tilth. Ginger can be grown in bed (flat or raised) and ridges and furrows systems

depending upon the rainfall and soil type. It can be grown in pot or poly bag in the urban area where land is the limiting factor. Beds of about 1 m width, 30 cm height and of convenient length are prepared with an interspace of 50 cm in between beds. Solarization of beds for 40 days using transparent polythene sheets (100 micron thickness) is recommended for areas prone to rhizome rot, bacterial wilt disease and nematode infestations. It should be done after ploughing of land.



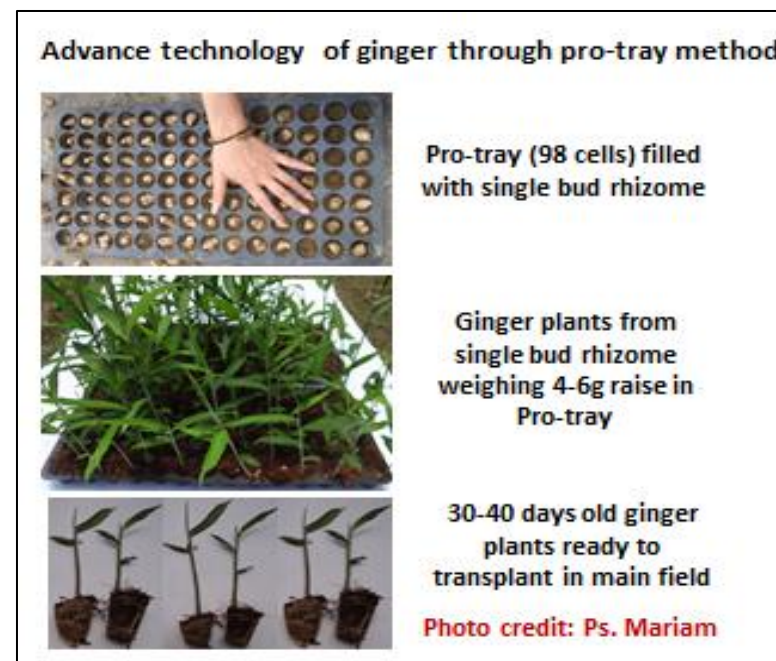
Planting

Ginger is propagated through finger rhizome (sett) weighing about 20-30g having 1-2 buds. The quantity of rhizomes required for planting of one hectare is about 1500 to 2000 kg. Before planting, the rhizomes should be treated with Mancozeb @ 0.3% (3g per litre of water) and Quinalphos @ 0.75% (0.75ml/litre of water) and stored in gunny bag for 2-3 days to promote early, uniform sprouting and protect from pest and diseases.

Transplanting

Ginger can also be propagated through transplanting of rhizome seedling. It is an advanced method for production of planting materials. Its advantages are production of healthy disease free

planting materials, easy transportation, reduction of seed rate and eventually reduced cost on planting material. The seed rate under this advance technology through pro-tray method is about 400 to 500 kg per hectare which is far below the normal seed rate. The advance technology developed by ICAR-IISR, Kerala is given below:



Firstly select the healthy ginger rhizome for seed purpose and treat with mancozeb @ 0.3% and quinalphos @ 0.075% for 30 min and store in well ventilated place. One month before planting, the seed rhizomes are cut into single buds with small piece of rhizomes weighing about 4-6 g. Treat the single bud sprouts with mancozeb 0.3% for 30 min before planting to protect against the fungal

infection. Fill the pro-trays (98 cells) or bigger size hole with nursery medium containing partially decomposed coir pith and vermicompost (3:1), enriched with PGPR/Trichoderma @10g/kg of mixture. Plant the ginger bud sprouts in pro-trays and maintain the pro-trays under shade net house. Apply water as per requirement with rose can or by using sprinklers. Seedlings will be ready within 30-40 days for transplanting in the main field. The yield level of ginger transplants is on-par with conventional planting system.

In the region, planting of ginger starts from February under hill condition but the main planting time is during March-April with the optimum spacing of 25x30 cm (plant to plant and row to row). The seed rhizome is placed to a depth of 5-10cm in pit and cover with soil. Mulching with paddy straw or dry leaves may be done to protect sprouts, conserve moisture, prevent soil erosion, minimise weed growth and to enhance germination. Proper drainage system to avoid water stagnation is necessary as the crop in the region is usually grown as rainfed.

Manuring

In the region mostly the crop is grown without any manures and fertilizers. However to increase the productivity 20-25 t/ha of FYM and 120:25:25 NPK kg/ha can be applied (Urea 260 kg + SSP 156kg + MOP 42 kg). At the time of land preparation full dose of FYM, phosphorus, potassium and half dose of nitrogen should be applied. Further, the remaining nitrogen can be applied in two split at 60 and 90 days after planting @35kg/ha each followed by earthing up for proper growth and development of crop. Foliar application of micronutrient mixture (5g/litre) will boost up the yield of crop.

Manuring should be done after weeding for proper growth and development of crop.

Mulching

Mulching the ginger field is a useful operation as it gives several advantages. Mulching can be done with green leaves, organic wastes like straw, stovers, dry coconut, oil palm leaves, dry grasses before flowering, etc. It conserve moisture, add organic matter to the soils, smoothers weed growth, prevent splashing and erosion of soil due to heavy rain. It also provides favourable conditions for the sprouting of the setts and protects sprouts from hot sun.

The first mulching may be done at the time of planting with green leaves. Application of dried leaves or paddy straw as mulch in ginger is also recommended for effective weed control. Green leaf mulching is to be repeated at 45 and 90 days after planting, immediately after weeding, application of fertilizers and earthing up.

Interculture operation

Two weeding are necessary for better growth and rhizome development during June to September depending upon the intensity of weed growth. Weeding is done just before the application of fertilizer and mulching. Proper drainage channels are to be provided if there is stagnation of water. Earthing up is necessary to cover the exposure of rhizomes and provide sufficient soil volume for free development of rhizomes. It is done immediately after weeding and application of fertilizers. If weeding and earthing up is not done on time rhizome yield may be drastically reduced.

Intercropping and crop rotation

Continuous cultivation of ginger depletes the soil fertility as it is an exhaustive crop as well as promotes incidence of pests and diseases. Therefore, it may be rotated with other crops or planted as an intercrop with legumes and vegetables. Also, it can be grown as an intercrop in maize, coconut, arecanut, coffee, mandarin, mango, guava and grapes. It can be grown successfully under an agro-forestry system and intercrop in an orchard as ginger is a shade-loving plant. Under irrigated conditions of lands, ginger is rotated with banana, turmeric, onion, garlic, chilli, vegetables, sugarcane, etc.

Irrigation

Generally, the crop is grown as a rainfed in the north-east region of India. However, for increasing production, the crop can be irrigated at 4-10 days interval depending upon the moisture of the soil. Irrigation at fortnightly intervals is desirable from mid-September to the 3rd week of December.

Harvesting

Traditionally, marginal farmers practice harvesting of mother rhizome in the early part of crop growth after the daughter or finger rhizomes are developed, to sell in the market. This practice is not advisable as it spreads disease to the crop through tools and implements while removing the mother rhizome.

Generally, depending upon the varieties and purposes (fibre, essential oil or pungency), the crop comes to harvest in 6-8 months. For green ginger, along with the plant is harvested at 6 months and for preserved ginger, rhizomes are harvested at 7 months when the plants



shows yellowing colour. However, for dry ginger, the matured rhizomes are harvested at 8 months after planting when it attained full maturity i.e. when the leaves turn yellow and plants dry up.

Light irrigation may be given before harvesting for easy digging of the rhizome if the soil is hard. But under sandy loam soil application of irrigation is not necessary. In large scale cultivations, tractor or power tiller drawn harvesters are also used for harvesting the rhizomes. The rhizomes should be carefully cleaned and sun-dried for a day or two before marketing. In the region late harvest is also practiced, as the crop does not deteriorate by leaving it for some months underground soil. The advantage of late harvest is that it fetches higher price as the ginger is not available in the market during the lean period. For consumption fresh green ginger is preferred while for export or commercial market, dried ginger of bleached and unbleached are in demand.

Yield

Properly managed crop gives an average fresh rhizome yield of about 15-25t/ha.

Plant protection

Shoot borer (*Conogrethes punctiferalis*): Its larvae bore into the pseudostem and feed on growing shoots extruding frass resulting in yellowing and drying of leaves. It can be controlled by spraying of Malathion @ 0.1% (1ml/litre of water) or Neem gold @ 5ml/litre of water at monthly interval during July to October.



Rhizome scale (*Aspidiella hartii*): It infest in field at later stage or in storage. It feeds on sap of rhizome which becomes shrivelled affecting germination. It can be managed by timely harvest and treat the rhizome with quinalphos (0.075% or 0.75ml/litre) for 20-30 minutes before storage and planting.

Soft/Rhizome rot (*Pythium sp.*): It is a serious soil borne disease, showing yellowing of leaves, drying up of shoot & decaying of rhizomes with foul smell. Treat the rhizome with mancozeb 0.3% or thiram 0.25% for 30 minutes before storage and planting as well spray or drench with Bordeaux mixture 1% at 30 days interval at standing crop.

Bacterial wilt (*Fusarium sp.*): Application of CaCl_2 @ 3% + Seed treatment with Mancozeb 0.2% + Quinalphos 0.75% or bioagent (*Bacillus sp.*) decrease the incidence of disease. Solarisation of soil with transparent polythene sheet of gauge 100 micron for about 40-50 days prior to planting helps in controlling bacterial wilt while increasing yield and quality (Pasighat Co-opted centre, 2019).

Leaf spot: Spray 1 per cent Bordeaux mixture, 0.3 per cent mancozeb or 0.2 per cent thiram for controlling of leaf spot of ginger.

Post-harvest management

Preservation of seed rhizomes for planting

Ginger is harvested during December-January and planted during the month of April-May. Hence, there is a need to preserve the rhizomes for a period of about 3-4 months. The selected healthy rhizomes are treated with a solution of 0.1% Quinalphos and 0.3% Dithane M 45 for 30 minutes in order to protect from pest and diseases. The rhizomes are stored in pit dug in a cool and protected place. Layer of sand is spread at the bottom of the pit. Keep alternate layer of rhizomes with dry sand or saw dust keeping some gap at the top of the pit for aeration. Pit is covered with wooden planks and plastered with mud making 1 or 2 holes for aeration.

Curing of fresh rhizome for dried ginger

Fully developed rhizomes are harvested after 8 months of planting for preparation of dry ginger. Preparation of commercial dry ginger involves a series of steps as described below:

- (a) **Soaking in water:** Rhizomes are soaked overnight in cement tubs for easy removal of skin.
- (b) **Peeling:** The skins of gingers are peeled off, with sharp bamboo knives. Do not rupture epidermal cells. Peeling hastens drying process.
- (c) **Washing and Drying:** The peeled rhizomes are washed and sundried for 3-4 days on cement floors with frequent turning for uniform drying.

- (d) **Polishing:** After drying the rhizomes are polished by rubbing with a coarse cloth to remove all bits of skin or dirt. These are unbleached dried ginger.
- (e) **Bleach ginger:** To get bleached ginger, peeled rhizomes are soaked in 2% lime water for 6 hours and fumigated with sulphur for 12 hours. The bleached gingers are white in colour and more attractive in appearance.
- Yield of dry ginger is about 16 to 25% of the fresh ginger. It can store longer period, convenient to transport, higher value with low volume.

Value addition of ginger for higher income

Value addition is the highest recognition of the value of the product through processing, packaging and marketing. It is the process of changing or transforming a product from its original form to a more valuable form. Many value-added products are used and impart a special taste to food preparations. Value addition has several advantages viz. it is simple to carry, having long-lasting flavours, with low bacterial contamination, having higher income from food and pharmaceutical industry. Ginger can be processed as dry ginger, preserved ginger or various value added products such as candy, pickles, oil, oleoresin, shreds, flakes, chutney, powder, paste, salted, crystalized, soft drinks, etc.

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