

E R G O F I T O I N A C T I O N

Give Nature What Nature Wants

Bananas



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BANANA:

A banana is an edible fruit produced by several kinds of large herbaceous flowering plants in the genus *Musa*. (In some countries, bananas used for cooking may be called plantains.) The fruit is variable in size, colour and firmness, but is usually elongated and curved, with soft flesh rich in starch covered with a rind which may be green, yellow, red, purple, or brown when ripe. The fruits grow in clusters hanging from the top of the plant. Almost all modern edible parthenocarpic (seedless) bananas come from two wild species – *Musa acuminata* and *Musa balbisiana*. The scientific names of most cultivated bananas are *Musa acuminata*, *Musa balbisiana*, and *Musa × paradisiaca* for the hybrid *Musa acuminata* × *M. balbisiana*, depending on their genomic constitution. The old scientific name *Musa sapientum* is no longer used.

ORCHARDS:

An orchard is an intentional planting of large plants (such as banana), trees or shrubs that is maintained for food production. Orchards comprise fruit, berry or nut-producing trees that are grown for commercial production.

The general health of the orchard directly translates into its yield, therefore financial income for the farmer. There are many factors that can affect the fruit tree performance in terms of yields. One of the major reasons is the continuous and often increased dosage of chemical fertilization while often neglecting the vital natural bacteriological balance. Although the types of large plants or fruit trees are numerous, the basics remain the same, the radical apparatus, the photosynthesis; the fruits or berries they bear and the sicknesses they suffer are similar amongst many other common factors.

PLANTLETS:

A healthy plantlet will make a great difference when planting.

Plantlets, like all plants, require a healthy rhizosphere to thrive. There are numerous media and fertilization approaches for plantlets, but radical health is vital in all cases.

In order to ensure correct beneficial microbial activity at root level, a small dose (2 grams) of **Ergofito Universal Plus** per sapling is advisable. Apply the said dosage every 20 days for five applications or until transplanting (please refer to “Ergofito Benefits” brochure for listed benefits)

Bio Agent	Quantity	When
Ergofito Universal Plus	2 Grams Per Plantlet	When Seeding and or Transplanting

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GROWING PLANTS:

Growing plants will benefit from a balanced rhizosphere with the correct beneficial microbial activity.

Yearly application:

Apply once a year on the ground around the tree, in the diameter of the canopy:

Bio Agent	Quantity	When
Ergostart Bio	125 Kg Per Hectare	Immediately

The above is applied with sufficient water, generally diluted 1:50, (1Kg of product to 50 liters of water). **Ergostart Bio** will immediately start decomposing all inert organic matter into plant food. More importantly it will de-mineralize any accumulation in the rhizosphere that is and has suffocated the soil. It will start by converting all of the above into humus, thus rejuvenating tired soils and allow normal and healthy root development.

Bio Agent	Quantity	When
Ergofito Universal Plus	10 Kg Per Hectare	30 Days After the Above Application
Ergofito Universal Plus	10 Kg Per Hectare	40 Days After Above Application
Ergofito Universal Plus	10 Kg Per Hectare	40 Days After Above Application

The above application will ensure superior growth and a strong preventive defense against plant sicknesses and parasitic attacks.

Plants send out explorer roots to identify nourishing soil. They use a capillary element (a root hair), which explores a very small space (micro- habitat) and samples the nutrients available. If there is only enough 'food' for one root hair the plant deposits toxins along the exterior surface of this space to stop the occupied area from being explored by other capillary elements.

When the food is finished the plant makes the microhabitat toxic and sheds off its root hair. This prevents other root hairs from exploring soil that has been exhausted. Through chemical fertilization the nutrients can be replenished in

the spaces but if there is not sufficient bacterial activity to detoxify the soil, these areas will still be avoided by new roots. This is why the efficiency of soil (absorption of plant nutrients) is below 15% when using chemical fertilizers.

ERGOFITO contains the enzymes and bacteria that destroy these toxins and transform the poison back into food for plants. This emulates the properties of non-agricultural land that is full of organic material, high in microbiological activity and does not get affected by soil tiredness. The same applies to any soil rich in humus. Soil exhaustion does not occur where humus is present.

BANANA PLANT SICKNESSES:

Banana plants are divided into five sectors:

- Bacterial Diseases
- Fungal Diseases
- Viral diseases
- Nematodic, parasitic
- Miscellaneous diseases and disorders

The majority of diseases are fungal. Some are very prevalent such as Sigatoka or Panama disease.

<u>Bacterial diseases</u>	
Bacterial wilt	<i>Pseudomonas solanacearum</i> (race 1)
Blood disease	<i>Pseudomonas spp.</i>
Bugtok	<i>Pseudomonas solanacearum</i> (race 2)
Finger tip rot (gumming)	<i>Pseudomonas spp.</i>
Rhizome rot	<i>Erwinia carotovora</i> , <i>Erwinia chrysanthemi</i>
Javanese vascular wilt	<i>Pseudomonas spp.</i>
Xanthomonas wilt (BXW), Banana bacterial wilt, enset wilt	<i>Xanthomonas campestris pv. musacearum</i>
<u>Fungal diseases</u>	
Anthracnose	<i>Colletotrichum musae</i>
Armillaria corn rot	<i>Armillaria mellea</i> <i>Armillaria tabescens</i>
Black cross	<i>Phyllachora musicola</i>

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Black leaf streak (BLS) or Black Sigatoka	<i>Mycosphaerella fijiensis</i> <i>Paracercospora fijiensis</i> [anamorph]
Black root rot	<i>Rosellinia bunodes</i>
Brown blotch	<i>Pestalotiopsis leprogena</i>
Brown spot	<i>Cercospora hayi</i>
Ceratocystis fruit rot	<i>Ceratocystis paradoxa</i> <i>Chalara paradoxa</i> [anamorph]
Cigar-end	<i>Verticillium theobromae</i> <i>Trachysphaera fructigena</i>
Cladosporium speckle	<i>Cladosporium musae</i>
Corm dry rot	<i>Junghuhnia vincta</i>
Cordana leaf spot	<i>Cordana johnstonii</i> <i>Cordana musae</i>
Crown rot	<i>Fusarium pallidoroseum</i> <i>Colletotrichum musae</i> <i>Verticillium theobromae</i> <i>Fusarium</i> spp. <i>Acremonium</i> spp.
Cylindrocladium root rot	<i>Cylindrocladium</i> spp.
Damping-off	<i>Deightoniella torulosa</i>
Deightoniella fruit speckle, leaf spot and tip rot	<i>Deightoniella torulosa</i>
Diamond spot	<i>Cercospora hayi</i> <i>Fusarium</i> spp.
Dwarf Cavendish tip rot	<i>Nattrassia mangiferae</i> = <i>Hendersonula toruloidea</i>
Eyespot	<i>Drechslera gigantea</i>
Fruit freckle (freckle)	<i>Guignardia musae</i> <i>Phyllosticta musarum</i> [anamorph]
Fruit rot	<i>Botryosphaeria ribis</i>
Fungal root-rot	<i>Fusarium solani</i> <i>Nectria haematococca</i> [teleomorph] <i>Fusarium oxysporum</i> <i>Rhizoctonia</i> spp.
Fungal scald	<i>Colletotrichum musae</i>
Leaf rust	<i>Uredo musae</i> <i>Uromyces musae</i>
Leaf speckle	<i>Acrodontium simplex</i>
Leaf spot	<i>Curvularia eragrostidis</i>
Leaf spot	<i>Drechslera musae-sapientum</i>

Leaf spot	<i>Leptosphaeria musarum</i>
Leaf spot	<i>Pestalotiopsis disseminata</i>
Main stalk rot	<i>Ceratocystis paradoxa</i>
Malayan leaf spot	<i>Haplobasidium musae</i>
Marasmiellus rot	<i>Marasmiellus inoderma</i> = <i>Marasmius semiustus</i>
Moko	<i>Pseudomonas solanacearum</i> (race 2)
Panama disease (Fusarium wilt)	<i>Fusarium oxysporum f.sp. cubense</i> Races 1, 2 and 4 - inc. Tropical Race 4 (TR4) and Subtropical Race 4
Peduncle rot	<i>Lasiodiplodia theobromae</i> <i>Fusarium pallidoroseum</i> <i>Fusarium oxysporum</i> <i>Verticillium theobromae</i>
Pestalotiopsis leaf spot	<i>Pestalotiopsis palmarum</i>
Phaeoseptoria leaf spot	<i>Phaeoseptoria musae</i>
Pitting	<i>Pyricularia grisea</i>
Pseudostem heart rot	<i>Fusarium moniliforme</i> <i>Gibberella fujikuroi</i> [teleomorph]
Root & rhizome rot	<i>Cylindrocarpon musae</i>
Sclerotinia fruit rot	<i>Sclerotinia sclerotiorum</i>
Septoria leaf spot	<i>Mycosphaerella eumusae</i> [sexual stage] <i>Septoria eumusae</i> [anamorph] A new species even more aggressive than Black Sigatoka and spreading in Asia and the Indian Ocean.
Sheath rot	<i>Nectria foliicola</i> <i>Mycosphaerella musicola</i> <i>Pseudocercospora musae</i> [anamorph]
Sooty mold	<i>Limacinula tenuis</i>
Speckle	<i>Mycosphaerella musae</i>
Squirter (black end disease)	<i>Nigrospora sphaerica</i>
Stem-end rot	<i>Colletotrichum musae</i>
Trachysphaera finger rot	<i>Trachysphaera fructigena</i>
Tropical speckle	<i>Ramichloridium musae</i> = <i>Veronaea musae</i> = <i>Periconiella musae</i>
Verticillium tip rot	<i>Verticillium theobromae</i>
Yellow Sigatoka	<i>Mycosphaerella musicola</i>

<u>Viral diseases</u>	
Disease	Viruses
Bract mosaic	<i>Banana bract mosaic virus</i> <i>Abaca bract mosaic virus</i>
Bunchy top	<i>Banana bunchy top virus</i> <i>Abaca bunchy top virus</i>
Mosaic	<i>Cucumber mosaic virus</i> <i>Abaca mosaic virus</i>
Streak	<i>Banana streak virus</i>
Banana mild mosaic	<i>Banana mild mosaic virus</i>
Banana virus X	<i>Banana virus X</i>

<u>Nematodes, parasitic</u>	
Nematode root rot (burrowing nematode)	<i>Radopholus similis</i>
Root-knot	<i>Meloidogyne arenaria</i> <i>Meloidogyne incognita</i> <i>Meloidogyne javanica</i>
Root-lesion	<i>Pratylenchus coffeae</i> <i>Pratylenchus goodeyi</i> <i>Pratylenchus brachyurus</i> <i>Pratylenchus reniformia</i>
Spiral nematode root damage	<i>Helicotylenchus multicinctus</i> <i>Helicotylenchus dihystra</i>

<u>Miscellaneous diseases and disorders</u>	
Alligator skin	Light abrasions on fruit peel caused by leaves or bracts
Blue disease	Magnesium deficiency
Choke	Low winter temperatures
Dwarfism	Genetic mutation
Elephantiasis	Unknown cause
Fruit chimera	Genetic mutation
Fused fingers	Genetic defect
Giantism	Genetic mutation
Heart leaf unfurling disorder	Unknown cause
High mat	Unknown cause
Leaf edge chlorosis	Unknown cause
Maturity bronzing	Unknown cause

Rayadilla	Zinc deficiency
Rosetting	Nitrogen deficiency
Roxana	Unknown cause
Spike leaf	Low winter temperatures
Split peel	Rapid filling of pulp of fruit
Taiwan marginal scorch	Unknown cause
"Segmented Banana"	Chilling injury to fruit One of the less common plantain diseases is <i>exostentialis clittellus</i> referred to by most plantain and banana farmers as "segmented banana". This is a result of the peel forming tiny inter-fruit membranes which cause the banana to appear as though it has been sliced before it is peeled. This is generally a result of freezing the fruit, and occurs most commonly in fruit that is sold in large stores or supermarkets.
Yellow mat	Unknown cause
Yellow pulp	Delay in fruit filling, drought, excessive shading, magnesium deficiency, poor nutrition
Yellows	Lack of water
Neer Vazhai	Unknown etiology
Kottai Vazhai or seediness in Parthenocarpic Poovan banana	Unknown etiology, probably due to BSV infection

How Ergofito help the plants combat plant sicknesses?

The multiplication of the beneficial bacteria acts in an antagonistic and repressive way towards the phytopathogenic micro-organisms, particularly present in soils lacking humus.

The mechanism of this antagonistic/repressive action towards the phytopathogenic micro-organisms can be summarized as follows:

- **Micro parasitism:**
Occurs when the lyses of the cell of fungi and pathogen mildew or nematodes through enzymatic activity are attacked.
- **Soil sanitation:**
Occurs with the entry of toxic metabolites for the pathogen microorganisms, such as phenols, tannins, chlorogenic acid and auxins (biochemical resistance).

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- **Food competition:**
This action takes place by the new microorganisms devouring the existing food source present in the soil thus starving the pathogens.
- **Strengthening of the threshold resistance:**
Promote the structural thickening of the tissues of the epicuticular layers of protection of the leaves and roots that impede penetration into the plant.

The Mechanism:

The stimulation of the bacterial activity allows the beneficial (Ergofito) microorganisms to occupy spaces in the plant and the surrounding soil in a complex series of physical, chemical and biological reactions that act against the agent that cause plant diseases.

- Reduction of the spaces which are normally occupied by pathogens
- Creation of biological antagonistic control of pathogens
- Accentuation in the reaction of the plant's immune system
- Stimulation of the production Phytoalexin

ERGOFITO ACTION IN PREVENTIVE AND CURATIVE SITUATIONS:

- More efficient defense against parasitic insects due to the plant strengthening
- Fungal preventive action to confront the infections due to Mycogone and Verticillum
- Rot control in seedbeds caused by Pythium and Phytophthora.
- Basal rot control of vegetable crops, agricultural and ornamental due to Phycomycete and Rizoctomia, Sclerotium, Sclerotinia, Botrytis etc.
- Reduction in the incidence of vascular diseases responsible for the withering caused by Fusariumum and Verticillum.
- Preventive and curative action in the arboreal cultures (orchards, urban greenery, citrus etc.) as well as forestal fragrances towards the responsible agents for branch cancer (Nectria, Cytospora, Phopsis etc.). Also towards radical attacks due to Basidiomycetes (Armillaria, Fomes, Stereum, etc.) It will also protect leaves cuts from being penetrated by pathogenic fungi.

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TREATING BACTERIAL DISEASES:

Over and above the recommended **Ergofito** fertilization, apply the following for bacterial diseases:

Radical application:

Bio Agent	Quantity	When
Ergofito Defense	4 Kg Per Hectare	Immediately
Ergofito Defense	4 Kg Per Hectare	Ten Days Later
Ergofito Defense	4 Kg Per Hectare	Ten Days Later
Ergofito Defense	4 Kg Per Hectare	Ten Days Later

(If the sickness persists, apply the above given dosage every 30 days after the initial treatment)

TREATING FUNGAL DISEASES:

Over and above the recommended Ergofito Fertilization, apply the following for fungal diseases:

FIRST APPLICATION RADICAL:

Bio Agent	Quantity	When
Ergofito Banana Fungal (A)	31 Kg Per Hectare	Immediately

SECOND THIRD AND FOURTH APPLICATION FOLIAR:

Bio Agent	Quantity	When
Ergofito Banana Fungal (B)	11 Kg Per Hectare	10 Days After the First Application
Ergofito Banana Fungal (B)	11 Kg Per Hectare	10 Days After the First Application
Ergofito Banana Fungal (B)	11 Kg Per Hectare	10 Days After the First Application

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TREATING VIRAL DISEASES:

Over and above the recommended Ergofito Fertilization, apply the following for viral diseases:

FIRST APPLICATION RADICAL:

Bio Agent	Quantity	When
Ergofito Banana Viral (A)	31 Kg Per Hectare	Immediately

SECOND THIRD AND FOURTH APPLICATIONS - FOLIAR:

BIO AGENT	Quantity	WHEN
Ergofito Banana Viral (B)	11 Kg Per Hectare	10 Days After the First Application
Ergofito Banana Viral (B)	11 Kg Per Hectare	10 Days After the First Application
Ergofito Banana Viral (B)	11 Kg Per Hectare	10 Days After the First Application

TREATING NEMATODES/ PARASITIC DISEASES:

Over and above the recommended Ergofito Fertilization, apply the following for Nematodes/Parasitic diseases:

ALL APPLICATIONS RADICAL:

BIO AGENT	Quantity	WHEN
Ergofito Nemacontrol (A)	105 Kg Per Hectare	Immediately
Ergofito Nemacontrol (B)	5 Kg Per Hectare	10 Days After the First Application

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TREATING DISEASES:

Over and above the recommended Ergofito Fertilization, apply the following for miscellaneous diseases and disorders:

MISCELLANEOUS DISEASES AND DISORDERS:

Radical Application:

BIO AGENT	Q u a n t i t y	WHEN
Ergofito Defense	4 Kg Per Hectare	Immediately
Ergofito Defense	4 Kg Per Hectare	Ten Days Later
Ergofito Defense	4 Kg Per Hectare	Ten Days Later
Ergofito Defense	4 Kg Per Hectare	Ten Days Later



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