

AVOCADO CULTIVATION TREATMENT FOR CONTROL THE ANTHRACNOSE FUNGUS

BIOLOGICAL OBJECTIVE: Avocado crop diseases represent a serious problem for exports. In this sense, anthracnose is one of the main diseases that attack the fruit with a wide distribution and economic importance in all areas where it is produced, causing losses of 20 to 30%. If the attack is very severe, coupled with poor management of the disease, this percentage may even rise. It is a disease that, in addition to damaging the flower and fruit tie by 10%, also damages tender branches and leaves, thereby reducing the photosynthetic capacity of the tree. It is common to observe it, in addition to avocado, in tropical crops such as mango, banana, papaya, passion fruit, citrus, and other fruit crops.

Anthracnose is caused by two pathogens: *Colletotrichum gloeosporioides* (Penz) Penz & Sacc. and *Colletotrichum acutatum* of the Ascomycetes family. The latter pathogen has a more limited host range, more abundant spore masses and is more orange in color, and develops more slowly. The conidia (set of microspores) of *C. gloeosporioides* are produced on dead leaves and branches inside the tree canopy and are dispersed by water during the rainy season. Once deposited on the surface of the fruit and with free water, the conidia germinate in 7 hours. A germ tube (10-20 µm in length) originates from each conidium, developing a terminal appressorium after 5 or 6 hours after the tube emerged. A hypha emerges from the appressorium that penetrates the cuticle of the epidermis or rind of the fruit. This hypha remains dormant until the fruit ripens due to the presence of antifungal compounds in the epidermis. As the fruit ripens, these compounds reduce their concentration and the growth of the fungus is activated, also affecting the outermost part of the pulp. Subsequently, the fungus fructifies below the surface of the fruit until the cuticle and peel are broken and the conidia are again released into a mucilaginous matrix to be dispersed by the water.

1. OBJECTIVE: Establish a treatment in Hass Avocado cultivation to evaluate the effect of the Bio-fungicide BIOCOPPER in controlling the anthracnose fungus.

Symptomatology. *Colletotrichum Gloeosporioides* mainly attacks young shoots, buds, branches, flowers and fruits, although the damage is more noticeable in the latter. In avocado fruits, the lesions appear round in different sizes, initially they are light brown or brown in color, later turning black, slightly depressed and without defined edges.

Small reddish-orange grains appear at the center of the lesions. Later the lesions become larger and sunken and join with others, covering the surface of the fruit, even reaching the interior of the pulp where it causes rotting and an unpleasant taste. In ripe Hass avocado fruits, it is difficult to perceive the symptoms due to the color of the fruit.

Symptoms on leaves or stems rarely appear, except under very humid conditions. Small brown spots appear on the leaves and whitish exudates appear on the branches that dry the attacked parts; Likewise, in flowers it causes brown colorations, which cause their fruit to fall or abort.

Favorable conditions. There is a greater release of microspores from 6:00 a.m. to 8:00 a.m., with a relative humidity greater than 80% and a temperature of 13 to 14 ° C. Other conditions that favor its development are rainfall greater than 1500 mm per year and cloudiness for 4 to 6 continuous hours. Otherwise the damage caused by blows due to strong winds or manipulation of the crop and those caused by pests (thrips, mites or other pests) increase the incidence of this fungus in the crop and mainly in the fruit.



2. LOCATION OF THE DEMONSTRATIVE UNIT: The orchard is located in an undetermined area of Nepal.

3. TREATMENT AREA: The numbers suggested here are to be used for the treatment of 1 hectare of avocado orchard.

4. SUGGESTED TREATMENT: It is recommended to use the Bio-Fungicide "BIOCOPPER-HIDRO" (BIOKRONE) or equivalent.

BIOCOPPER HIDRO® It is a novel product made with environmentally friendly components, it contains 20% of active ingredient in a formulation of dispersible granules and with a high disposition of copper ions that are released in a controlled manner, resulting in greater biological effectiveness than traditional products.

How does it work? It acts directly on the spores of fungi and bacteria preventing their germination, likewise, it prevents the growth of mycelium and the production of sporangia, thereby limiting the infection or spread of diseases present in crops. Given its formulation, it allows it to act as a protective shield against diseases in the foliage of crops.


AVAILABLE PRESENTATIONS: 1 Kg dispersible granules

ACTIVE SUBSTANCE: Copper Hydroxide (Content not less than 65.13% of metallic copper)

RECOMENDED FOR: Avocado, Citrics and others

5. TREATMENT: The treatments will be applied according to the following table and in accordance with the regulations on the use of environmental bio-fungicides.

THE BIOKRONE COMPANY MIX PRODUCTS SUGGESTION FOR HASS AVOCADO ANTHRACNOSE TREATMENT 2021.

	PRODUCT PICTURE	PRODUCT NAME	DOSIS (Kg / L / Hectare)	DESCRIPTION
1		BIOCOPPER HIDRO	2.0 - 3-0 Kg/Ha	<p>Make 3 applications to the foliage at intervals of 7 days; application volume in 950 Liters - 1050 Liters of water / hectare. L / Ha</p> <p>It is a novel product made with environmentally friendly components, it contains 20% of active ingredient in a formulation of dispersible granules and with a high disposition of copper ions that are released in a controlled manner, resulting in greater biological effectiveness than traditional products.</p> <p>It acts directly on the spores of fungi and bacteria preventing their germination, likewise, it prevents the growth of mycelium and the production of sporangia, thereby limiting the infection or spread of diseases present in crops. Given its formulation, it allows it to act as a protective shield against diseases in the foliage of crops.</p> <p>http://www.biokrone.com/biofungicidas/biocopper-hidro/</p>

6.- APPLICATION SCHEDULE: A single complete application will be made on the aforementioned affected surface.

7.- VARIABLES TO BE EVALUATED for the Integrated management of Anthracnose:

The management of this disease includes a series of practices and procedures that range from crop planning to post-harvest handling and marketing. The following sections are considered:

a) Preventive work Selection of the cultivation site. Avoid establishing avocado orchards in areas with strong winds, since the branches can break and during this phenomenon cause openings in the skin of the fruits, favoring the entry of pathogens such as the fungus that causes anthracnose.

b) Orchard place selection. There are avocado cultivars that are more susceptible than others to different diseases. Therefore, in places with high rainfall, cultivars that produce during the summer or in dry periods of the year should be planted. In addition, avocado orchards that adapt to the specific environment where you want to establish the plantation must be selected.

c) Land cleaning. Before establishing the crop, it is recommended to remove weeds and remains of the previous harvest (fruits, leaves, branches) to avoid any risk of infection by the fungus.

d) Improved drainage. An attempt should be made to improve drainage prior to planting new Avocado Orchard by leveling the ground, leaving a slope to avoid flooding that favors the development of the fungus.

e) Planting density. The sowing density is variable and will depend on the management that is provided to the crop. This should be the one that guarantees adequate ventilation, avoids increasing the humidity levels in the foliage and favors the rapid drying of the fruits.

f) Avocado crop health. The removal of senescent or chlorotic leaves on the plant must be carried out by pruning. In this way, the application of fungicides and the control of pests that can damage the crop are facilitated, allowing the entry of the fungus.

8.- PROCEDURE: The mixture described in 950 to 1,050 liters of water will be prepared and applied with spray guns, mainly covering the fruits and the foliage in the orchard.

Fungicide application. Among the fungicides used for its control are copper oxychloride and copper hydroxide, which are generally applied at 28-day intervals from fruit set to harvest. On the other hand, the application of Azoxystrobin alone or in combination with a program of copper-based fungicides has had satisfactory results for the control of anthracnose. Other fungicides used are shown in Table 1. Rotation is recommended in the application of these products so as not to generate resistance of the fungus to fungicides. (INTAGRI. 2017. *Antracnosis en el Cultivo de Aguacate. Serie Fitosanidad. Núm. 81. Artículos Técnicos de INTAGRI. México. 4 p.*)

Table 1. Main products applied for the chemical control of anthracnose. Source: Morales, 2017.

PRODUCT	DOSIS (Mixed in 100 Water Liters)
Azufre Elemental 93 (Elementar Sulfur)	600 - 800 grams
Folpet PH 80	150 - 200 grams
SulfoCop-F	300 grams
Hidróxido-Cúprico PH 77	300 - 400 grams
Oxícloruro de Cobre PH 85	300 - 400 grams
Oxido Cuproso GS 56	250 grams
Sulfato de Cobre PH 93	600 - 750 grams
Tiabendazol PH 60	60 - 75 grams
Azoxystrobin	50 - 60 ml (mililiters)

9.- DAY OF TREATMENT APPLICATION: Indetermined still by the producer.

10.- EXPECTED CONCLUSIONS.

a) The fungicide BIO-COPPER is effective for the control of ANTHRACNOSE in the Hass avocado cultivation, Please check the following Scientific Papers for get more info about the Avocado sickness.

http://www.avocadosource.com/Journals/Memorias_VCLA/2017/Memorias_VCLA_2017_PG_114.pdf

http://www.avocadosource.com/Journals/Memorias_VCLA/2017/Memorias_VCLA_2017_PG_135.pdf





