ICCOA

ORGANIC GINGER
CULTIVATION PRACTICES
Ginger cultivation- General

- require rainfall of between 250 and 300 cm and require additional irrigation where rainfall is not adequate.
- The crop cannot withstand water logging. Cultivate in well drained loamy soils rich in humus.
- Not desirable to grow ginger in the same field year after year.
- Can be cultivated as an inter or mixed crop.
- It is desirable to include pulses crop in rotation with ginger.
- Pest and disease free rhizomes must be used for sowing without chemical treatment.
Preparation of land and planting

Minimum tillage operations may be adopted.

Manuring: Add 1 kg Trichoderma to 2 tons of compost + 500 kg Neem cake powder and apply as a basal dose per acre while planting the rhizomes in the pits.

Form beds of 15 cm height, 1 m width and of convenient length. Give 50cm distance between beds.

Solarize the beds using polythene sheets to control the multiplication of pest and disease causing organisms.

Seed material: 600 kg rhizome/acre.

Spacing: plant to plant 25 cm within the row; row to row distance is also 25 cm between rows. place the seed rhizomes in shallow pits and fill with soil mixed with the basal dose fertilizer mixture mentioned above.
Cultural practices

• Mulch the ginger beds with green leaves

• The first mulching is to be done @ 4t/ac at the time of planting. Repeat @ 2 t/ac at 40th and 90th day after planting. Use of *Lantana camara* and *Vitex negundo* as mulch to reduce shoot borer attack.

• Pour cow dung slurry on the bed after each mulching.

• Carryout weeding.

• Ginger has a tendency to grow horizontally and the soil can be hilled around the growing stems to force a more vertical growth habit. Soil should be hilled 3 to 5 times during the growing season.
Fresh Ginger Harvest and post harvest operations

- **Fresh ginger** harvest is done from the 6th month onwards.
- When fully mature leaves turn yellow and start drying up gradually. Clumps are lifted carefully and rhizomes are separated from dried leaves and roots.
- Yield of fresh ginger varies with varieties ranging from 6 to 10 tons/ac.
- Fresh rhizomes are washed 2 or 3 times and sun-dried for a day.
Dry ginger

- Harvest after 7-8 months.
- For dry ginger, soak the produce in water overnight. Rub and clean them.
- The outer skin is removed with a bamboo splinter/wooden knife. Colour will fade if iron knife is used.
- Peeled rhizomes are washed and dried in the sun for one week. Rub Rhizomes to remove left over skin. Dry to get 11% moisture level.
- Storage for longer periods is not desirable. The yield of dry ginger is normally 16-25% of the fresh ginger.
Preservation of seed rhizome.

• Spread layers of leaves of *Glycosmis pentaphylla* (In Malayalam 'panal’) is a good practice.
• Seed rhizomes are to be stored properly in pits under shade.
• For seed material, healthy and disease-free clumps are marked in the field when the crop is 6-8 months old and still green. Big and healthy rhizomes from such plants are selected immediately after harvest.
• Seed rhizomes are stored in pits of convenient size made inside the shed to protect from the sun and rain. Smear walls of the pits with cow dung paste.
• Store them in pits in layers along with well dried sand or saw dust (i.e. place one layer of seed rhizomes, then place 2 cm thick layer of sand or saw dust). Sufficient gap is to be left at the top of the pits for adequate aeration. The pits can be covered with wooden plank with holes for aeration.
• Inspect the rhizomes once in twenty days to remove shriveled and disease affected rhizomes.
• Can also be stored in pits dug in the ground under the shade of a tree if there is no chance for water to enter the pits. In some areas, the rhizomes are loosely heaped over a layer of sand or paddy husk and covered with dry leaves in a thatched shed.
Nitrogen Deficiency

• Pale or yellow green leaves (chlorosis) symptoms appear first in the older leaves.
• Leaves small in size. Overall growth is markedly reduced. Deficiency results in reduction of rhizome yield.
• Grow leguminous crops as intercrop. Repeat oilcake and biofertilizers with compost as top dressing when symptoms are noticed.
Potassium Deficiency

**Corrective measure:** Application of Sulphate of Potash @ 5 Kg/acre in four splits (basal, 60, 90 and 120 Days after planting)

or foliar spray of Sulphate of Potash @ 10gm/lit of water dilution at fortnightly interval.
Iron Deficiency

• Correction measure:

• Soil application of Ferrous Sulphate @ 12 Kg/acre mixed with compost.

• Foliar spray of Ferrous sulphate @ 5gm/lit water dilution during 3rd, 4th and 5th months.
Rhizome Scales

- Initially the white scales are scattered on rhizomes and later they congregate near the growing buds.
- When the infestation is severe, the rhizomes and buds shrivel and ultimately the entire rhizome dries.
- Collect and destroy damaged leaves • Apply well rotten sheep manure @ 4 t/acre in two splits or poultry manure in 2 split doses.
The shoot borer (*Conogethes punctiferalis*)

- The shoot borer is the most important pest of ginger.
- It appears during July-October period.
- Find the shoots infested by the borer, clip and destroy them.
- Spray neem oil @ 5ml/lit water at fortnightly intervals.
- Keep 4 Light traps to collect the adult moths to prevent egg laying.
Parasitoids of shoot borer:

**Larval parasitoids**
1. *Bracon brevicornis*
2. *Myosoma sp*
3. *Apanteles sp*

**Larval and pupal parasitoids**
1. *Xanthopimpla sp*

Predators of shoot borer:
1. Lacewing
2. Ladybird beetle
3. Spider
4. Fire ant
Predators of shoot borers - 2

5. Dragonfly
6. Robber fly
7. Reduviid bug
8. Praying mantis
White grubs 
(*Holotrichia setticolis*)

• Tilling of the soil - solarization reduces white grubs which get exposed to sun and foraged by the birds.
• Mechanical collection and removal- wherever possible.
• Entomopathogenic nematode *Steinernema* sp. can be mixed in the FYM and can be applied in the field.
• (Dose: 1 billion infectile juveniles of the nematode per acre)
Biological control of Insect pests

- Conserve or inundate the natural bioagents such as ladybird beetle, spiders, Chrysopids, Trichogrammatids etc.
Bacterial wilt *Ralstonia solanacearum*

Yellowing ginger foliage caused by bacterial wilt

Yellowing ginger foliage caused by bacterial wilt
Wilt and dieback
Bacterial wilt of ginger

Discolored ginger root due to bacterial wilt
Bacterial wilt
*(Ralstonia solanacearum)*

- Use Plant Growth Promoting Rhizobacteria (PGPR) like Azospirillum.
- Crop rotation with maize, cotton, and soybean.
- Incorporation of Pseudomonas spp., Mycorhiza @ 1Kg/per acre with well decomposed FYM
- Seed treatment with Trichoderma spp. + Pseudomonas florescens before sowing can control disease.
- Uniform drenching of all the beds with Bordeaux mixture (1 %) can be done.
SOFT ROT IN GINGER

*Pythium spp. Pythium myriotylum*

- Use small and raised beds with deep drains
- Practice crop rotation
- Disease-free seed.
- Keep weeds to a minimum
Soft rot or rhizome rot (Pythium aphanidermatum)

• Major seed-borne disease of ginger. Water stagnation causes infection. Provide adequate drainage. Select seed rhizomes from disease free areas. Solarization of soil done at the time of bed preparation reduces the fungus inoculum. Remove and destroy affected plants.

• *Trichoderma* should be applied at the time of planting and subsequently if necessary. (Use 1 kg Tricho with 1 ton of compost and apply). Mulch with green leaves and apply cow dung solution.

• Bordeaux mixture (1 %) in disease prone areas can be applied.
Root-knot nematode and Burrowing nematode *Meloidogyne* spp.

*Radopholus similis*

Burrowing nematode (*Radopholus similis*) damage

Symptoms on rhizome caused by burrowing nematode

Damage due to burrowing nematode
Root knot nematode: Water soaked lesions on roots; Galls on roots; reduction in plant vigor; yellowing plants wilt in hot weather.

Burrowing nematode: The appearance of small, water-soaked shallow lesions on rhizome which later turn brown. This lesion merges together and leads to rotting. Infected plants show yellow leaves with less number of shoots and stunted growth.

Plant resistant varieties-solarizing soil-Treating rhizome with hot water (51°C for 10 minutes) before planting reduces burrowing nematode problem.
Dry rot

*Fusarium and Pratylenchus complex*

- Caused by fungus and nematode
- Initially lower leaves have yellow tips followed by complete yellowing. Then, upper leaves become yellow. Later the leaves become dry and whole plant appears stunted. Infected rhizome shows brownish ring.
- Seed treatment with Bordeaux mixture and solarizing the soil before planting will reduce infection.
Predators and Parasitoids

- **Predators** are beneficial insects - feed on insects that damage crops.
  - For example, lady bird beetle is a predator - can feed on pests like aphids. One ladybird beetle can eat about 50 aphids per day.
  - You can see in the next slide how much other insects are feeding and on which pest.
- **Parasitoids** are beneficial insects - lays eggs in the larva’s body or on the eggs of pests. When the eggs hatch in the pest’s body, they damage the parts and kill them.
  - If more eggs are laid by them, more pests are damaged. For example: a minute wasp-Trichogramma can lay 20 to 200 eggs on the eggs of pests and destroy.
  - You can see in the next slides about the egg laying capacity of these parasitoids.
# Feeding/egg laying potential of different parasitoids/predators

<table>
<thead>
<tr>
<th>Predators/Parasitoids</th>
<th>Feeding potential/ Egg laying capacity</th>
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</thead>
<tbody>
<tr>
<td>Ladybird beetle</td>
<td>Predatory rate of adult coccinellid on aphids is 50 aphids per day</td>
</tr>
<tr>
<td>Hover fly</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; instar larva can consume 15-19 aphids/day. 2&lt;sup&gt;nd&lt;/sup&gt; instar larva can consume 45-52 aphids/day. 3&lt;sup&gt;rd&lt;/sup&gt; instar larva can consume 80-90 aphids/day. In total life cycle they can consume approx. 400 aphids.</td>
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<tr>
<td>Green lacewing</td>
<td>Each larva can consume 100 aphids, 329 pupae of whitefly and 288 nymphs of jassids during entire larval period</td>
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<tr>
<td>Spider</td>
<td>5 big larvae/adults per day</td>
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<td>Reduviid bug</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; &amp; 2&lt;sup&gt;nd&lt;/sup&gt; nymphal instars can consume 1 small larva/day. 3&lt;sup&gt;rd&lt;/sup&gt; &amp; 4&lt;sup&gt;th&lt;/sup&gt; nymphal instars can consume 2 to 3 medium larvae/day. 5&lt;sup&gt;th&lt;/sup&gt; nymphal instar &amp; adult can consume 3 to 4 big larvae/day. In total life cycle they can consume approx. 250 to 300 larvae.</td>
</tr>
<tr>
<td>Predatory mite</td>
<td>Predatory rate of adult is 20-35 phytophagous mites/female/day. <a href="http://www.eduwebs.org/bugs/predatory_mites.htm">Link</a></td>
</tr>
<tr>
<td>Bracon hebetor</td>
<td>Egg laying capacity is 100-200 eggs/female. 1-8 eggs/larva</td>
</tr>
<tr>
<td>Trichogramma sp</td>
<td>Egg laying capacity is 20-200 eggs/female.</td>
</tr>
</tbody>
</table>
Bio-diversity

- These plants attract the beneficial insects like Predators and Parasitoids to the farm.

- It is essential to keep these plants in the hedges or bunds so that the beneficial insects can survive in the farm.
Reference

- [www.agritech.tnau.ac.in/org_farm/orgfarm_ginger.htm](http://www.agritech.tnau.ac.in/org_farm/orgfarm_ginger.htm)
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- [https://farmer.gov.in/imagedefault/ipm/Ginger.pdf](https://farmer.gov.in/imagedefault/ipm/Ginger.pdf) AESA based IPM
- Nutritional disorders in Ginger-University of Queensland
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THANK YOU