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DIAGNOSIS OF ANTHRACNOSE, WITCHES' BROOM, CENICILLA AND FUMAGINA IN MANGO CROPS IN SAN SEBASTIÁN NOPALERA, OAX.

DIAGNOSIS OF ANTHRACNOSE, WITCH'S BROOM, POWDERY MILDEW AND SOOTY MOLD IN MANGO CULTIVATION IN SAN SEBASTIÁN NOPALERA, OAX

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Abstract - The following work had the objective of identifying phytopathogenic agents that reduce mango production in San Sebastián Nopalera. The study was conducted in the experimental area of the Instituto Tecnológico del Valle de Etla; Nodo San Sebastián Nopalera in August 2016. Mango plants with symptoms of anthracnose, witches' broom, ash and fumagina were selected for disease diagnosis. Diseased leaves were collected from mango plants. The preparation of the culture medium, washing and sowing of the plant material, and the identification of the phytopathogenic fungi were carried out. Field and laboratory studies confirmed the presence of anthracnose (*Colletotrichum gloeosporioides*), witches' broom *(Fusarium oxysporum*), ash (*Oidium mangiferae*) and fumagina (*Capnodium* sp.) on mango plants. The climatic conditions in San Sebastián Nopalera (temperatures of 26°C and relative humidity of 80 to 90 %) favor the development of the phytopathogenic fungi under study. This work provides information to develop phytosanitary programs for mango cultivation in San Sebastián Nopalera.

***Key words*:** disease, anthracnose, witches' broom, ash and fumagine.

Abstract -- The aim of this study was to identify phytopathogenic fungi that reduce mango production in San Sebastian Nopalera. The study was carried out in the experimental area of the Instituto Tecnológico del Valle de Etla, Nodo San Sebastián Nopalera in August 2016. Mango plants with symptoms of anthracnose, witches' broom, powdery mildew and fumagine were selected for disease diagnosis. Sick leaves were randomly collected to confirm the diseases through the preparation of the culture medium, washing and inoculation of the plant material and identification of the phytopathogenic fungi. The field and laboratory study confirmed the presence of anthracnose (*Colletotrichum gloeosporioides*), witches' broom (*Fusarium oxysporum*), powdery mildew *(Oidium mangiferae*) and fumagine (*Capnodium* sp.) in mango plants. The climatic conditions in San Sebastian Nopalera present average temperatures of 26°C and relative humidity of 80 to 90%, which favors the development of the identified phytopathogenic fungi. This work provides information to develop phytosanitary programs for mango cultivation in the community of San Sebastian Nopalera.

***Key words*:** Disease, anthracnose, witches' broom, powdery mildew, fumagine.

INTRODUCTION

The mango industry is a business that moves 500 million dollars a year and where Mexico is positioned in the fifth place of production and is considered the main exporter of mangoes worldwide with 370 thousand tons per year**.** The main mango producing states are: Guerrero with 22% of the national production, Nayarit 17%, Sinaloa with 15%, Oaxaca with 10% and Chiapas with 9%, between these four states they accumulate 73% of the national production [1]. The state of Oaxaca is one of the main mango producing states at the national level, occupying the seventh place in planted area and the fifth place in production.

In San Sebastián Nopalera there is a great variety of fruit plants such as: shrimp, banana, banana, nanche, guava, soursop, mamey, mameyito, orange, lime, meson and mango. This last crop is of economic importance for

, in recent years, phytosanitary problems (fungal disease problems) have significantly reduced their commercial production and therefore economic losses, as well as the loss of fruit species.

The following research work aims to carry out the diagnosis of the following fungal diseases. fungal diseases: anthracnose (*Colletotrichum gloeosporioides*.), witches' broom *(Fusarium Oxysporum*.), ash (*Oidium mangiferae*) and fumagina (*Capnodium* sp.) in mango plants in the community of San Sebastian Nopalera.

DEVELOPMENT

Methodology

Five mango plants with symptoms of anthracnose, witches' broom, ash and fumagine were selected. The methodology described by Agrios [2] was used to diagnose the diseases. First, diseased leaves of mango plants were collected from the study area (16º.54'54¨N and 97°47'51¨W). The plant material was transferred to the laboratory of the Instituto Tecnológico del Valle de Etla (Nodo San Sebastián Nopalera), where the isolation, purification and identification of the phytopathogenic fungi were carried out.

The methodology described by Agrios [2] was used with some modifications: since we did not have a flask and distilled water to dissolve the culture medium, an 800 ml glass bottle and purified water were used. In the bottle, 20 g of potato-dextrose-agar (PDA) culture medium (BD Bioxon,

Becton Dickinson de México), 500 ml of purified water was added and covered. The culture medium was sterilized a pressure cooker at 1.5 kg.cm² for 20 minutes and then removed, allowed to cool to 30°C and emptied in equal proportions into Petri dishes; emptying was carried out in a handmade microbiological chamber. This was built because we do not have a laminar flow hood. The collected materials were washed with a water jet and left to dry. Five internal tissue sections of approximately 0.5 cm² were cut from each leaf and disinfected with 2% hypochlorite for 2 minutes, washed with purified water and deposited on napkins.

The plant material was seeded in PDA culture medium under aseptic conditions (handmade microbiological chamber). During seeding process, two lighters made of glass jars were used.

These were set inside the handmade microbiological chamber to eliminate some microorganisms in the environment. The culture medium boxes were incubated at 23±2°C with natural light for 7 days in this chamber [2]. Using a three-phase light microscope at 40x and 80x, the germinated phytopathogenic fungi were observed in the Petri dishes. The identification of the phytopathogens was based on the manifestation of fruiting bodies and general taxonomic keys.

DISCUSSION Y ANALYSIS ANALYSIS OF RESULTS

Field and laboratory studies confirmed the presence of anthracnose, witches' broom, ash and fumagine. These data agree with those described by Valdez [4] who mentions that *Colletotrichum gloeosporioides* causes considerable damage to leaves, flowers and fruits of the mango crop.

On the other hand, Rosas [5] affirms that mango (*Mangifera indica* L.) is affected by ash (*Oidium mangiferae*). The apparent symptoms of the disease occur in the young tissues of flowers, leaves and fruits; the main characteristic of this disease is a whitish color in the affected areas.

Rebolledo [6] found that fumagina (*Capnodium* sp.) is associated with the presence of insects secreting sugary substances that are deposited on the surface of stems, leaves and fruits, which favors the growth of the fungus, which forms a black film on the surface of the organs and prevents sunlight from reaching the tissues, consequently, it prevents the normal functioning of the plant as it hinders the photosynthesis process.

Finally, Avilez [7] mentions that witches' broom (*Fusarium oxysporum*) is generated through floral malformation, which is considered the main phytopathological problem of mango worldwide.

The results obtained in the field are presented below.

Table 1 shows the diseases and causal agents identified in mango cultivation.

Table 1. Diseases and causal agents identified in mango cultivation.

Cultivation	Disease	Causative agent
Handle	Anthracnose	(*Colletotrichum gloeosporioides*.)
Handle	Witch's Broom	(*Fusarium oxysporum*.)
Handle	Cenicilla	(*Oidium mangiferae*)
Handle	Fumagina	(*Capnodium* sp.)

Table 2 the symptoms they cause to the mango crop.

Table 2. Symptoms caused to the mango crop.

Cultivation	Symptoms
Handle	Dark spots with chlorotic halo on leaves.
Handle	The apex of the branches as well as the inflorescence present dark-colored deformations.
Handle	It appears as a white powder on the leaves.
Handle	It is characterized by the appearance of damage caused by various

The foliar phytopathogens of the mango crop is shown below.

Figure 1 depicts the symptoms of ash.

Figure 1. Ash symptoms

Figure 2 shows the symptoms of anthracnose.

Figure 2. Anthracnose symptoms.

Figure 3 represents the symptoms of witches' broom.

Figure 3. Symptoms of witches' broom.

Figure 4 shows the symptoms of fumagina.

Figure 4. Fumagina symptoms.

Laboratory results confirmed the phytopathogenic fungi under study. Colletotrichum gloeosporioides spore is transparent and elongated. The mycelial mass of Fusarium oxisporum is dark brown. The spores of Oidium mangiferae are transparent and barrel-shaped. The mycelial mass of Capnpdium sp. is dark brown. Spores and mycelium of the causal agents of anthracnose, witches' broom, ash and fumagine in mango crops are shown below.

The figure 5 represents the spore of Colletotrichum gloeosporioides.

Figure 5. Spore of Colletotrichum gloeosporioides.

Figure 6 represents the mycelial mass of Fusarium oxysporum.

Figure 6. Mycelial mass of Fusarium oxysporum.

Figure 7 shows the spores of Oidium mangiferae.

Figure 7. Spores of Oidium mangiferae.

Figure 8 shows the mycelial mass of Capnodium sp.

Figure 8. Mycelial mass of Capnodium sp.

CONCLUSION

The following causal agents were identified: anthracnose (Colletotrichum gloeosporioides), witches' broom (Fusarium oxysporum), ash (Oidium mangiferae) and fumagina Capnodium sp). This work provides information to develop phytosanitary programs for mango cultivation in San Sebastián Nopalera.

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