

Zingiber officinale (Ginger) in Kerala *

by

K. KANNAN¹ and K. P. VASUDEVAN NAIR²

Synopsis: In this paper, an exhaustive account of the different aspects of ginger cultivation in Kerala State is given.

Ginger (*Zingiber officinale*) is an important commercial spice crop, grown from very ancient times in India, especially in Kerala. Though ginger is also cultivated in the West Indies (Barbados and Jamaica), Sierra Leone, Brazil, China, Japan and Indonesia, India still is the largest producer of dry ginger in the world.

Total production of dry ginger in the country is estimated to be 22,000 tons valued at Rs. 3.5 to Rs. 4 crores. Of these, one third is exported, mainly to the Middle East countries, particularly Saudi Arabia, Aden, Egypt and Iran and also to United Kingdom, West Germany and France. The details of exports of dry ginger from India during the past five years are given below :-

Year	Quantity (in tons)	Value (Rs. Lakhs)
1958	5836.615	51.23
1959	3651.199	52.12
1960	4125.405	75.14
1960-'61	5577.172	87.32
1961-'62	7808.163	112.00
1962-'63	6087.482	120.00

Though ginger is cultivated in almost all the States in India, more than 55 per cent of the area and 50 per cent of the production are in Kerala. The area and production of dry ginger in the different States of India in 1961-'62 were as follows :-

State	Area (in hectares)	Production (in tons)
Kerala	12,069.00	11,379.20
Andhra Pradesh	486.00	304.80
Madhya Pradesh	729.00	812.80
Uttar Pradesh	1,620.00	3,007.36
Madras	364.50	304.80
Maharashtra	526.50	508.00

1. Superintendent, 2. Research Assistant, A. R. S., Ambalavayal (Kerala State)

* Received on 31-7-1964.

<i>State</i>	<i>Area (in hectares)</i>	<i>Production (in tons)</i>
Mysore	405.00	711.20
Orissa	486.00	406.40
Punjab	283.50	203.50
Rajasthan	121.50	304.80
West Bengal	931.50	1,219.20
Himachal Pradesh	1,377.00	508.00
Tripura	162.00	203.00
Assam	2,025.00	2,540.00
Total	21,586.50	22,412.96

Kozhikode and Kottayam districts together account for more than 75 per cent of the area under ginger in Kerala with 5020 and 4120 hectares respectively. The other important ginger growing districts are Palghat (2160 hectares), Ernakulam (1300 hectares) and Cannanore (520 hectares).

Soil and Climate: A rich soil with good drainage and aeration is ideal for ginger. It comes up well on a variety of soils provided sufficient rainfall or irrigation and adequate drainage facilities are available. Depth of the soil is not important as it is found to thrive even in soils less than 30 cm. deep. It thrives well in the clayey loams of Wynad, red laterites of Kottayam and in sandy loams. Ginger should not be planted in the same soil repeatedly year after year.

Ginger requires a warm and humid climate for its growth. In Kerala, it is grown purely as a rainfed crop. It comes up well in areas having an annual rainfall of 150 cm. to 300 cm. with the major portion being received during the growing season. In fact, a moderate rainfall at the time of sowing till the completion of germination, fairly heavy rainfall during the growing season, and no rainfall from about a month prior to the harvest; are the optimum for the successful cultivation of ginger. In low or moderate rainfall areas like Madras, Andhra Pradesh etc. it is raised as an irrigated crop.

Though ginger is adapted to varying altitudes from sea level to 1500 metres, the optimum elevation for its successful cultivation is from 300 to 900 metres.

Varieties: No systematic work on the correct description and classification of ginger varieties grown in different ginger growing areas have been done so far. But studies conducted at the Agricultural Research Station, Ambalavayal with 19 types of ginger collected from the leading ginger growing tracts of India and other foreign countries, have shown that considerable differences exist between these types in respect of yield and quality of rhizomes. On the basis of these studies, a few high yielding types have been selected and distributed for large scale cultivation. (Fig. 1 & 2.)

Rio-de-janeiro, a type introduced from Brazil has recorded the highest yield of 25,000 to 30,000 kg. per hectare. This is 2 to 3 times the average yield of local types. The fibre content of this variety is 5.19 per cent and the percentage recovery of dry ginger to green ginger is 16 to 18. This is fast becoming popular throughout the ginger growing areas of Kerala.

The next in importance in respect of yield is *China*, a type introduced from China. This gives an average yield of 18,000 to 20,000 kg. per hectare. The fibre content is comparatively low with only 3.43 per cent. But due to the low recovery of dry ginger to green ginger, ranging from 12 to 15 per cent only, this is not finding favour with the cultivators of Kerala who convert major portion of their produce as dry ginger. In China, this variety which has fleshy rhizomes is used for the preparation of ginger preserves.

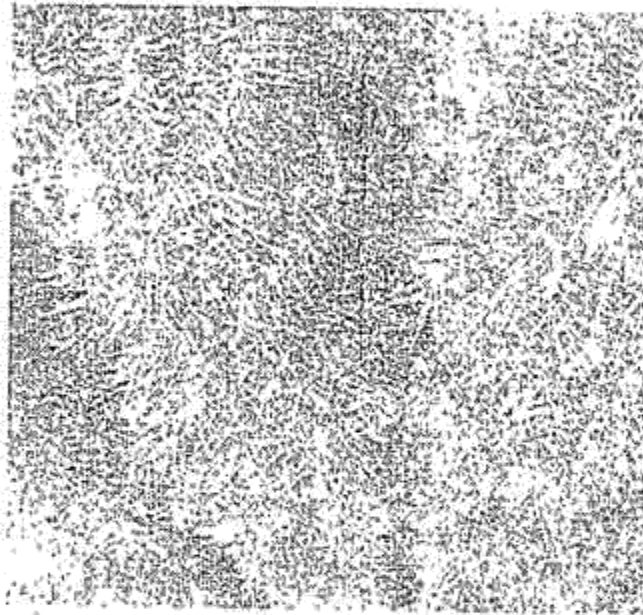


FIG. 1

Ginger crop grown on raised beds



FIG. 2

Important varieties: L to R: 1. Maran, 2. Karkal, 3. Rio De Janeiro, 4. Narasapattam, 5. Mannantoddy, 6. China.

Among the indigenous types, *Narasapattam*, collected from Andhra Pradesh yields 15,000 to 18,000 kg. per hectare. The percentage recovery of dry ginger in this type is as high as 21 and the fibre content is 4.64. *Wynad Manantoddy* also gives about the same yield with 18 per cent dry ginger and 4.32 per cent fibre content. The type with least fibre content (1.78 per cent) and highest recovery of dry ginger (23 per cent) is *Karkal*, obtained from South Kanara. But its yield is only 8,000 to 10,000 kg. per hectare. The other types with low fibre content are *Burdwan* (2.22 per cent), *Ernad Manjeri* (2.43) and *Wynad Kunnamangalam* (3.26).

Rotation: Ginger is grown both as a pure crop and as an inter-crop in the coconut gardens, young coffee and orange plantations in Kerala. Under rainfed conditions a three year rotation with ginger in the first year, dry paddy followed by gingelly in the second year and *ragi* or *samai* in the third year is followed. Under irrigated condition it is rotated with chillies, vegetables, groundnut, *ragi* and maize. In some places a system of mixed cropping is adopted with chillies or *ragi* planted along the borders of ginger beds.

Ginger should not be planted in the same field year after year. Repeated planting in the same field year after year will lead to infestation of diseases, especially soft rot. As ginger is an exhausting crop this practice will also tend to decrease the yield.

Preparatory Cultivation: Preparation of land for planting ginger starts in the month of March with the receipt of early summer showers. The land is cleared of shrubs and perennial weeds and ploughed repeatedly 6 to 8 times. All weeds should be collected and removed and the clods broken. In some places instead of ploughing, *mammatty* digging is given. The object is to get a fine tilth.

The land is then thrown into raised beds. These beds are of convenient length preferably, 3 to 6 metres, about one metre wide and 15 cm. high. Each bed is separated by an interspace of 30 to 45 cm. In slopy areas the beds should be small, formed along the contour.

Seeds and Sowing: Time of planting has been found to have considerable influence on the yield of ginger. The general practice is to plant in the month of May or June after the onset of south-west monsoon. But trials conducted at the Agricultural Research Station, Ambalavayal have shown that 100 to 200 per cent increased yield could be obtained by planting ginger by the first week of April with the receipt of summer showers. By planting earlier, the ginger plants will make sufficient growth, to withstand heavy rains and will grow rapidly with the receipt of heavy rains. This finding is of considerable economic importance as by adjusting the time of planting alone and without incurring any additional expenditure, the cultivator gets a good additional income.

Planting is done in shallow pits (5 cm. deep) dug on the raised beds at a spacing of 22 cm. x 22 cm. or 22 cm. x 15 cm. between the pits which is found to

be the optimum for securing high yield. (Fig. 1.) Bits of seed rhizomes weighing 15 gm. each and having at least one bud are planted in each pit and covered. A seed rate of 1,200 to 1,400 gm. per hectare should be used.

Manuring and Mulching: Ginger is an exhausting crop and requires heavy manuring. Well rotten cattle manure or compost at the rate of 25 to 30 tons per hectare are applied at the time of planting. This may be either broadcast over the prepared beds before planting or applied over the seed rhizomes in pits before covering.

Ginger fertiliser mixture containing NPK 8:8:16 at the rate of 450 kg. per hectare is applied at the time of second mulching. In Madras and Bengal, oil cakes are sometimes applied.

Mulching the beds with green leaves is the most important operation for ginger. Two mulchings are given, first immediately after planting and second about one and a half months after planting. Since planting is done at a time when the monsoon has not set in, the first mulch conserves moisture and helps the rhizomes to germinate. This also prevents excessive weed growth and when decomposed adds to the humus content and enhances fertility of the soil. Quick rotting green leaves at the rate of 10,000 kg. per hectare are used. The second mulch is also given with the same quantity of green leaves. Mulching with a total quantity of 20,000 kg. of green leaves per hectare twice has given about 200 per cent increased yield over the non-mulched area.

After Cultivation: In addition to mulching and manuring, weeding and earthing up are the other important after cultivation operations done to the crop. First weeding is done just before the second mulching. Twigs of first green leaf mulch should also be removed at this time. Beds are earthed up after providing the mulch. Another weeding and earthing up are given about three months after planting. Further weeding may be done if and when necessary.

Harvesting: The crop is ready for harvest in about 8 months (in the month of December when planted in April). The leaves at this time turn yellow and gradually dry up. The rhizomes are lifted either with digging forks or dug out with *mammatties*, taking care not to damage the rhizomes. The rhizomes are cleaned of roots and adhering soil particles.

Yield: The average yield of green ginger in Kerala is estimated to be only 5,000 to 6,000 kg. per hectare which is very low. This could be considerably increased by the use of high yielding types and adopting correct time of planting and cultural practices as is evidenced from the high yield of 20,000 to 30,000 kg. green ginger per hectare obtained at the Agricultural Research Station, Ambalavayal.

Curing: The bulk of ginger is marketed as dry ginger which is obtained by curing green ginger. One of the limiting factors in the export of our produce is the lack of uniformity in the cured products. Therefore, preparation of dry

ginger calls for great care and attention. The curing process standardised at the Agricultural Research Station, Ambalavayal is found to give good quality dry ginger.

The green ginger cleaned free of roots and adhering soil particles are washed in water 2 or 3 times. The outer skin of the rhizomes are then peeled. Peeling should be done with great care and skill. The essential oil, which gives ginger the aromatic character, is present in the epidermal cells and excessive or careless scraping will result in damaging these cells, leading to a loss of essential oils. Split bamboos or broken bottle pieces are used for peeling. Steel knives are not used as they are found to stain the produce. The peeled rhizomes are again washed well and dried in the sun. They are turned frequently to effect uniform drying. The drying continues for 6 to 8 days. Finally the dried rhizomes are rubbed together to remove the last particles of skin and other foreign matter. These are then packed in gunnies for marketing.

Soaking the peeled rhizomes in a 2 per cent clear lime water for 6 hours before drying is done in some places to give the dry ginger a good appearance. This also prevents insect attack. It is reported that the dry ginger prepared in this way is not liked in foreign markets especially the Middle East countries.

Preservation of Seed Ginger: Seed ginger has to be stored for about 5 months from the time of harvest in December to the time of planting in April. Due to the highly perishable nature of ginger rhizomes, it offers serious problem during storage, transit and marketing. Rhizome rot, sprouting, rooting and shrivelling are the common defects noticed in storage and transportation. Therefore, it is necessary that great care should be bestowed in the proper storage of ginger.

Keeping the seed rhizomes in pits is found to be the best method of storage. Big and healthy rhizomes are selected at the time of harvest and treated with 0.25 per cent solution of wetttable cerosan (155 gm. of wetttable cerosan in 45 litres of water) for 30 minutes, as a prophylactic measure against soft rot disease. Three changes can be treated in the same solution. The treated rhizomes are then dried under shade and stored in pits dug in a cool place and protected from sun and rain. The pits should not be more than one metre deep. A layer of sand or saw dust is put at the bottom of the pit before storage. Either the pit is left as such without covering or the pit is covered with a wooden plank leaving some space between the seeds and plank and plastered with mud. In the latter case, a small hole is made in the plank through which a hollow bamboo tube is inserted to provide aeration for the rhizomes. In either case, the stored seed material will remain without deterioration.

The trials conducted at the Central Food Technological Research Institute, Mysore have shown that a combination of treatments like protective skin coatings, containing a fungicide and a plant growth inhibitor, coupled with packing in polythene bags would help in the storage of ginger rhizomes without deterioration. This process helps in the long distance transport of seed materials also.

Pests and Diseases: Soft rot: The most serious disease affecting ginger crop is soft rot or rhizome rot caused by the fungi, *Pythium aphanidermatum* and *Sclerotium rolfsii*. This is prevalent in all ginger growing areas and spreads both through the soil and the seed. Heavy rainfall, lack of drainage or continued dampness aggravates the disease. The earliest symptom of the disease is the yellowing of the leaf margins which gradually spreads to the entire leaf. The leaves wilt and dry up and a light pull at this time is enough to cause the affected shoots to break off at the base, which has become soft and watery. Ultimately the inner tissues of the rhizomes decay and disintegrate, while the outer rind remains unaffected. In serious cases of out break of the disease, losses to crop ranging from 80 to 90 per cent may occur.

The results of investigations made at the Agricultural Research Station, Ambalavayal have shown that the disease could be controlled very effectively by the following methods:

1. Select sites having proper drainage, for planting ginger.
2. Do not plant ginger repeatedly in the same land. Observe a three year rotation.
3. For seed purpose big sized and healthy rhizomes from disease free areas should be selected.
4. Treat the seeds with 0.25% wettable ceresan (115 gms. of wettable ceresan in 45 litres of water) for 30 minutes and dry in the shade before storage.
5. When the disease occurs in the field, drench the ginger beds with *chesunt compound* as soon as the first symptoms of the disease are noticed. The solution of the fungicide is applied to the bottom of the affected plants at the rate of 1.70 ml for each clump. It is better to apply the solution to the beds adjoining the affected beds also. The fungicide may also be applied to the entire area even at the time of planting the rhizomes, as a preventive measure.

(Cheshunt compound is prepared by mixing well powdered ammonium carbonate and copper sulphate at the rate of 11:2. This is stored in an air-tight container for 24 hours. Twenty eight gram of this product is dissolved in 9 litres of water to prepare the solution).

In addition to its fungicidal properties, it adds to the manurial value also and this helps in the vigorous growth and productivity of the crop.

Leaf spot: This is another common disease of ginger caused by a fungus, *Colletotrichum capsici* (Syd). Small yellow spots appear on the leaves in great numbers which later on turn brown. The infected leaves appear reddish brown instead of the normal green colour. This is not a serious disease and can be controlled by spraying with one per cent Bordeaux mixture.

Stem borer: This is the only serious pest found on ginger. This bores into the shoots which turn yellow and dry. The pest is controlled by cutting and removing the affected shoots and spraying with 0.05 per cent "Endrin".

Uses: Ginger is a herbaceous perennial and the edible part is the underground rhizome of the plant. Ginger finds many uses both in the green and dry forms. In Japan young ginger shoots are used for pickling. In China tender ginger is preserved in syrup. Cleaned ginger is boiled in water for one hour and then sugar is added at the rate of 5 kg for every 10 kg. of ginger. This is again boiled for two hours and allowed to stand for ten days. Ginger is also used for spicing ginger wine, a cordial beneficial in cold weather and specially useful in colic. It is an important ingredient in ginger beer, which is a good stimulating drink, a carminative and an aromatic stimulant to the gastro intestinal tract. It is a good remedy for flatulence. In many countries ginger is used in medicinal preparations for digestive disorders. Ginger finds various uses in culinary art. It has also aphrodisiac properties.

Dry ginger contains one to three per cent of a volatile oil and 50 per cent of starch, with fibre, protein resin, fixed oils etc. as its other constituents. In the standard B. P. ginger should not have more than six per cent of ash on incineration and not less than 1.7 per cent of ash soluble in water.

Cost of Cultivation: The cost of cultivation of ginger varies from place to place depending on the cost of seeds, wages paid to the labour and the cultural operations given. The following is the expenditure incurred in the cultivation of ginger by improved methods in one hectare, at the Agricultural Research Station, Ambalavayal in 1963-'64. The average yield of green ginger is calculated as 15,000 kg. per hectare or 3,000 kg. dry ginger.

Cost of cultivation per hectare (About 2.2 acres):

<i>Items</i>	<i>Expenditure</i>	
	Rs.	P.
Preparatory cultivation (clearing the area and ploughing 6 times).	...	180 00
Preparing beds.	...	100 00
Cost of 1200 kg. of seeds at the rate of 0.75 per kg.	...	900 00
Forming pits, cutting seeds, planting and covering.	...	50 00
Cutting green leaves, mulching and earthing up. (2 times with 20,000 bags of green leaves).	...	250 00
Manures and manuring (including cost of 25 tons of cattle manure and 450 kg. ginger mixture).	...	450 00
Weeding thrice	...	100 00
Plant protection (against soft rot and shoot borer).	...	40 00
Harvesting and clearing ginger	...	160 00
Preparation of dry ginger	...	150 00
Total expenditure.	...	2,380 00

Receipts :

	Rs.	P.
Cost of 3000 kg. of dry ginger at Rs. 3/- per kg.	9,000	00
Net profit per hectare	...	6,620 00 or
	<i>(Rs. 3,000/- per acre)</i>	

The price of dry ginger fluctuates very violently every year, depending on the demand from foreign market and hence the profits from ginger cultivation are not steady. The price per quintal of dry ginger in 1951-'52 was Rs. 440/- while in 1957-'58 it was only Rs. 70/-. In 1963-'64 it ranged from Rs. 300 to Rs. 380 per quintal and hence the high profit.

If the yield of ginger could be increased by adopting improved cultivation practices and by the use of high yielding varieties and at the same time if a reasonable minimum price for the produce is guaranteed, very few annual crops will yield a profit as high as ginger.