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SHORT COMMUNICATION

THE CAUSE OF LEAF SCORCHING AND DEATH OF MANGO SEEDLINGS: A PRELIMINARY INVESTIGATION

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INTRODUCTION

Death of mango seedlings in nurseries due to leaf scorching has been reported since mid 1990s and the economic losses caused by this disease have been reported to be high. The incident was first reported in the nursery at Middeniya farm in 1996 followed by Hingurakgoda farm. Between September 1996 and October 1997, the farms of Department of Agriculture located in Aluththarama, Ulpothagama, Pelwehera and Mahailluppallma also reported the same problem and all farms suffered severe economic losses due to the death of mango seedlings. Private farms, too, reported the death of mango seedlings due to leaf scorching during the same time period. The problem was high during February-March and July-August when compared to rest of the months. The reason for the leaf scorching was not known and a diagnostic survey was carried out in all the affected government farms and a few selected private nurseries to identify the cause. The objectives of the study were to find out the causal factor of leaf scorching and to develop control measures.

MATERIALS AND METHODS

The survey was carried out from 22.09.97 to 10.10.97, and included the DOA farms namely, Pelwehera, Mahailluppallama, Aluththarama, Hingurakgoda, Bata-atha, Walpita, Ambepussa, Gannoruwa and Wariyapola, and private farms namely, Galkiriyagama, Jayanthipura, Ibbagamuwa, Kudagalgamuwa and Lokahettiya.

Artificial infestation of thrips to healthy mango seedlings

Twenty healthy mango seedlings (*Mangifera indica*, variety "Karuthacolomban") obtained from the Gannoruwa research farm were used in the experiment. Experiment had two treatments *ie.* artificially-infested plants and un-infested (control) plants, and each treatment consisted of 10 plants. These plants were kept in insect proof cages at two plants/cage/treatment. Two plants were considered as a replicate and hence, each treatment had 5 replicates. The ten cages were arranged in a Complete Randomized Design (CRD) inside a plant house at the Horticulture Crops Research and Development Institute (HORDI), Gannoruwa. Preliminary

surveys revealed that thrips, suspected to be red-banded thrips (*Selenothrips rubrocinctus)*, are the major carrier of the disease. Hence, red-banded thrips collected from the field were introduced to the seedlings at the rate of five adults and ten nymphs per plant of the artificially-infested treatment. Observations were made on the symptom developments on leaves of both artificially-infested and control plants at regular intervals.

Chemical control of thrips

Thirty mango plants (variety Karuthacolomban*)* affected by leaf scorching in association with thrips obtained from Bata-atha and Pelwehera farms were used in the experiment. The experiment had three treatments, each treatment consisting of 10 plants. Each plant was considered as a replicate. These plants were arranged in a CRD placed inside a plant house at HORDI, Gannoruwa. The plants in the first treatment were sprayed with Imidacloprid 200 SC and those in the second treatment were sprayed with Fipronil 50 SC, at a rate of 1 ml per liter of water at 12-day intervals. The plants in the third treatment were kept as the control and regular observations were made on the changes of the plants.

Pathogenicity of associated fungi and bacteria

Fungi and bacteria associated with plants affected by leaf scorching and other symptoms were isolated from affected parts and cultured on potato dextrose and nutrient agar media for identification and inoculation purposes. Healthy leaves and stems of mango seedlings were inoculated with the pure cultures of fungal isolates and kept in humid chambers for one week. The plants were transferred to the green house and kept for 6-8 weeks for observations of symptom development.

Analysis of potting media

Soil mixtures used for nursery pots in DOA farms were tested for soil pH and porosity to check whether soil could induce leaf scorching, as some earlier investigators had attributed inappropriate soil properties as the causal factor for leaf scorching.

RESULTS AND DISCUSSION

Based on the symptomatological classification affected plants were catagarized into four groups *ie*. Leaf scorching; root/collar rot; yellowing of leaves and death of scion. The survey results showed that farms situated in dry zone were more prone to leaf scorching. The incidences were 80% (Bata-atha), 40% (Aluththarama), 60% (Pelwehera), 30% (Wariyapola), 30%

(Mahailluppallama) and 75% at Galkiriyagama. However, government farm at Hingurakgoda, which is situated in the dry zone, had a low incidence (3%) possibly because of regular spraying of pesticides.

In addition to leaf scorching high incidence of leaf yellowing was observed in Wariyapola farm. High incidences of collar/root rot and scion death were found in Ambepussa farm. Furthermore, the private nurseries that practiced regular spraying of insecticides had either escaped from the problem of leaf scorching or recorded low incidences. The incidences of thrips in these nurseries were very low. The nurseries that received fungicides only were more prone to leaf scorching than the other nurseries. In all these farms, a high infestation of thrips (20 or more nymphs/leaf) was always associated with the affected plants, where as farms with low incidences of leaf scorching recorded low population of thrips (< 10 nymphs /plant).

Identification of thrips

The major species of thrips associated with leaf scorching was identified as red-banded thrips (*Selenothrips rubrocinctus*) (Thysanoptera: Thripidae) comparing with the reference specimens at HORDI. It was observed, during the survey, that the nymphs fed in company with adults. Thrips fed normally within the depressions adjacent to main veins on underside of mature leaves. The main host recorded for this species was mango (Hill, 1975). During the survey it was observed that other than mango, thrips were feeding on cashew, guava, kottamba and willow trees adjacent to the nurseries and leaves of these seedlings/trees also showed scorching. It has been reported that this pest cause damages to cocoa, litchi and mangosteen (Wang, 1994; Huikun and Deguang, 1988; Pableo and Velasco, 1994).

Artificial infestation of thrips to healthy plants

About 24 hours after introduction of thrips, small brown patches started to appear on mature leaves and later these patches grew bigger. These were observed as large brown patchy areas either along the outer margin of the leaves or spread all over the leaf surface after about 2 weeks of introduction of the pest. Even the stems of the plants got scorched due to the feeding damage of the thrips. Along the developments of scorching symptoms the buds with tender leaves started to turn brown and dry off. The axillery buds were activated and after 4-5 weeks, proliferation of axillery buds was clearly seen. Further, as most of the affected leaves had fallen off at this stage, both adults and nymphs were seen feeding on activated axillery buds. Even the activated axillery buds got dried off later due to feeding damage. Meanwhile, the plants in the control treatment grew without any development of scorching symptoms.

Chemical control of thrips.

The thrips present on plants were completely controlled by two applications of Imidacloprid or Fipronil. With the control of thrips, treated plants started recovering, while those kept as control completely died after about 4 weeks from the initiation of the experiment.

Pathogenicity of associated fungi and bacteria

No bacteria were isolated from the scorched mango seedlings. However, different fungal species were associated with mango seedlings that showed similar leaf scorching in different locations. They were *Alternaria* sp. and *Pestalotia* sp. from seedlings of Pelwehera farm, while *Fusarium oxysporum* from seedlings of Aluththarama farm. The fungi isolated from Bata-atha farm were *Colletrotricum* sp, *Botryodiploidia* sp and *Pestalotia* sp and those from Jayanthipura farm were *Colletrotricum* sp and *Botryodiplodea* sp. None of these fungal species produced scorching symptoms when inoculated to healthy plants. This confirmed that associated fungi did not have any relationship with leaf scorching.

Scion death

Colletotricum gleosporioides and *Botryodiplodia theobromae* were isolated in association with scion death from all the locations surveyed. These fungi produced dark lesions on the stems that spread rapidly in humid chambers causing extensive tissue death.

Collar rot

Botryodiplodia theobromae was isolated from collar rot affected plants of Mahailluppallama, while *Phythium* sp. and *Fusarium* sp. were observed on the roots of yellowing plants at Aluththarama. Low porosity of the potting mixtures (table 1) may have induced the infection by pathogenic fungi. Further, Ploetz *et al.* (1994) and Ploetz (2003) reported that the symptoms produced by above fungi on mango were different from the leaf scorching symptoms.

Relation of soil pH and porosity to leaf scorching and seedling death.

Table 1 contains information on pH values and porosity of potting media used by most of the farms. The pH values were not widely deviated from the desired value. *ie.* 6.5–7.5. The porosity in most of the potting mixtures was in the correct range. Therefore, it could be concluded that there is no correlation between the leaf scorching of mango seedlings and properties of the soil mixtures used as suggested otherwise by earlier investigators.

Table 1. The pH value and porosity of soil potting mixtures.

Location	pH	*Porosity* %
Pelwehera	7.4	8.6
MI	7.4	8.0
Hingurakgoda	7.6	8.7
Aluththarama	6.9	12.6
Bata-ata	7.4	17.3
Ambepussa	6.0	17.3
Gannoruwa	6.1	21.0
Wariapola	7.1	12.0
Galkiriyagama	6.6	16.0
Ibbagamuwa	6.5	16.0

Optimum soil pH for mango – 6.5; Optimum porosity for mango – 15-20%

Based on the results of the diagnostic survey and laboratory and plant house experiments, it was evident that leaf scorching of mango seedlings was caused by feeding damage of *S. rubrocinctus* while fungi or soil properties had no impact on the disease incidence.

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