

GINGER

PRODUCTION AND POSTHARVEST MANAGEMENT

INTRODUCTION

Ginger (*Zingiber officinale* Rose, $2n = 2x = 22$) is an important spice crop of the world. It is a valuable cash crop and plays an important role in Indian Ayurvedic medicine as a folk remedy to promote cleaning of the body through perspiration, to calm nausea, and to stimulate the appetite. Ginger tea is also used as a carminative and in the symptomatic treatment of colds. Ginger contains gingerol, an oleoresin (*combination of volatile oils and resin*) that accounts for the characteristic aroma and therapeutic properties. Components of gingerol (*zingiberone, bisabolene, camphene, geranial, linalool and borneol*) possess beneficial properties for the treatment of poor digestion, heartburn, vomiting and preventing motion sickness. It is originated in India and grown in almost all the states. In India, share of Kerla is the maximum in production (19.0%) from an area share of (18%). It is also grown in Himachal Pradesh, Uttarakhand, Assam, Orissa, Jammu & Kashmir and in North East states like Meghalaya, Sikkim, Mizoram, Manipur, Tripura, Nagaland and Arunachal Pradesh. East Siang, West Siang, Basar, Darang are major ginger producing area of Arunachal Pradesh.

CLIMATE AND SOIL

Ginger requires tropical, subtropical, and humid climate for its commercial production. It can be grown successfully to an altitude of 1500 m. A well-distributed (8-10 months) rainfall (1500-3000 mm) during growing season and dry spells during land preparation as well as before harvesting is required for good growth and yield of the crop. Dry weather with a temperature range of 28-30°C for about a month before harvesting is ideal. High humidity throughout the crop period is necessary. Ginger prefers good garden soil, rich in humus, light, loose friable, well drained and of at least 30 cm depth. Rhizome growth is better on slightly acidic soil (pH 6.0 to 6.5).

VARIETIES

Most promising varieties of ginger are Nadia, Maran, Rio-de-Janeiro, China, Wynad Kuruppampadi, Ernad, Suprabha, Suruchi, Surabi, Varad and Himgiri.

PLANTING

In North India, planting of ginger is done with onset of monsoon. In Eastern India, planting is done in March. The method of land preparation depends on the soil and climatic conditions. Usually beds of 1.0 m width, 15cm height and 3-6 m in length with 30 cm wide channels between beds are made. Ginger is universally propagated from cuttings of rhizome, known as bits. A direct relationship has been established between size of planting material and final yield. Bits are made from mother rhizomes having 3-5 cm in length, 15-20g weight (15g is optimum) and at least one sound bud. A seed rate of about 15-20 q/ha is considered to be optimum for planting. Before planting bits should be treated with fungicide (Dithane M-45 @ 0.25% or Agallol @ 0.5%) as a safeguard against soft rot and to induce early sprouting. The spacing for planting of ginger should be kept 25-45 cm between rows and 15-20 cm between plants.

MANURES AND FERTILIZER

Well rotten cattle dung or compost at the rate of 25-30 t/ha should be applied at the time of planting. The amount of inorganic fertilizers depends on the fertility of soil and organic manure used. It ranges between 100-120 kg N, 75-80 kg of P₂O₅ and 100-120 kg K₂O per hectare. Half of nitrogen, entire quantity of P₂O₅ and K₂O should be given as a basal dose. Rest of the nitrogen should be applied as a top dressing in two equal doses at 45 and 90 days after planting.

SHADE AND MULCHING

One row of maize in every inter-row space of ginger with maintenance of 100% maize population and application of additional fertilizer to maize additional yield of good ginger and maize can be obtained. Mulching is essential as it enhances sprouting, increases infiltration and organic matter. First mulching should be done at the time of planting with quick rotting green leaves at the rate of 10-12 t/ha or with dry leaves at the rate of 5-6 t/ha. It should be repeated after 45 and 90 days after planting. Any

locally available mulch material like coconut leaves, green leaves, tree leaves, banana leaves, dry grass, paddy straw or cane trash etc. can be used for ginger cultivation.

WATER MANAGEMENT

Water requirement of ginger has been estimated between 1320-1520 mm. The crop raised in the month of April-May needs 2-4 initial watering at an interval of 7 days depending upon the type of soil. After this the crop receives monsoon rain and comes up well till end of September. Subsequently the crop has to be given watering commencing from middle of October and end of December at 15 days intervals. In ginger cultivation sprouting, rhizome initiation and rhizome development are critical stages of irrigation.

WEED MANAGEMENT

Two weedings are generally given to the ginger crop. First weeding should be done just before the second mulching. It is repeated depending on the intensity of weed growth or at an interval of 45-60 days. During hoeing, every care should be taken so that the rhizomes should not be disturbed, injured or exposed.

PLANT PROTECTION

To control shoot borer and leaf roller the spray of Malathion (0.1%) or Monocrotophos (0.5%) at 15 days interval is very effective. Rhizome scale insect destroys rhizomes and it can be controlled by dipping the seed rhizome in Quinalphos (0.1%) prior to storage. To avoid rhizome rot, good drainage and treatment of the seed rhizome with 0.3% Dithane M-45 for 30 minutes before storage should be done. Bacterial wilt causes milky ooze as gentle pressing of rhizomes and it can be effectively controlled by treating the seed rhizome with 200 ppm of Streptocycline for 30 minutes.

HARVESTING AND YIELD

For fresh ginger, the crop should be harvested before attaining the full maturity means when rhizomes are still tender, low in pungency and fiber content, usually from

fifth month onwards after planting. Harvesting for preserved ginger should be done after 5-7 months of planting while harvest for dried spices and oil is best at full maturity, i.e. between 8-9 months after planting when leaves start yellowing. Rhizomes to be used for planting material should be harvested until the leaves become completely dry. After digging out, these rhizomes should be treated with fungicide Dithane M-45 @ 3 g/litre of water, dried in the shade, and stored in pits covered with 20 cm layer of sand alternating every 30 cm layer of rhizome. These pits should be dug under a thatched roof to protect the rhizomes from rain, water and direct sun. Average yield varies from 12-15 t/ha. However, recovery of dry ginger varies from 20-22%.

POSTHARVEST MANAGEMENT

WASHING AND DRYING

After harvest, the fibrous roots attached to the rhizomes should be trimmed off and soil is removed by washing. Rhizomes should be soaked in water overnight and then cleaned. The skin can be removed by scrapping with sharp bamboo splits or wooden splice. Use of metallic knives should be avoided since they will discolour the rhizomes. Peeling or scraping reduces drying time, thus minimize mold growth and fermentation. However scraping process tends to remove some of the oils constituents which are more concentrated in the peel. By removing the outside corky skin the fiber content also decreases. After scrapping, the rhizomes should be sun-dried for a week with frequent turnings and well rubbed by hand to remove any outer skin. This is called as the unbleached ginger. The peeled rhizomes should be repeatedly immersed in 2% lime solution for 6 hours and allowed to dry in the sun for 10 days while rhizomes receive a uniform coating of lime and moisture content should be 8-10%. This is called as the bleached ginger which has improved appearance with light bright color. Mechanical drying is rapid, gives more homogenous and cleaner product over sun-drying method where peeled ginger takes 8 to 9 days to reach a moisture content of 8-9%. To reduce losses in quality cleaning and drying should be done as fast as possible after harvesting. To avoid discoloration the temperature should not exceed 60°C during mechanical drying.

GRADING, PACKAGING AND STORAGE

Proper care should be taken during the grading and packaging to supply quality ginger. Dried gingers can be categorised or graded as Unpeeled, Peeled, Rough scraped, Bleached, Splits and slices and Ratoons based on drying process. These different forms of rhizomes should be packed in jute sacks, wooden boxes or lined corrugated cardboard boxes depending upon distance for transportation and type of market. Dry slices or powder should be packed in multi-wall laminated bags or polyethylene film pouches.

Fresh ginger should be stored at 10-12°C and 90% relative humidity in cold room. A "zero energy" cool chamber which maintains the temperature 6 to 7°C below than outside temperature can be used in the producing areas where cold storage are not available. Gamma-irradiation at doses of 0.05-0.06 KGy inhibits sprouting of fresh ginger. Besides this storage of fresh ginger in polyethylene bags with 2% ventilation prevents dehydration and mould development. Dried rhizomes, slices, or splits should be stored at 10-15°C in cold room. If cold storage facility is not available, extraction or distillation of dried ginger should be done rapidly because after three months at room temperature storage the oil content decreases considerably. Gamma-irradiation of dried rhizomes at doses of 5-10 KGy prevents mould and bacteria growth. Ethylene oxide @ 50 ppm can be used as a fumigation treatment of rhizomes.

PROCESSING

GINGER OIL

Ginger oil can be prepared by steam distillation of grind paste or dried powdered ginger which is used as a flavouring agent for soft drinks, ginger beer and in food preparation. For oil extraction, dried rhizomes are ground to a coarse slurry, paste or powder, loaded into a still for distillation and steam is passed through the slurry/paste/powder. This steam containing the volatile components is condensed with cold water and collected in separate container. The oil can be separated from the water upon cooling by the separatory funnel. Re-distillation can be done to increase

oil yield. Usually oil yield obtained from dried rhizomes is 1.5% to 3.5% on dry weight basis and 0.4% on green weight basis depending upon variety of ginger used.

GINGER OLEORESIN

It is blend of oil and resinoids. Oleoresin is obtained by extraction of dried ginger, pulverized to coarse powder, with organic solvents like ethanol or acetone. Oleoresin content ranges from 3.5 to 9.5%.

GINGER CANDY

Ginger candy can be prepared by selecting big sized rhizomes of low fiber content. These rhizomes should be washed with water to remove the adhered dirt and debris. The peel should be removed with the help of wooden splinters or knives and wash thoroughly with water. After this, rhizomes should be pricked properly with the help of forks so that sugar can penetrate deep in the tissues. The pricked rhizomes should be cut into pieces of 1-2 cm thickness. The pieces should be boiled for almost one hour until they become soft. After boiling sufficiently, the ginger pieces should be removed from water and kept in shade for drying. After this, the ginger pieces should be spread in a stainless steel utensil having alternate layer of sugar and ginger pieces (1 Kg ginger pieces: 1 Kg sugar) and kept for 24 hours. On second day remove the ginger pieces from sugar syrup and add 2 gm citric acid and boil the syrup until sugar strength reached up to 60⁰ Brix. Allow the syrup to cool, add the ginger pieces in to the syrup and keep it for 24 hours. On third day remove the ginger pieces and add 1 gm citric acid and boil the syrup until sugar strength reached up to 65⁰ Brix. Allow the syrup to cool and add the ginger pieces in to the syrup. Again keep it for 24 hours. On next day the same process should be repeated by addition of 1 gm citric acid and boiling the syrup until the sugar strength reached up to 75⁰ Brix. Allow the syrup to cool and add the pieces in to the syrup. Keep it for 4 days in syrup. Then remove the well soaked pieces from syrup and dry it in oven at 60⁰C for 6-8 hrs. These dried pieces

can be coated with powdered sugar or confectioner's sugar or glucose powder by sprinkling the powder over the pieces and mixed thoroughly. Fill the coated ginger candy in glass/ jars or pack in polyethylene pouches and store in cool and dry place.

GINGER SOFT DRINK (RTS)

Ginger ready to serve (RTS) soft drink can be prepared by selecting healthy and blemish free rhizomes. Wash the rhizomes with water and peel with the help of wooden splinters or knives. Cut into small pieces and make pulp by passing through mixer-grinder by addition of little water to facilitate easy pulping. After pulping strain the pulp and keep it for 1 hour for settling down the sediments at bottom. Then siphon off the clear juice and mix it with sugar syrup solution which can be prepared by addition of sugar + citric acid + water @ 120 gm + 3 gm citric acid + 850 ml water. Strain the sugar syrup with muslin cloth to remove the impurities from dissolved sugar and mix the ginger juice or pulp @ 30 ml and then add the preservative potassium metabisulphite @ 40 mg/ liter of RTS. Mix all the ingredients thoroughly and fill into the bottles then crown corked. The sealed bottles should be pasteurized at 85°C for 15 minutes and then air cooled and can be kept for storage in cool and dry place.

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GINGER SHREDS

Ginger shreds can be prepared by washing and peeling of the rhizomes. After peeling rhizomes should be grated in to small pieces. Then grated small pieces of ginger should be kept in the muslin cloths and squeezed slightly to remove excess juice content. Then add black salt and common salt @ 4% and it should be kept in oven for drying at 60°C for two days. Final product should be packed in polyethylene pouches and kept in cool and dry place for use.

GINGER PICKLE

Ginger pickle can be prepared by washing and peeling of the rhizomes. Then peeled rhizomes should be cutted into small rectangular pieces. These pieces should be dried in shade for removal of outer moisture. The mixture of spices (ajowain + black pepper + cumin seed + chilli powder and citric acid @ 10 gm each for 250 gm of ginger pieces) should be prepared and mixed together. After this, fill all material into

glass jar and keep it for sun drying up to two weeks with occasional stirring. Finally it can be stored in cool and dry place.

GINGER CHUTENY

Chutney of good quality and taste can be prepared by using ginger. For this ginger rhizome (250 g) should be washed, peeled and grind in mixer. Tamarind (250 g) and garlic (100 g) should also be grind in mixer and then grinded paste of ginger, tamarind and garlic should be mixed. This mixture should be heated to a little and add salt (100 g). Then frying of another garlic paste (100 g), fenugreek powder (20 g) should be done in little mustard oil (100 ml). This fried mixture of spices should be mixed with ginger paste, sugar (500 g) and fill into glass jar. Final product should be stored in cool and dry place.

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