

5. **Soil drenching** : soil drenching with Mancozeb (0.3%) or Metalaxyl @ 500 ppm as a soil drench is recommended in severely soft rot infested areas.

6. **Hot water treatment** : rhizome treatment in 51°C hot water for 10 minutes is recommended in disease epidemic areas.

7. **Biological controls** : Antagonistic fungi namely *Trichoderma harzianum*, *T.hamatum*, *T.viridae* and bacterial isolate like *Bacillus* and *Pseudomonas fluorescens* have been reported to reduce the soil borne pathogen of ginger.

8. **Nematode management** : In nematode infested areas pre planting application of neem (*Azadirachta indica*) cake (1 ton/ha) followed by post planting application of carbofuran (1 kg a.i./ha) 45 days after planting is recommended for control of *Meloidogyne incognita*.

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DISEASES OF GINGER



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Diseases of Ginger

Ginger is affected by many pests and diseases. Of these soft rot (*Phythium* spp, bacterial wilt (*Ralstonia solanacearum*, yellows (*Fusarium Oxysporum*, *Phyllosticta* leaf spot, nematode (*Pratylenchus coffeae*) and storage rots are major disease that cause economic loss.

1. **Soft rot / rhizome rot** : Causal organism (*Phythium aphanidermatum* and *Phythium myriotylum*). The initial symptoms developed on leaves as slight fading of green colour followed by yellowing of tips. The chlorosis proceeds downwards resulting in withering and dead of leaves. The rhizome become soft and on pressing collapse easily. In advance stages only skin is left. The internal tissues rot completely and the plants wilt and collapse. The rotting continue in storage also.

2. **Bacterial wilt** : causal organism (*Ralstonia solanacearum*). Bacterial wilt of ginger is one of the most important production constraint in tropical sub tropical and warm temperate regions of the country and inflicts serious economic losses. Once introduced in an area it persists in the soil because of its wide host range. The severity of the disease is evident from the rapid and quick spread in the field when the environmental conditions (high rainfall & warm weather) are favorable for the disease development.

The first visible symptoms are curling of leaves followed by yellowing & withering the affected pseudostem and rhizome. When cut transversally and pressed milky exudates oozes out. The suspected stem may be collected from the field and immersed in clean glass of water after giving a fresh cut & holding in the middle of the glass. A white jel oozing out from the cut ends confirms the infection of bacterial wilt.

2. **Fusarium yellows/dry rot** : causal organism (*Fusarium oxysporum fssp zinziberis*) It is prevalent on drought prone areas. On leaves symptoms appear first as yellowing of the margins of the lower leaves. older leaves dry up first followed by younger ones. Plants may also show premature drooping/wilting and drying in patches in the field. In rhizomes a cream to brown discolouration accompanied by shriveiling is commonly seen. vascular rot is also prominent. A white cottony fungal growth may develop on the surface of stored rhizome which reduces the marketability of rhizomes to a great extent.

3. **Leaf spot** : causal organism (*Phyllosticta zinziberis*)

From june to sept due to heavy rainfall accompanied by high humidity and

moderate temperature ginger foliage are attacked by a number of leaf spots/blight diseases. Small spindle to oval or elongated spots appear on younger leaves. The spots have white papery centres and dark brown margins surrounded by yellow halos. The spots later increase in size & collapse to form large spots which eventually decrease the effective photosynthetic area on the leaf surface. In case of severe attack the entire leaf dries up.

4. **Nematode diseases** : Meloidogyne spp, Radophalous similies & *Pratylenchus* spp have been reported as the major nematode causing significant damage and yield reduction.

Integrated management of the above diseases :

1. **Selection of seed rhizome** : the best method to manage the seed borne disease is by the use of disease free seed rhizome. For this purpose seed rhizome have to be collected from disease free fields/areas with no history of bacterial wilt.

2. **Chemical treatment** : Treatment of seed rhizomes for 30 minutes with mancozeb (0.3 %) or carbendazim (0.3%) in case of soft rot prior to storage & planting is recommended. Carbendazim alone or in combination with ridomil MZ is also used to prevent the seed borne inoculums of both phythium and fusarium. Under improved production packages, combined treatment with Ridomil MZ (0.1%) plus Bavistin (0.1%) plus Chloropyriphos (0.05%) has been found to be very effective in management of soft rot.

Bordeaux mixture (1%) at forth nightly interval as need best application helps in minimizing the foliar disease/leaf blight etc. especially under north eastern region during July-Sept.

3. **Cultural method** : Proper drainage for cultivation ensures healthy crop. Clean cultivation, collection and burning of disease and dead leaves, stem and other plants parts helps in reducing the disease inoculums particularly leaf spot diseases. Crop rotation with non host crop like leguminous crops, maize, ragi, paddy etc. not only benefit the soil nutrient supplementation but also keeps the disease under check.

4. **Soil solarization** : Soil solarization is a soil disinfection practice achieved by covering moist soil with transparent polythene film during the period of high temperature and intense solarization. This is one of the best method to check the bacterial wilt and soft rot disease.