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TECHNICAL BROCHURE

CONTROL OF THE MANGO ANTHRACNOSE IN WEST AFRICA

COLEACP

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1. EPIDEMIOLOGY AND BIOLOGY OF ANTHRACNOSE

The typical infection process involves a common sequence of steps. The inoculum arrives on the fruit as water-borne conidia, which germinate to form a terminal appressorium. This globular structure is protected by a characteristic thin wall, which gives it a level of resistance to adverse conditions (climatic factors, fungicides, etc.).

Appressoria on the surface of the fruit appear to be the main latent form of anthracnose. This latent period is caused by the resistance of the immature fruit, which contains toxic compounds (phytoalexins). On mango, the appressoria emit penetrating hyphae that develop in the subcuticular cell base before being temporarily stopped.

Anthracnose develops rapidly on ripe fruit because the fruit loses its natural resistance during ripening, resulting in post-harvest storage problems.

2. PREVENTIVE CONTROL

This section contains extracts from COLEACP's technical itinerary for mango.

Protection of mango orchards against post-harvest rotting agents should be designed in an integrated manner from establishment of the orchard to harvest. Preventive control and phytosanitary maintenance measures are valuable in promoting the general health of trees, limiting the duration of high humidity conducive to infection, and reducing the amount of inoculum during susceptible crop stages. An orchard protection strategy based mainly on the use of fungicides is rarely satisfactory. Fungicides must be used in a considered way and reserved for specific protection under conditions that are very favourable to infections by certain fungi.

Careful harvesting limits the risk of injury and contamination of the fruit, as well as the regrowth of quiescent infections that set in during fruit development. Post-harvest treatments inactivate infections that are still quiescent and prevent their development during the commercialisation process.

The following preventive measures can greatly reduce the risk of contamination.

Orchard establishment:

- choice of plants from suppliers who have perfect control of the various diseases in their nursery;
- planting with sufficient spacing to promote air circulation.

Orchard maintenance:

- removal of excess branches to air the foliage and avoid confined environments;
- limiting the height of mango trees by pruning so that phytosanitary treatments can cover the entire foliage.

Before flowering:

- elimination of all dead and/or partially necrotic parts, which are the source of subsequent contamination.

After flowering:

- regular collection and burning of necrotic or dead material plant litter (remains of inflorescences, dry twigs, dead leaves, etc.);
- staking of low branches to keep the fruit off the ground;
- applying measures to limit the populations of fruit flies, which can be vectors of spore transmission;
- regularly collecting fallen fruit, burying them in a pit and covering to prevent spore dispersal by wind or insects.

At harvest time:

- handling mangoes with care to avoid injury;
- absence of contact between soil and fruit, especially where there are abrasive sandy and muddy soils during the rainy season;
- managing sap flow by positioning fruit on easy-to-clean supports.

All year round, but more often during flowering and fruit set in the rainy season:

- simple epidemiological monitoring: observing the phenological stages of the mango tree, climate records, noting the appearance of symptoms and evaluating contamination levels on new shoots, leaves and inflorescences.

3. CONTROL USING PLANT PROTECTION PRODUCTS (PPPs)

3.1. Strategy for dealing with PPPs

Anthracnose can penetrate fruit as soon as it is set if the weather conditions are favourable (dew, rain); the disease then remains latent until the fruit enters its ripening phase. The aim of using plant protection products is to block the resumption of fungal development during fruit ripening.

Ideally, a disease control pathway for mangoes (especially for anthracnose) should include at least applications of PPPs during the flowering/fruit set period, followed by a post-harvest treatment. Fungicide applications are also useful during the fruit growth phase, if the climatic conditions are favourable for the fungus and fruit ripening, to prevent the fungus from resuming development. Unfortunately, in practice, producers/exporters generally limit themselves (wrongly) to post-harvest treatment. However, orchard treatment at flowering/fruit set is very beneficial if feasible; that is, in orchards where the trees are still young, or are pruned to keep them at an acceptable height for spraying. Trials carried out in Côte d'Ivoire and Senegal by COLEACP in 2014/15 have shown that anthracnose attacks can be maintained at an acceptable level with treatments only at flowering/fruit set.

Recommended treatments

STAGE	NUMBER OF TREATMENTS	MODE OF APPLICATION	ACTIVE INGREDIENTS
Flowering/fruit set	1 to 3 applications depending on the products[1]	Orchard spraying	copper, azoxystrobin, trifloxystrobin + fluopyram
Growing fruit	Only during the dewy period in the dry season. Every 2 weeks during the rainy season[1]	Orchard spraying	copper, azoxystrobin, etc.
Post-harvest	1 application	Usually soaking the fruit in a bath	prochloraz, fludioxonil

1 Follow the manufacturer's instructions.

3.2. Products authorised at the Comité Sahélien des Pesticides (CSP) (Sahelian Pesticide Committee) and in Côte d'Ivoire

Products for orchard application

TRADE NAME	ACTIVE INGREDIENTS	CSP	CÔTE D'IVOIRE
Golden Blue 985 SG	copper sulphate	Approved[2]	-
Ortiva 250 SC	azoxystrobin	–	Approved[2]
MasterCop 214.6 SC	copper sulphate	–	Approved[2]
Luna Sensation 500 SC	trifloxystrobin + fluopyram	–	Approved[2]

2 Application at flowering and pre-harvest

Products for post-harvest application

TRADE NAME	ACTIVE INGREDIENTS	CSP	CÔTE D'IVOIRE
Mirage 450 EC	prochloraz	-	Approved
Scholar Max 230 SC	fludioxonil	-	Approved

Good Agricultural Practices (GAP) for authorised products

TRADE NAME	MODE OF APPLICATION	DOSE	NUMBER OF TREATMENTS	PRE-HARVEST INTERVAL (PHI) FOR EU MRLS
Golden Blue 985 SG	Spraying with 300 l water/ha	4–5 kg/ha	3 applications: flowering, setting and grow-out	n/a
Ortiva 250 SC	High-volume water spraying	40 ml/100 l water	1 application at full bloom/fruit set when petals have fallen. A second application no later than 21 days before harvest.	21 days
MasterCop 214.6 SC	n/a	n/a	n/a	n/a
Luna Sensation 500 SC	Spraying with 200 to 300 l water/ha	0.5 l/ha	2 applications at: - flowering - early set	14 days
Mirage 450 EC	Post-harvest soaking for at least 30 seconds	25 ml/100 l	A dipping application.	–
Scholar	Post-harvest soaking for at least 30 seconds and maximum 5 minutes	150 ml/100 l	A dipping application. Water must be heated to 50°C before use in solution.	

n/a: Information not available

3.3. Regulatory situation

ACTIVE INGREDIENTS	STATUS IN THE EU	EU MRL (MG/KG)	CODEX MRL (MG/KG)
Copper sulphate	Approved	20	n.s.
Azoxystrobin	Approved	0.7	0.7
Trifloxystrobin	Approved	0.01*	n.s.
Fluopyram	Approved	1	n.s.
Fludioxonil	Approved	2	2
Prochloraz	Approved	5[3]	7

n.s.: Maximum residue level (MRL) not specified.

* Limit of determination (LOD)

3 This MRL will change to the limit of determination (LOD) in the course of 2020.

3.4. Alternatives

Several alternatives to PPPs are currently under consideration. For post-harvest treatments, products based on fludioxonil (Scholar) are being registered with the CSP and may have national derogations for use in the 2020 season.

Scholar is already registered in South Africa and Côte d'Ivoire on mango for post-harvest treatment with the GAP presented in section 3.2.

For more information, contact COLEACP.

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