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Post - Harvest Technology of GINGER

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Post - Harvest Technology of Ginger

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Ginger *(Zingiber officinale* (Rosc.) is a herbaceous tropical perennial belonging to the family *Zingiberaceae*. The underground rhizome of ginger is valued as a spice and cultivated as an annual. Ginger originated in South - East Asia, probably in India. The Sanskrit name '*Sringavera*' gave rise to the Greek term 'Zingiberi' and later to the generic name 'Zingiber'. Ginger is cultivated in several parts of the world and the major producing countries are India followed by China, Nepal, Indonesia, Thailand, Nigeria, Bangladesh, Japan, and the Phillippines. Ginger is being used as a spice and as a natural additive for more than 2000 years. It has hypoglycaemic and hypolipidaemic effect and suppresses prostaglandin synthesis through inhibition of cyclooxygenase- 1 and cyclooxygenase - 2. Ginger has been identified as a herbal medicine. In traditional Chinese and Indian medicine, ginger is used to treat a wide range of ailments including stomach ache, diarrhoea, nausea, asthma, and respiratory disorders (Grzanna et al., 2005) and now it has been accepted as an immunity booster against Covid - 19.

Jamaican and Indian gingers are considered of superior in quality followed by West African ginger. Jamaican ginger possesses delicate aroma and flavour. It is sometimes considered as the finest grade. Indian ginger, known in the world market as 'Cochin' and 'Calicut' ginger, has a lemon like by-note which is preferred to Jamaican ginger. Dried African ginger possesses somewhat camphoraceous and coarser odour, and is rich in aroma, pungency besides having good demand for oil and oleoresin extraction.

Ginger contains volatile oil, crude fibre, fixed fatty oil, pungent compounds, resins, cellulose, starch, and mineral elements. The composition of these components varies with cultivar, region, agroclimatic conditions, maturity and processing. The pleasant

aroma of ginger is mainly due to zingiberene and the warm pungent taste is contributed by gingerols, shogaols and zingerone.

Chemical Composition of Ginger

Volatile oil %	1.25 to 2.81
Crude fiber %	1.4 to 9.5
Cold alcohol extract %	1.12 to 3.9
Total ash %	6.11 to 9.58
Acid insoluble ash %	0.3 to 1.23
Crude protein %	8.1 to 11.6
Starch %	41.54 to 55.06
Water extract %	10 to 20
Acetone extract %	5.11 to 11.71

(Balakrishnan, 2016)

The yield and quality parameters of ginger, such as plumpness of rhizome, dry recovery percentage, fiber, oleoresin, and oil content are highly influenced by varieties, climate and soil.

Hence, selection of suitable variety for cultivation is important with respect to the end-product requirements. For dry ginger production, varieties with high dry recovery percentage (>20 %), bold fingers and low fibre content (<4 %) are required. Several traditional varieties and improved varieties are popular in the market.

Ginger Varieties for Processing

Dry ginger varieties	Kuruppampady, Maran, Manantoddy, Valluvanad, Himachal, Wayanad
Improved varieties	IISR Varada. IISR Rejatha, IISR Mahima, Suprabha, Suruvi, Suruchi, Himagiri
Green ginger varieties	Rio-de-Janeiro, China, Wayanad local, Aswathy
Dual purpose	Athira, Karthika, Rio-de-Janeiro,
Varieties with low fibre content	Rio-de-Janeiro, China, Jamaica
Varieties with high oleoresin	Maran, Suravi, China, Rio-de-Janeiro, Aswathy
Varieties with high essential oil	IISR Rejatha, Rio-de-Janeiro

Harvesting of Ginger

Harvesting is done by lifting the rhizomes from soil that may been loosened at first. Delaying of harvest causes reduction in quality of rhizome and storage life, increased fiber content, and incidence of sprouting. The maturity at harvest depends upon end use of the produce. For green ginger and fresh ginger products, ginger is harvested before full maturity when it is tender, low in pungency and fiber content (5 to 7 months). For dry ginger and oil production, ginger is harvested at full maturity (8 to 9 months) when the leaves turn yellow. After harvesting, ginger is washed and cleaned to remove adhered soil and the roots. Pressure washing is preferred as it is more efficient and reduces the microbial load.

Processing and Value Added Products of Ginger

Several value added products of commercial importance can be prepared from fresh as well as dry ginger.

Fresh Ginger Products

1. Green ginger
2. Preserved ginger
    a. Ginger in brine
    b. Ginger in syrup
    c. Crystallized ginger
    d. Ginger candy
    e. Glazed ginger
3. Ginger chutney
4. Ginger puree and paste
5. Ginger wine
6. Ginger pickle
7. Ginger- fruit beverages
8. Ginger shreds
9. Ginger beer and ale

Dry Ginger Products

1. Dry ginger- scraped and unscraped
2. Bleached ginger
3. Ginger powder
4. Ginger oil
5. Ginger oleoresin

6. Ginger drops
7. Encapsulated ginger

Fresh Ginger Products

Green Ginger

Fresh ginger or green ginger is used for flavouring as it contains the full note of the spice. Fresh rhizomes with low fibre content and rich in aroma, pungency, fat and protein are preferred for green ginger. If the harvest is delayed, the fibre content will increase whereas protein and fat contents decrease. After harvesting, ginger is washed to remove the adhered soil and roots, and is lightly dried before being marketed in fresh form. Fresh ginger should be stored in a cold and humid environment and can be stored at 10 -12ºC and 90% relative humidity (RH) in a cold room for extended shelf life.

Preserved Ginger

Fresh ginger rhizomes are used for processing to make preserved ginger products and succulent ginger rhizomes with very little fibre and less pungency are preferred. The preserved ginger can be made into different products *viz*., ginger in brine, ginger in syrup, ginger candy, crystallised ginger and glazed ginger. The tender rhizomes preserved in salt solution is 'ginger in brine' and if it is in sugar syrup, marketed as 'ginger in syrup'. Ginger is kept in sugar syrup till it reaches to 70^{0}Brix and then dried to get ginger candy. Ginger candy covered with transparent coating of sugar to have a glossy appearance is glazed ginger. Crystallized ginger is peeled ginger that has been impregnated with sugar syrup, dried and coated with crystalline sugar.

Ginger chutney

It is prepared by grinding ginger with garlic, tamarind, and is seasoned with spices, then bottled.

Ginger Paste

In India, 'ginger garlic paste' used for culinary purpose is traditionally made with 50 per cent sliced and macerated ginger, 35 per cent garlic and 15 per cent salt. Nowadays, it is available to consumers in suitable packing with improved shelf life. Ginger puree is ground ginger only, containing preservatives or kept in frozen state.

Ginger Wine

Ginger pieces are allowed for alcoholic fermentation by yeast to produce ginger wine.

Ginger Pickle

It is prepared by mixing ginger pieces or shreds with spices, masala and is preserved.

Ginger- Fruit Beverages

Ginger extract is blended with fruit beverages for appealing flavour and nutritional benefits. Lime - ginger beverages are more popular.

Ginger Shreds

Washed and peeled ginger rhizomes are grated and squeezed slightly to remove excess juice content. Black salt and common salt are added and kept in oven for drying at 60°C. The final product is packed in polyethylene pouches and kept in cool, dry place for use.

Ginger Beer and Ginger Ale

Ginger beer has a complex flavour and cloudy appearance and ginger ale is valued for its sparklingly clear appearance, distinct lemony-aromatic note on the basis of ginger aroma, high pungency and high carbonation.

Dry Ginger Products

Dry Ginger

Ginger is dried either peeled/scraped or unpeeled/ unscraped, in the sun or by mechanical drying till safe moisture level. Harvested ginger is washed and the peeling or scraping of the epidermal layer of fresh rhizome is done with pointed end bamboo splinters and not by iron knife as it causes discolouration of rhizomes. Peel acts as a barrier for moisture evaporation during drying and peeling helps in efficient drying of ginger rhizomes. After peeling, rhizomes are washed and dried uniformly under the sun for a week up to a moisture content of 10 per cent. In some countries, after washing, the fresh rhizomes are made into thin slices for faster dehydration and if the ginger is sliced, it takes only five to six hours by using a mechanical cross-flow dryer. To avoid flesh darkening and discolouration, the temperature should not exceed 60°C during mechanical drying. Solar tunnel dryers can also be used for thin layer drying of ginger. Dried ginger is used for the preparation of value added products like ginger powder, ginger oil, ginger oleoresin and so on.

Food Safety and Standards Authority of India (FSSAI), describes Dried Ginger Whole as the dried rhizome of *Zingiber officinale* in pieces, irregular in shape and size, pale brown in colour with peel not entirely removed and washed and dried in sun. It may be bleached with lime and shall have characteristic taste and flavour free from musty odour or rancid or bitter taste. It shall be free from mould, living and dead insects, insect fragments, rodent contamination and added colouring matter. It shall conform to the following standards;

FSSAI Standards for Dried Ginger

(i) Extraneous matter	Not more than 1.0 per cent by weight
(ii) Moisture	Not more than 12.0 per cent by weight
(iii) Total ash on dry basis (a) Unbleached	Not more than 8.0 per cent by weight
(b) Bleached	Not more than 12.0 per cent by weight
(iv) Calcium as Calcium oxide on dry basis (a) Unbleached	Not more than 1.1 per cent by weight
(b) Bleached	Not more than 2.5 per cent by weight
(v) Volatile oil content on dry basis	Not less than 1.5 per cent by v/w
(vi) Insect damaged matter	Not more than 1.0 per cent by weight

Bleached Ginger

Bleached ginger is prepared by immersing peeled rhizomes repeatedly in two per cent lime solution for six hours and dried under sun for ten days up to a moisture content of eight to ten per cent.

Ginger Powder

Ginger powder is made by pulverizing dry ginger to a mesh size of 50–60 and the grinding releases the flavour. Some flavour may be lost by heat development during grinding which can be minimized by adopting cryomilling or freeze grinding. As per FSSAI, ginger powder means the powder obtained by grinding rhizome of *Zingiber officinale* and shall have characteristic taste and flavour free from musty odour or rancid or bitter taste. It shall be free from mould, living and dead insects, insect fragments, and rodent contamination and free from added colouring matter.

It shall conform to the following standards;

FSSAI standards for ginger powder

(i) Moisture	Not more than 12.0 per cent by weight
(ii) Total ash on dry basis (a) Unbleached	Not more than 8.0 per cent by weight
(b) Bleached	Not more than 12.0 per cent by weight
(iii) Calcium as Calcium oxide on dry basis (a) Unbleached	Not more than 1.1 per cent by weight
(b) Bleached	Not more than 2.5 per cent by weight
(iv) Volatile oil content on dry basis	Not less than 1.5 per cent by v/w
(v) Water soluble ash on dry basis	Not less than 1.7 per cent by weight
(vi) Acid insoluble ash on dry basis	Not more than 1.0 per cent by weight
(vii) Alcohol (90% v/w) soluble extract on dry basis	Not less than 5.1 per cent by weight
(viii) Cold water soluble extract on dry basis	Not less than 11.4 per cent by weight

AGMARK grade designations and quality of garbled bleached ginger (whole)

Grades	Quality					
	Special characteristics					
	Size of rhizomes (length in mm) (Min)	Organic extraneous matter % (m/m) (Max.)	Inorganic extraneous matter % (m/m) (Max.)	Moisture % (m/m) (Max.)	Total Ash % (m/m) (Max.)	Calcium (as calcium oxide) % (m/m) (Max.)
Special	20.0	1.5	0.5	12.0	12.0	2.5
Standard	15.0	1.5	0.5	13.0	12.0	4.0

Ginger Oil

Ginger oil is free-flowing, pale greenish yellow liquid possessing the characteristic aroma but not the pungent taste of the spice. It is soluble in ether and insoluble in water and is produced commercially by steam distillation process. The oil yield derived from dried rhizomes generally ranges from 1.5 per cent to 3.0 per cent. Oil can be extracted from fresh as well as dry ginger. The oil from fresh ginger retains the true aroma of the fresh spice and finds application in delicate flavour and perfumery formulations. Ginger oil is also used as a flavourant in food processing, and in pharmaceuticals.

Ginger Oleoresin

Ginger oleoresin is the true essence of ginger which comprises of volatile as well as non-volatile fractions and is obtained by solvent extraction of powdered dry ginger with suitable organic solvents such as alcohol, acetone or ethyl acetate, etc. Concentration of solvent extract is done under vacuum and complete removal of traces of solvent yields ginger oleoresin. The yield, flavour and pungency of extracted oleoresin vary with cultivars, maturity of rhizome, choice of solvent and the method of extraction employed. Generally, an oleoresin yield of 3.9 to 9.3 per cent with an average of 6.5 per cent on dry weight of ginger is obtained. The oleoresin can be prepared from green ginger also and is known as green ginger oleoresin which has fresh aroma and wholesome flavour.

Micro-encapsulated Ginger Oil and Oleoresin

Microfine particles of oil and oleoresin are protected by a wall material coating which is an edible medium such as starch, maltodextrin, or natural gums so that the flavour is encapsulated within the tiny capsule. This encapsulation locks the flavour and ensures protection of flavour loss during storage and controls the release of flavour material and provides uniform dispersibility in the food matrix.

Ginger Drop/ Ginger Essence

Ginger oleoresin is diluted in solubilizers like polysorbate or propylene glycol and made into ready to use form.

Conclusion

The refreshing pleasant aroma, biting taste and medicinal properties make ginger, an indispensable food ingredient throughout the world. In Ayurveda, ginger is recommended as a carminative, diaphoretic, antispasmodic, expectorant, peripheral circulatory stimulant, astringent, appetite stimulant, anti-inflammatory agent, diuretic, and it aids in digestion also. Ginger has excellent antioxidant properties that helps in the prevention of cancers, coronary heart disease, and is also used to preserve lipid-based foods. There are a number of studies about the antimicrobial activity of gingerols. Fresh ginger, dry ginger, bleached dry ginger, ginger powder, preserved ginger, ginger candy, ginger in brine/ syrup, etc. are major value added products of ginger. Ginger oil and oleoresin has good demand in international market. Ginger is extensively used in pharmaceutical as well as food industry and has immense potential for value addition through processing.

References

Balakrishnan, K.V. 2016. Postharvest and Industrial Processing of Ginger. In: Ravindran, P.N. and Babu, K.N. (eds), *Ginger: The Genus Zingiber* (1st Ed.). CRC Press Publishing, London, pp.391-434.

FSSAI, 2011. Compendium of food additives version IX (29-03-2019). https://www.fssai.gov.in

Grzanna R, Lindmark L, Frondoza C. 2005. Ginger-A herbal medicinal product with broad anti-inflammatory actions. J. Med. Food, 8(2): 125-132.

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Bush Pepper Cultivation in Homesteads

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Bush pepper can be considered as a new generation urban spice crop. Unlike black pepper vines, bush pepper does not consume much space. Bush pepper can be grown anywhere, irrespective of the season and location. Bush pepper, because of its bushy growth, shade tolerance, early and year round bearing habit, offer great scope for growing in terrace gardens, kitchen gardens, urban homesteads and as an under-storey crop in coconut as well as arecanut plantations and agro forestry systems.

Planting materials for bush pepper cultivation are readily available from plant nurseries at about Rs 50 per plant. Those interested in growing bush pepper can raise the planting materials by themselves from the lateral branches of high

yielding mother vines. One-year-old lateral branches with three to five nodes are to be collected during March-April and planted in the nursery. Prior to planting, all leaves except the flag leaf are removed from the branches. The cuttings are treated with 0.2 per cent Copper Oxychloride (2g/L water) solution for 30 minutes. A sharp slanting cut is made at the basal portion of the vine and the cut end is dipped in commercial formulations of rooting hormone to promote rooting. Alternatively, the cut ends can also be treated with 1000ppm IBA (Indole-3-butyric acid) solution (1g IBA/L water) for 45 seconds.

The cuttings are planted either in trenches or in polythene bags of 45 cm X 30 cm size and 200 gauge thickness, containing moist coir pith as rooting media. Three or four cuttings can be planted in a polybag. While planting, make sure that the lower node of the cutting is inside the rooting media. The trenches may be covered with polythene sheet to maintain humid condition which would promote rooting. Polythene bags planted with the cuttings may be kept in a mist chamber for rooting. In the absence of a mist chamber, the mouth of the polybag is to be secured tightly with a gunny rope to prevent the loss of moisture and shall be kept in a shaded area in the nursery.

It takes about 40 to 50 days for the laterals to root. When the cuttings have rooted, the mouths of the polybags needs to be kept open for three to four days. Now, the cuttings can be transplanted in smaller poly bags of 15cmX10cm size filled with potting mixture. The transplanted cuttings may be kept in partial shade for one to two months in order to obtain well established plants.

Bush pepper can be grown in pots of 30-35 cm diameter or in grow bags filled with potting mixture and may preferably be kept under partial shade. Potting mixture consisting of soil, cocopeat and farm yard manure in 3:2:1 proportion is ideal for planting bush pepper plants. Bush pepper plants are much susceptible to foot-rot disease. Basal application of *Trichoderma* enriched cow dung and spraying two per cent *Pseudomonas* is found to be effective in preventing Phytophthora Foot Rot in bush pepper. The bush pepper plants grown in pots may be provided with two gram urea, three gram super phosphate and four gram muriate of potash at bimonthly interval. Repotting is to be done every two years.

Application of chemical fertilizers is not at all recommended for bush pepper grown on terrace

gardens. The fertilizers that get leached along with irrigation water can cause damage to the concrete roofing. In such cases, cow dung slurry or a fermented mixture of fresh cow dung with neem cake and groundnut cake is diluted and may be applied at fortnightly intervals. In case of the non-availability of fresh cow dung, an organic manure mixture consisting of equal proportion of Farm Yard Manure (FYM), bone meal, vermicompost, neem cake and groundnut cake may be prepared. One table spoon full of this manure mixture can be applied to each of the grow bag at fortnightly intervals.

Bush pepper can be grown as an intercrop in coconut, arecanut and cocoa gardens at a spacing of 2m x 2m. It can also be grown along with other crops in the backyards of houses. Bush pepper plants grown in fields may be provided with farmyard manure at 5 kg per plant per year. Chemical fertilizers such as urea, super phosphate and muriate of potash must be applied @ 20:30:40g per plant once in every three months. Soil drenching with 0.2 per cent copper oxychloride solution is effective towards the prophylactic management of fungal diseases.

Cuttings grow like a bush and flower in the same year Bush pepper produces leaves and spikes continuously. The bushy nature of the plant is have to be ensured by proper pruning of the hanging shoots. Bush pepper starts yielding from the very first year and continues to yield for 8-10 years. The berries are harvested when two or three berries in the stalk turn bright red. On an average one kilogram of pepper can be harvested annually from a bush pepper plant of two to three years old. Yield can be obtained throughout the year since the flowering is not season bound as in the case of black pepper vines.

Bush pepper cultivation can be taken up as a remunerative hobby by homemakers. Growing at least four to five bush pepper plants in every homestead is sufficient to meet the domestic requirement of black pepper. It gives a farm fresh flavour to culinary preparations and adds aesthetic value to the homestead and terrace gardens.

Spices Board Staff Champions at Kerala State Masters Game 2021

Winners of the Second Kerala State Masters Game 2021, from Spices Board, with Shri D. Sathiyan IFS, (Chairman cum Secretary) and Shri P. M. Suresh Kumar (Director) and Dr A. B. Rema Shree (Director).

Shri Xavier V. J. (2nd right), Shri Srilal (3rd right), Shri Suresh Kumar (1st left) won gold medals and Shri M Govindasamy (2nd left) won silver medal in weight lifting championship held at Thrissur District Council Weightlifting Training Center from 12th to 14th March 2021. Shri Vinoj Mathew (1st right) achieved first place in 1000 meters, second place in 5000 meters, third place in 800 meters athletics and silver medal in weight lifting championship. All winners also qualified for the national selection to be held in Hyderabad in June 2021.

Chilli and its Wild Relatives

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India is known as the land of spices. Since ages, food preparations in the country have been well infused with various spices. Among the masala ingredients that form the core of Indian cuisine, chillies are indispensable. They are used for seasoning, adding flavour to chutney, pickle and also for garnishing the dishes. India produces sufficient chillies for its domestic consumption and exports to countries such as Sri Lanka, Nepal, USA, Mexico and so on. Andhra Pradesh and Karnataka are the major players of chilli production in India. Though hot peppers are grown globally, Asian region contributes 68 per cent of global green chilli production. In south India, mostly two contrasting chilli types are in demand, namely Byadgi with deep red colour (non-pungent) and Guntur with considerable pungency.

Chillies are ingredients in commercial products at a significant scale. Dry chilli powder is considered as a rich source of bioactive compounds such as flavonoids. Richness of Vitamin C, beta-carotene, potassium, and phosphorus make chillies a nutritionally desirable composition. However, this composition varies across soil types, colour, climate and harvesting techniques. The compound, oleoresin, extracted from red chillies, is used as a colouring agent in food and beverages, cosmetics and many more. In cosmetic industry, oleoresin serves as a natural colouring agent in lipsticks and other facial creams. Consumption of chillies is known to defend against cancer, and corrects blood flow. Vitamin C in green chillies fights wrinkles and fine face lines. Apart from the consumption utilities, chillies are used in pharmaceuticals as ingredients for curing pain, obesity, inflammation, arthritis and psoriasis, or diabetic neuropathy.

Wild Relatives of Chilli

Wild species of genus *capsicum* harbor many of the commercially valued traits. One of such compositions is capsaicinoid content. Capsaicinoids, over 30 per cent, are made up of dihydrocapsaicin,

nordihydrocapsaicin and homocapsaicin. Capsaicinoids are heat promoting substances. The Scoville scale is a tool used to measure the hotness of chilli pepper and in turn the capsaicin content. It can be measured organoleptically or quantitatively. Scoville Heat Units (SHU) is a measure of number of times capsaicin need to be diluted with sugar water to be able to taste without feeling heat. Capsaicinoids found in chilli fruit consist more of capsaicin and dihydrocapsaicin which are responsible for about 90 per cent of the spicy taste of chilli. Capsaicinoids inhibit the compound that transmits nerve impulse from peripheral nervous system to central nervous system, thereby suppressing the local pain sensations. New studies from the American Association for Cancer Research suggest that capsaicin is also able to kill prostate cancer cells by causing them to undergo apoptosis. However, it is also employed in treating other types of cancers. Now, *Capsicum baccatum* has been documented to have the potential as a new source of natural compounds to identify novel strategies for combating antibiotic-resistant bacteria, and solving industrial and clinical problems related to biofilms.

Though *Capsicum annuum* is commercially cultivated in the country due to pungent (hot pepper) and non-pungent (sweet pepper) fruits, other species are grown in patches to meet the local requirements. The germplasm of chilli, like any other crop, is rich in diversity for plant geometry, fruit shape, colour of the fruit, flower morphology, response to stress and other economical traits. *Capsicum* genus consists of over 27 species including 22 wild and five domesticated species. Domesticated chilli species include *C. annuum, C. frutescens, C. baccatum, C. chinense, and C. pubescens.* Chillies are believed to be domesticated from Mexican region, and Columbian exchange has facilitated its present spread in the world. The capsaicin chemistry in hot pepper, targeting vanilloid receptors in mammals is thought to have evolved to exclude animal ingestion of chilli fruits rendering the seeds inviable for dispersal. Birds, on the contrary, excrete the chilli seeds unaffected and hence are out of capsaicin target.

The wild species are also valuable for resistance that they carry for biotic agents such as anthracnose, Chilli leaf curl virus (ChLCV), powdery mildew, thrips, mites and so on. *Capsicum* species and their descriptors along with sources of biotic stress resistance are given in Table 1.

Table 1: Species under genus *Capsicum*, their descriptors and source of biotic stress resistance.

Species	Characteristics
Capsicum annuum	Domesticated in Mexico or northern part of South America. Plants in this species are annual to perennial, small shrub up to two meters tall, bearing white or purple flowers and fruits turn red, yellow or green when ripe. Mostly commercially grown species. Susceptible to most of the biotic stresses. This species has diversity for capsaicin content ranging from almost 0 (Byadgi types) to 235,000 SHU. Known to harbor deep red (high oleoresin) fruits. Varieties: Pusa Sadabahar, Phule Jyoti, Jalapeno, Aparna (yellow ripe fruits).
Capsicum frutescence	Domesticated in Carribean region. The plants are semi woody to woody, having sparse branching and fruiting habit. It is a small shrub or tree like shrub up to two meters tall. Flowers lack prominent constriction between base of the calyx and pedicel; mostly bear erect red ripe fruits. Bred for ornamental purpose. SHU may range from 30,000 to 50,000, in extreme cases 175,000 are also available. E.g.: PBC 687 (VI046934)
Capsicum chinense	Domesticated in Amazonas region. Harbors the world's hottest peppers. Plants are woody, small stout shrub up to 1.5 meter tall, well spread and often leaves are crinkled. Flowers are small mostly pendent, off white. A prominent constriction between the base of the calyx and pedicel, flowers lack calyx teeth. Immature fruits are green, white or green with purple tinge. Fruits are observed with surface granulations and constrictions. Mostly ripe fruits turn red. Resistance source against chilli leaf curl virus (ChLCV). Capsaicinoid content in these species ceil up to 2,200,000 SHU. In India, it is mostly found in the North-East region. Varieties in the order of decreasing pungency are Carolina Reaper, Naga Viper, Bhut Jolokia, etc.

Capsicum baccatum	Domesticated in Bolivia region of North America. The plants are semi woody, spreading. Flowers are white or cream coloured often with prominent yellow pigmentation on corolla; fruits are available in different shapes which turn red, brown or orange-yellow upon ripening. Capsaicin content ranges from 30,000 to 50,000 SHU (mild pungency). Source of anthracnose resistance. Varieties: PBC 80, PBC 81
Capsicum pubescence	Domesticated in southern Andes. Mostly perennial species with woody stem and growing height. This species has pubescent leaves and large rotate or purple flowers with 5-8 lobes. Flowers are purple with white spots at the center. Contains dark brown or black seeds.
Capsicum chacoense	Annual wild species with low spreading habit. Flowers are tiny, white in colour with small fruits. E.g.: VI029126 (WVC collection)

Utilisation of Wild Species in Crop Improvement

Wild species serve as vast collection of desirable traits in undesirable horticultural background. These can be effectively utilized in the breeding programs through direct hybridization wherever the species are cross compatible to *annuum*, if not bridge species are used. In the days to come, resistant genes will be immensely valued due to vulnerability of the commercial hybrids for boom and burst cycle.

Plant and fruit morphological variations found in **A.** *Capsicum chinense* (VI012596); **B.** *Capsicum chacoense* (VI064760); **C.**Bhut Jolokia (*Capsicum chinense*) and **D.** *Capsicum baccatum* (VI014924) species

SYMSAC X 2021
INTERNATIONAL SPICE SYMPOSIUM

Xth Symposium on
Spices and Aromatic Crops

SYMSAC X, an International Symposium on Spices as Flavours, Fragrances & Functional Foods was held during 9-12 February 2021 in a hybrid mode of virtual and venue-based events. The symposium brought together the world's leading spices scientists and other stakeholders and served as a platform for the international spices community to deliberate on various issues of common interest. The symposium, jointly organized by Indian Society for Spices, Kozhikode, Indian Society of Seed Spices, Ajmer and Spices Board, witnessed participation of speakers and delegates from across the globe.

Setting stage for discussions and debates on spices trade, spices research and spice economics across the globe, the international symposium paved way for an exchange of ideas and concerns among the academia, the producers and the spice industry representatives. More than 300 delegates from more than 15 countries took part in the symposium. The latest developments in the field, both basic and applied, were presented and discussed at the symposium. Each technical session had invited lead papers from experts and contributory papers as oral presentations. The event hosted 30 lead lectures, 21 oral presentations and more than 200 poster presentations.

The symposium was declared open by Dr Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education & Director General of Indian Council of Agricultural Research (ICAR). Inaugurating the event, the Director General of ICAR stressed on the importance of spices as functional food and its increasingly documented role in preventing infections, citing a set of recent studies.

Production of spices in the country along with production of other horticultural crops are witnessing steady increase and the production is about 9 million tonnes of spices annually, said Dr Mohapatra during the inaugural address. He also appreciated the research and development activities taking place in the spices sector as well as in other agriculture sectors for driving the growth in production, processing, marketing, value addition, and export.

Shri D. Sathiyan, IFS, Secretary and Chairman,of Spices Board highlighted the scope and latent potential of value addition in spices. He said that the present level of value addition at 51 per cent of the total spice exports needs to be enhanced further and the plans focusing on high-end value addition in various spice commodities requires elaboration.

Dr Vikramaditya Pandey, Assistant Director General (HS-I), ICAR, New Delhi presided over the inaugural session. Dr Rattan Lal, Director, Professor of Ohio State University delivered the keynote address on carbon sequestration for nutritional security.

Dr A. K. Singh, Deputy Director General (HS), ICAR; Ms Hoang Thi Lien, Executive Director of International Pepper Community, Indonesia; Dr Gopal Lal, Director, ICAR - National Research Centre on Seed

Dr T. Mohapatra delivering the inaugural address of SYMSAC X

Spices; Dr Homey Cheriyan, Director, Directorate of Arecanut and Spices Development; Dr J. Rema, Director of ICAR-IISR; Dr A. B. Rema Shree, Director (Research), Spices Board; Shri Ramkumar Menon, Chairman of World Spice Organization Kerala and Dr Santhosh J. Eapen, General Chairman of SYMSAC-X also spoke at the occasion.

The event witnessed the paper presentations by lead speakers from different countries. Key speakers included Ms Hoang Thi Lien, Executive Director of International Pepper Community; Shri D. Sathiyan, IFS, Secretary, Spices Board; Mr Gusland McCook, Acting Director General, Jamaica Agricultural Commodities Regulatory Authority; Mr B. Sarada De Silva, Chairman, M/s. B. Darsin De Silva & Sons Pvt. Ltd., Sri Lanka; Dr. Gopal Lal, Director, ICAR- NRCSS, Ajmer; Dr Prabodh Kumar Trivedi, Director, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow; Dr K. Kandiannan, Vivekananda Technical Centre of RKM, Government of Fiji, Prof. G. Padmanabhan, Honorary Professor, Indian Institute of Sciences; Dr G. Bhanuprakash Reddy, ICMR-National Institute of Nutrition; Dr Balu P. Maliakel, M/s. Akay Natural Ingredients Private Limited; Dr Gopinadhan Paliyath, University of Guelph; Dr Ramasamy Ravi, Tennessee State University, USA, and Dr Jissy Jacob, Associate Principal Scientist, Mondelēz International, USA.

Other key speakers included Dr C. Anandharamakrishnan, Indian Institute of Food Processing Technology; Dr R. T. Patil, Former Director, ICAR-CIPHET, Ludhiana; Mr Geemon Korah, M/s. Kancor Ingredients Ltd.; Mrs Sushama Sreekandath, M/s. A.V.T. McCormick Ingredients Pvt. Ltd.; Dr Rajeev K. Varshney, ICRISAT, Hyderabad; Dr Ganesh Bagler, Indraprastha Institute of Information Technology; Mr Debasis Dan, Principal Data Scientist Manager, Microsoft India; Dr Akshaya K. Biswal, Scientist, International Maize and Wheat Improvement Center, México; Prof. Neena Mitter, University of Queensland, Brisbane; Mr Sanjay Dave, Food Safety and Standards Authority of India (FSSAI), Dr Manish Pande, Quality Council of India; Prof. N. K. Dubey, Professor, Centre of Advanced Study in Botany, Banaras Hindu University; Dr K. K. Sharma, AINP on Pesticide Residues; Vic Anthony Joseph Fabre Tagupa, Chief Operating Officer, IFOAM Asia and Dr Jenna Elizabeth Forsyth, Post-Doctoral Research Fellow, Stanford University, Stanford, California.

Sessions' Highlights

Five sessions were conducted as part of the event to discuss different topics. First session on 'Spices Global Production and Trade Scenario' discussed key topics including global production and trade scenario of black pepper, tree spices, seed spices, herbal spices and Indian spices.

The second session focussed on, Spices- Chemistry and Functional Foods. Significance of curcumin and the medicinal properties of curcumin; spices and their novel bioactive compounds; spiceuticals: molecular mechanism of action of nutraceuticals in horticultural crops; quality control of spices by electronic nose; and 'spices and their antioxidant properties' were the key topics discussed at this session.

The third session on 'Spices-Processing and Value Addition' witnessed informative presentations on nano-encapsulation techniques for food bioactive components, advances in grinding technology of spices, cryo grinding technology, advances in spice processing and value addition, perspectives on input use efficiency, importance of sustainability strategies for food industry, etc.

Genomics of non-model crops, computational gastronomy: levering artificial intelligence for data-driven food innovations, AI applications for agricuture,

Dr Homey Cheriyan, Director, DASD addressing the inaugural session of SYMSAC X

CRISPR/ Cas gene editing and other novel strategies for crop improvement and next generation RNA based pesticides for sustainable crop protection, etc., were discussed in the fourth session titled 'Spices- Cutting Edge Technologies for Plant Health'.

The fifth and the final session focussed on 'Environment and Food Safety' covering topics including codex alimentarius and standards for spices, global approach for improving quality and safety in spice sector, essential oils of spices as food preservatives, pesticide residue: problems and solutions, and the organic movement in Asia and issues of adulteration in various spice commodities.

The Sugandha Bharathi Award for outstanding contributions in spices research was awarded to Dr P. N. Ravindran, former Director, ICAR-IISR and Sugandhasree Innovative Farmer Award was conferred on Mr Joseph T., Kottayam. The symposium also witnessed the release of a policy brief titled 'Towards self-sufficiency in spices – status, vision and strategies'.

Different awards including ISS Fellowships, Dr J.S. Pruthi Award of Honor, Dr V.S. Korikanthimath Award for the best Ph.D. thesis and Smt. Vijaya V. Korikanthimath Award for the best M.Sc. thesis were also conferred at the symposium to promote and encourage researchers in spices sector.

The recommendations from various technical sessions of SYMSAC-X, aimed at comprehensive


SYMSAC X 2021

International Symposium on Spices as Flavours, Fragrance and Functional Foods

09 - 12 FEBRUARY 2021

Declaration

We, the delegates of SYMSAC X, after having reflected, deliberated and discussed the pertinent scientific, technical and socio-economic challenges in the global spices segment, in its entire value chain, do hereby affirm and declare that:

The spices sector form an important component of the agricultural economy across the globe and the sector offers considerable scope and promise for uplifting the livelihoods of millions of stakeholders along the spice value chains with global reach and impact.

We take immense pride in knowledge that our R&D initiatives primarily cater to the majority of spice producer farmers across the globe operating in small holdings. As a community, we pledge to align our research priorities and targets to meet the aspirations of the small and marginal farmers.

Despite the challenges from a multitude of biotic and abiotic factors confronted by the spice crops, we express our confidence in the prospects of scientific intervention and the capability of research systems to mitigate and ensure sustainable output from the sector.

Spices being deliciously rich in odors, savors and intrinsic molecules, this fraternity perceives a significant potential for spices as functional foods, unique flavours and as ingredients in wellness applications spanning pharmaceutical, nutraceutical and other innovative interventions for the wellbeing of mankind.

We foresee that creative and prudent use of cutting edge technologies like smart farming, genomics and artificial intelligence will witness rapid developments, reduce the carbon footprint of this sector and aid in preparing the spice supply systems to cater to the projected global demand in a safe and sustainable manner.

We recognize the opportunity and potential for the spice research domain across the nations and institutions to harness the synergies from technology cooperation, free flow of information and knowledge sharing and commit ourselves to strengthen, support and nurture programmes towards this objective.

We reaffirm our firm belief in a science driven society for the better future of mankind and urge policy makers, international and intergovernmental institutions as well as funding agencies for facilitating more investment in the spice sector to make it globally competitive.

growth of the spices sector, would be submitted to the central government and the ICAR for consideration. The symposium recommendations can play a key role in designing policy interventions for the spices sector.

Key recommendations

- Need for sustained promotion and popularization of good agricultural practices among farmers to enhance the availability of high quality spices for domestic and industrial consumption.
- To address the issues, the symposium also recommended the introduction of Good Manufacturing Practices (GMP) for assuring clean and hygienic spices and to address pesticide residue and the presence of adulterants in spice commodities.
- Need to undertake comprehensive studies on carbon footprint for spices, for developing proper trade information management pertaining to spices sector.
- The need for openness in spices sector and to promote collaboration between institutions and countries for developing technology sharing and policy congruence to solve trade related issues in spices.
- Based on discussion, the symposium recommended evidence and analytical data based nutraceuticals development from spices. It also stressed the need for database on quality parameters, contaminant and adulterant raw materials to maintain efficacy and safety of nutraceutical preparations.
- The expert team has also prepared a set of recommendations for spice processing and value addition. The recommendations include large scale adoption of mechanisation for harvest and post-harvest operations and promotion of small and medium enterprises for quality spices products.
- The symposium also recommended the enhanced use of different types of genomic breeding approaches for biotic and abiotic stress management along with the development of reference genome of important spices crops and the enhanced use of Artificial Intelligence for stress management through collaboration with private players.

The four-day International Symposium concluded on February, 12. Dr T. Janakiram, Vice-Chancellor, Dr Y.S.R. Horticultural University was the chief guest for the valedictory session. Dr A. K. Singh, Deputy Director General (HS), ICAR presided over the session. The concluding ceremony also witnessed the Declaration of International Symposium on Spices.

Dr D Prasath, General Convener of SYMSAC-X presented the recommendations. Dr A. B. Rema Shree; Director (Research), Spices Board, Dr Homey Cheriyan; Director; Directorate of Arecanut and Spices Development, Dr Gopal Lal; Director; ICAR-National Research Centre on Seed Spices, Dr J. Rema; Director; ICAR-IISR, Dr Santhosh J. Eapen; President, ISS and Dr C N Biju, Secretary; ISS also spoke on the occasion.

Homage

Spice India pays homage to Shri A.P.K. Padmanabhan, Padmasri Nivas, Karippal, Kannur who was a regular contributor to Spice India magazine. He passed away on 4th March 2021. He had a profuse association with the Indian Spice Industry during his career as Associate at CFTRI, Mysore; Senior Technical Assistant at Synthite Industries and Production Manager at Shri Vainaghatesh Spices, Nagpur. He had also worked as advisor for various firms in the spice sector.

FORM IV

Statement about ownership and other particulars about newspaper ***SPICE INDIA*** *(English) to be published in the first issue every year after the last day of February*

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I, P.M. Suresh Kumar, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Date: 16.03.2021

(P. M. Suresh Kumar)

Spices Board Quality Evaluation Laboratory, Kolkata becomes Functional

Venugopal G., Scientist in-charge, Quality Evaluation Laboratory, Spices Board, Kolkata

Spices Board's eighth Quality Evaluation Laboratory (QEL) at Kolkata was inaugurated by Shri D. Sathiyan IFS, Chairman cum Secretary, Spices Board on 5th February 2021 in the auspicious presence of Smt. A. Shainamol IAS, Director (Finance), Shri P. M. Suresh Kumar, Director (Administration & Marketing) and Dr A. B. Rema Shree, Director (Research & Development), Spices Board, other officials of Spices Board, exporters, officials from other government agencies and stake holders.

Shri D. Sathiyan IFS, in his inaugural speech, stressed on the importance of Quality Evaluation Laboratory, Kolkata, as it would help to meet the Board's mandatory testing and other specific requirements of exporters from the eastern and North Eastern regions. Directors in their speech also spoke on the significance of QEL at Kolkata. It was informed that there has been a demand for testing of spices from various stakeholders and sister institutions like Agriculture/Horticulture departments and Universities, as Kolkata had no spice specific testing labs.

The first QEL of Spices Board was established in 1989 for providing analytical services to the Indian spice industry, monitoring the quality of spices produced / processed in the country and for analysing samples collected by the Board under the mandatory inspection and testing. Considering the volume of spice trade through Kolkata, Spices Board set up its eighth QEL at Baruipur for ensuring the required quality and safety of spices exported from the region.

QEL Kolkata at Baruipur has a total area of 990 sq. metres with an administrative office, training hall, laboratory and guest room facilities. The laboratory is planned to provide quality evaluation services for spices and spice products so as to meet the immediate and future testing needs of the region.

At present, High Performance Liquid Chromatograph (HPLC) is installed and standardized for aflatoxin analysis. The lab has started its analysis as per the mandatory inspection and testing for chillies, which is exported mainly from Kolkata, and cumin for detecting the presence of other seeds and extraneous matter.

The lab has also installed most modern sophisticated instruments like Ultra Performance Liquid Chromatograph (UPLC), Atomic Absorption Spectrometer (AAS), UV-Vis Spectrophotometer and Liquid Chromatograph with Mass Spectrometer (LC-MS/MS) for analysis of parameters like Sudan I-IV dye, capsaicin, lead, curcumin in turmeric, colour value, other illegal dyes, etc., in spices and spice products. The lab is also in the process of setting up a microbiology testing facility.

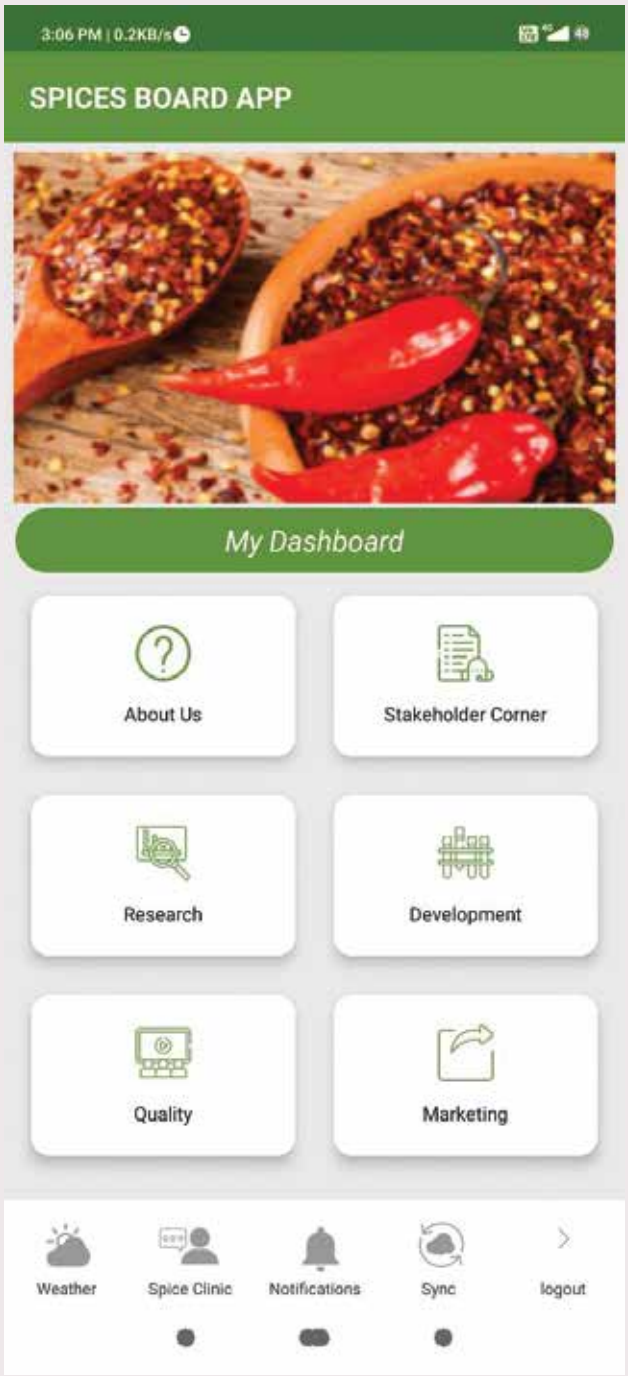
Address of QEL Kolkata

Spices Board, (Ministry of Commerce & Industry, Govt. of India)
Quality Evaluation Laboratory, PO - Bamangachi, Baruipur-Amtala Road, Near DRDO & West Bengal Tele Academy,
Dist. South 24 Parganas, Kolkata – 700145, India
Email: sbqelkolkata@gmail.com
Phone 033-22344304/22341834

34th Spices Board Day
and Launch of Spices Board App

The 34th Spices Board day was celebrated on 26th February 2021. The 34th anniversary of Spices Board was marked by the launch of Spices Board app, an application designed to benefit the spice farmers of India. Shri D. Sathiyan IFS, Chairman cum Secretary, Spices Board, Shri Staney Joseph Pothen, Vice Chairman, Spices Board, Shri P. M. Suresh Kumar, Director (Marketing and Administration), Dr A. B. Rema Shree, Director (Research and Development) Spices Board , Shri Nithin Joe, Deputy Director, Spices Board, Shri Jijesh T. Das, Deputy Director, Spices Board and other officials were present during the launch of the 'Spices Board App'.

Glimpse from 34th Spices Board day celebration



Shri D. Sathiyan IFS, the Chairman cum Secretary, Spices Board launched the app officially and presented it to the public. Speaking at the meeting, the Chairman cum Secretary commented that the app is named as 'Spices Board App' and more features have been added to the application to make it more useful to all stakeholders of the spice industry in addition to farmers. The Spices Board App, gives all information related to various schemes and activities of Spices Board and cultivation of spices in general.

Presenting the financial statistics, Shri D. Sathiyan informed that the Board has been performing tremendously well in marketing of spices and spice exports have grown manifold in quantum in the recent years. The Board aims to achieve the ambitious milestone of five billion US dollars by 2025 and 10 billion US dollars by 2030 respectively. He also introduced the tagline 'a pinch of spices for a bunch of benefits' and encouraged the officials of the Board and other stakeholders to use the tagline for promoting Indian spices. The future work plan and projects of the Board were laid out at the event.

Shri Staney Joseph Pothen, Vice Chairman, Spices Board commented on the magnanimous growth of the Indian spices sector and praised the farmers, exporters, Spices Board officials and various other stakeholders for their part in achieving the winning streak. He also lauded the efforts of the officials who worked on the Spices Board app and hoped for more such endeavours by the Board in the future.

Shri P. M. Suresh Kumar, Director (Administration and Marketing), Spices Board emphasized the achievements of Spices Board by quoting the Board's registered exporters, count which grew from 300 in 1987 to 7000 at present. He praised the efforts of the Electronic Data Processing section of Spices Board for developing the app. The Director also mentioned the Board's various developmental programmes and their wide acceptance by the farming community.

Dr A. B. Rema Shree, Director (Research and Development), Spices Board welcomed the distinguished delegates to the 34th anniversary celebrations. The Director commended the performance of the Board amidst the pandemic situation and expressed gratification in the launch of Spices Board app, which she expects to be very useful to the spice farmers of the nation.

Several officials of the Board, who have seen the inception and growth of Spices Board since 1987, shared their experiences and expressed solidarity in putting more efforts to strengthen the Board for achieving more milestones in spice sector.

Calendar of Operations
April 2021

Timely planning and execution of farm operations based on agro-climatic conditions of the area is important for successful farming for higher productivity and sustainability. To facilitate this calendar of operations in respect of important spice crops for April 2021 is given below.

Small Cardamom

Nursery

- Regular watering may be given to bed/polybag/ sucker nursery based on necessity.
- Avoid exposure of nursery to direct sunlight from top or side to prevent the incidence of leaf spot.
- To control damping off/seedling rot/leaf rot diseases in nursery, soil drenching with 0.2% copper oxychloride. Clipping and destruction of severely affected leaves before spraying is to be done to avoid further spread to healthy leaves.
- As bio-control measure, *Trichoderma* or *Pseudomonas* or *Bacillus* species may be applied in the soil.

Main Field

- Continue irrigation based on necessity wherever irrigation facility is available.
- Light pruning may be done by way of removing only the hanging dry leaves and sheath.
- For Integrated Pest Management, prune dry leaves without removing green leaf sheath.
- Observe for occurrence of beetles of root grub. If noticed, collect them with insect net and destroy the beetles to prevent them from egg laying.
- One round spray of Diafenthiuron at the rate of 80 g/100 lit of water may be given for the control of thrips/borer.
- Keep constant vigil for any *katte virus/kokke* kandu affected plants to uproot and destroy, if found.
- For controlling leaf rust and chenthal & leaf spots, 1% Bordeaux mixture (two to three rounds at 30 days interval).
- Stem lodging ,root rot and leaf yellowing can be

controlled by foliar spray and soil drenching with 1 % *Pseudomonas*.

- Cover the exposed roots with topsoil, proper mulching, irrigation and shade should be provided for the management of Fusarium diseases.
- Continue harvesting with a gap of 25-30 days depending upon the maturity of the capsules.
- Harvest only the matured capsules for getting better outturn.
- Ensure that 20-25 days pre-harvest interval is given if any pesticide spray has been done in the plantation.
- Wash harvested capsule thoroughly before drying in curing chamber.
- Timely removal of water vapour from curing chamber and maintaining proper temperature during curing will result in better green colour of produce.
- Always store the cured cardamom capsules at 10% moisture in 300 gauge black polythene lined gunny bags inside wooden box to retain green colour and quality.

Large Cardamom

Nursery

- Regular watering may be done in the sucker nursery with available water resources depending on moisture status in the soil.
- Dried or powdered cattle manure/organic manure/topsoil may be applied in the nurseries for healthy growth of suckers if not applied so far.
- Disease/pests infested suckers may be removed and destroyed.
- It is desirable for every large cardamom farmer to have their own large cardamom high yielding sucker nursery, for which selection of sites, collection of cattle manure, jungle soil, bamboo materials should be made immediately.

Main Field

- Large cardamom plants may be irrigated at regular intervals with available water resources, depending on rainfall and moisture status in the soil.
- Chirke and Foorkey infected plants may be destroyed by uprooting/burial at regular

intervals in the pits.

- Regular inspections may be carried out to observe caterpillar/shoot borer/shoot fly incidence if any and may be handpicked and destroyed mechanically.
- Application of cattle manure/compost/ organic manures will help in getting sustained production, improving productivity and quality of the crop.
- One round weeding followed by mulching may be carried out to conserve soil moisture if it is not done earlier.
- All the aged/diseased/unproductive cardamom plants may be uprooted and destroyed and the cardamom field may be kept ready for marking lines, opening pits, so that timely replantation/ gap filling operations can be taken soon after getting the rains.
- Soon after the receipt of rains, weeding may be attended for easy movement of pollinators and for getting higher yield.
- Arrangements may be made for getting good shade tree saplings for planting in the open/ poor shaded areas.

Ginger

- Prepare the mainfield after getting summer showers and plough the field into fine tilth and form beds of one meter width, convenient length and 25 cm height.
- Provide proper drainage channels to avoid water logging during the rainy season.
- Apply 30 tonnes of well powdered farm yard manure or compost along with 310 kg of super phosphate and 40 kg of muriate of potash/ha. as basal dose and mix well with soil surface of the beds which were already prepared.
- Planting of ginger may be done in first fortnight of April on receipt of summer showers with rhizome bits of about 20-25 g in weight.
- Before planting soak the rhizomes in 0.1% Quinalphos (400 ml/100 lit water) and 0.3% Dithane M 45 (300 gram/100 lit water) solution separately for 30 minutes each.
- Plant at a distance of 25x30 or 25x25 cm at not more than five cm depth with a hand hoe and then close it with powdered farm yard manure.
- Mulch the whole bed with about 15 tonnes of green leaves/ha.

Pepper

Nursery

- Watering to be continued regularly to the pepper cuttings in polybags.
- After summer showers, due to warm humid situation, there are chances for occurrence of leaf rot disease. If it appears, spray the cuttings with 0.2% Carbendazim or 1% Bordeaux mixture and also remove the disease affected cuttings and destroy them.

Main Field

- If liming was not done in the past two years, lime at the rate of 500 gram per vine may be applied after getting first summer rain.
- If any *Phytophthora* infestation is noticed, phytosanitation has to be undertaken strictly.
- Irrigate the plants once in a week by hose irrigation or daily by drip irrigation.

Turmeric

- Prepare the main field after getting summer showers and plough the field into fine tilth and form beds of one meter width, convenient length and 25 cm height.
- Provide proper drainage channels to avoid water logging during the rainy season.
- Apply 40 tonnes of well powdered farm yard manure or compost along with 185 kg of super phosphate and 50 kg of muriate of potash/ha as basal dose and mix well with soil surface of the beds which were already prepared.
- Planting of turmeric may be done in second fortnight of April on receipt of summer showers with rhizome bits of about 20-25 g. in weight.
- Before planting, soak the rhizomes in 0.1% Quinalphos (400 ml/100 lit water) and 0.3% Dithane M-45 (300 gram/100 lit water) solution separately for 30 minutes each.

- Plant at a distance of 20x25 or 25x25 cm. at not more than five cm. depth with a hand hoe and then close it with powered farm yard manure.
- Mulch the whole bed with about 15 tonnes of green leaves/ha.

Chilli

- Avoid application of pesticides just before picking.
- Do not allow the pods to over ripe/dry on the plant itself. Periodical picking improve the yield and quality.
- Dry the harvested chillies on clean polythene sheets or cement floors to avoid aflatoxin contamination.
- Dry the produce till the moisture content reaches 10-11%.
- Prevent contamination with dust and other foreign material.
- While drying keep the dogs, cats and poultry away from the drying floor.
- Store the produce in clean and dry gunny bags and stake them on a wooden plank, 40-60 cms away from the walls to prevent produce from moisture.

Fennel, Cumin, Fenugreek, Coriander

- The field must be ploughed and kept open during summer. This will help in controlling the pests and diseases and also facilitates the absorption of rain water.

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