The Effects of Mango Mealy Bug (Rastrococcus onvadens) infestation on three Fruit Trees

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ABSTRACT

The Mango Mealy bug (Rastrococcus inadens) infestation has become a serious menace not only to Mango (Mangifera indla) but also Sweet Orange (Citrus sinensis) and Breadfruit (Artocarpus altilis) production in the country. Studies carried out since 1984 have revealed that the infestation and accompanying production of honey dew during the dry and the flowering seasons prevents effective flower pollination and fertilization thereby causing failure on fruitset and ultimate reduction in production. The few fruits produced may be rendered unattractive and unmarketable by the sooty mould colonies left on them. In addition the heavy infestation of the undersurface of leaves may also reduce leaf photosynthetic efficiency.

Keywords: Mealy bug (Rastrococcus invadens), infestation, Sooty Mould, honey dew.

INTRODUCTON

The Mango Mealy bug (Rastrococcus invadens) infestation was noticed in Ghana in the 1960s. Its serious effect on production was however, limited to trees in and around Accra. During the drought of 1983 the effect spread to Kumasi and its surrounding areas. Mango and sweet orange trees were equally affected. Production was drastically reduced, and in some trees and orchards no fruits were obtained (3) A status survey rcently undertaken by the author indicated that the infestation had spread to all parts of the country where mango trees are found. The degree or the intensity of infestation which is better assessed on Mango, however,varies from region to region.

During years of heavy infestation by the mealy-bugs and subsequent attack by the fungi, Capnodia and Limacinia (l) which cause the sooty mould on the leaves, the production of the three fruit crops, Mango (Mangifera indica), sweet orange (Citrus sinensis) and Breadfruit (Artocarpus altilis) was seriously reduced. In some cases although there was heavy flowering there was no fruit production.

Mango and Sweet Orange are popular and important fruits in the coutry. In 1986 a Mango export traial was made to Europe Prices were also very encouraging. Production and marketing, however, had to be organised to meet the foreign market standards and preferences (8). The mealy bug infestation poses a serious threat to the development of Mango, Sweet orange and Breadfruit production in the country. The Breadfruit is not widely known in the country but it has a potential to be a food crop if attention is given to its cultivation and enough public attention is drawn to it as a food crop similar to yam (6). A nation-wide effort for the effective control of the pest is needed to enhance the development of a profitable industry of the three fruit tree crops in the coutry since it has been found that the accompanying sooty mould is not parasitic (2).

MATERIALS AND METHODS

Five marked trees of Mango and Sweet Orange each and two of Breadfruit on the Campus of UST Kumasi have been studied since 1984 to determine the effect of the Mango Mealy bug infestation on their growth and production. While there were many trees of Mango and Sweet Orange for the study, only 2 trees of Breadfruit were avail-

able. The average number of the Mealy bug found on 16 cm^2 under surface of heavily infested leaves were recorded. Insect counts were taken from January-February (dry season). Pattern of leaf shedding and flushes were also studied. Flowering and fruitset of each type of fruit tree were also recorded.

RESULTS

The insects were mainly found on the under-surface of the leaves as whitish fluffy mass mainly along the mid-rib and main veins of the leaves. On the Breadfruit leaves however, the insects were found dotted over the entire under surface with scattered concentrations on the mid-rib and the prominent veins as shown in figures 1-3. In Mango and Sweet Orange infestation started on the mid-rib and moves towards the petiole.

Infestation in candidate trees could start a few days after new leaves were fully unfurled. The highest average number of insects/16cm^2 space was found on Mango leaves followed by Citrus as in Table 1.

The symptoms of the sooty mould generally first appeared mainly on the upper leaf surface 1-2 months after the infestation. In Mango, the leaf flushes appeared from November-December and were colonized by December-February and heavy symptons of the fungus commenced on them by January-March. The insects after feeding exuded honey dew which fell on the leaves of the tree or any vegetation below or around it (3). Sometimes almost the whole canopy of the tree was covered by the sooty mould. In some cases where the canopy of such heavily infested tree covered a portion of a tarred road, that portion was also covered by the shiny exudate which was soon attacked by the mould. During the end of the dry season the sheet of the black sooty mould dried up and peeled off the surface of the leaves in a thin papery form (fig 4). Leaf flushes and shedding, and flowering seemed not to be much affected by the insect infestation and the incidence of the sooty mould. Those processes occurred normally and during their seasons. Leaf shedding seemed slightly heavy in Bread fruit trees, but there were no uninfested trees for comparison. Fruit-set in all three types of fruit tree was affected (Table2). In Mango and Sweet Orange the honey dew falling on the open flower prevented pollination and fertilization, and caused flower abortion (3). In Breadfruit the young fruits appeared at the tip of the branches and twigs but fell off leaving none or very few fruits to develop to maturity. The insects sometimes infested developing fruits of Mango and Sweet Orange rendering them unattractive. After the fruits had matured the insects either left them or

TABLE: 1 MEAN MEALY BUG POPULATION ON 16CM^2 OF HEAVILY INFECTED LEAF (AVERAGE OF 10 LEAVES)

Leaf	Mango				Sweet Orange				Breadfruit			
Year	1985	86	87	88	1985	86	87	88	1985	86	87	88
1	33	37	43	42	30	31	34	32	26	28	30	34
2	40	38	37	38	29	33	36	37	21	28	32	31
3	36	33	41	36	31	30	32	30	20	34	24	24
4	31	41	32	42	27	31	38	32	21	25	22	22
5	41	39	32	51	26	29	38	35	25	20	21	24
6	32	36	31	37	32	28	25	38	39	28	25	42
7	34	40	38	39	27	32	31	31	28	24	26	26
8	32	39	40	42	30	29	30	28	29	22	25	32
9	38	33	36	40	31	31	27	27	34	21	21	48
10	33	39	39	37	34	28	30	31	30	22	23	26
Total	350	365	369	374	297	298	339	328	255	251	249	309
Mean	35	37	37	37	30	30	34	33	26	25	25	31

FIG. I: The under - surface of heavily infested mango leaves.

FIG. II: Some leaves of sweet orange infested with the mealy bugs.

FIG III: Leaves of bread fruit infested with the mealy bugs. Notice the scattered nature of insects on the leaves.

FIG. IV: The sooty mould on the upper-surface of mango leaves. Notice the peeling off area on leaf on the right.

FIG. V: Mango fruit infested with the mealy bugs and sooty mould. Note the insects at the stylar end and the sooty mould all over the fruit.

were blown off, leaving black marks on them.

DISCUSSION

The mealy bugs feed on the sap of the leaves to live but this does not produce drastic effect by causing untimely leaf fall on trees infested. The colonization of the insects and the coverage by the sooty mould definitely impair the photosynthetic activities of the leaves. The thick whitish mat of the insect at the undersurface of the leaves might definitely obstruct the efficient functioning of the stomates. Sometimes almost all the leaves up to the top of the canopy are covered with the sooty mould. It is possible the honey dew was produced in vaporized form which later condensed and fell in droplets on the leaves. It may also escape to the atmosphere above the leaves before condensing and falling on the leaves. It may also happen that the honey dew permeates through the leaf cells from the under surface to the upper surface to be attached by the fungus. Wind action can also offer an explanation.

The insect population did not differ greatly at a given area of the undersurface of the leaves of the three types of fruit trees. The slight drop in concentration on the undersuface of leaves of Breadfruit trees might be due to the fact that the leaves are broader and the insect population is more evenly distributed on the entire undersurface (Table 1, fig 2).

Leaf phenology and flowering in the three fruit types did not appear to be much affected by the presence of the insects and the sooty mould.

In 1988 there was heavy flowering in all three types of fruits in and around Kumasi. Fruit-set was, however, very sparse and there were no fruits on many trees. The two Breadfruit trees flowered profusely in January-February but all the flowers abscissed early April so that there was no fruit production (Table 2).

The honey dew substance falling on the flower parts either prevents pollination or

TABLE 2: NUMBER OF FRUIT ON SELECTED TREES OF EACH TYPE OF FRUIT TREE

Year	Mango		Sweet Orange		Breadfruit	
	AYPP*	RP#	AYPP	RP	AYPP	RP
1984	+ (800)	5	+ (1500)	157	+ (65)	3
1985	+ (800)	268	+ (1500)	987	+ (65)	28
1986	+ (800)	297	+ (1500)	1860@	+ (65)	59
1987	+ (800)	113	+ (1500)	1107	+ (65)	32
1988	+ (800)	39	+ (1500)	481	+ (65)	0

*AYPP = Average yearly production figures #RP = Real production
+Average yearly production figures for mango and sweet orange were obtained from fruits just before maturity on five selected trees of both types and for breadfruit the figure was from two trees. Figures were for 1981/82 seasons before severe infestation began in 1983.
@The orchard where records were taken was sprayed with Actellic 25 EC against insects on November-December of 1985.

prevents shedding of pollen (3). The fruit drop after the apparent fruit-set in Breadfruit trees might be due to lack of pollination of flowers. A altilis fruits contain no seeds and may therefore be said to be parthenocarpic. It is however possible that flowers need pollination to induce the production of necessary hormones for fruit-set and development (4,5,7). Therefore since the honeydew usually prevents either pollen ripening and shedding or covers the stigmatic surface, the process cannot be effected on the fruits which appear, abort and drop.

The sooty mould on fruits is very difficult to clean, leaving it on the fruits makes them very unsightly and unattractive to customers and difficult to market, and this also aggravates the problem of economic losses to the producers.

CONCLUSION

The Mango mealy bug infestation has spread all over the country and has become a serious pest not only on Mango, but Sweet Orange and Breadfruit trees The economic losses in Mango, Sweet Orange and Breadfruit, are serious and call for immediate national efforts to be directed towards the control of the insects. The Biological control measures initiated should be intensified to forestall further economic losses.

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