IMPLICATIONS OF EPIDEMIOLOGICAL STUDIES ON STRATEGIES FOR CONTROL OF POWDERY MILDEW AND ANTHRACNOSE

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INTRODUCTION

Detection, identification and the study of the epidemiology of pathogens that cause major diseases of mango flowers is essential to prevent potential epidemics and subsequent economic losses. In order to control the pathogens effectively, the biology and life history of the disease causing organisms must be understood. The information gained from this study is therefore valuable in planning the control of powdery mildew and anthracnose. Proper timing of sprays for optimum disease control will eliminate unnecessary sprays which are costly and the introduction of needless pesticides into the environment. Two different strategies was used to study the epidemiology of powdery mildew and anthracnose. The reason being that powdery mildew spores are airborne while anthracnose spores are dispersed by rain splashing.

MATERIAL AND METHODS

Powdery Mildew

A spore trap technique similar to that described by Ostry & Nicholls (1982) was used to monitor the presence of *Oidium mangiferae*, the causal agent of powdery mildew. Microscope slides were covered with melted Vaseline and placed in the different orchards on poles using clothes pegs. At Nelspruit Vaseline spore traps were placed in sprayed and unsprayed areas of a Tommy Atkins orchard and in a sprayed Sensation orchard.

Spore traps were also placed on farms in the Tzaneen district in the Northern Transvaal and at Kaapmuiden in the Eastern Transvaal. After exposure the slides were stained with 0,1% trypan blue in 50% lactophenol and the number of spores trapped on each slide was determined by counting the spores in transects across the slide at 250X magnification.

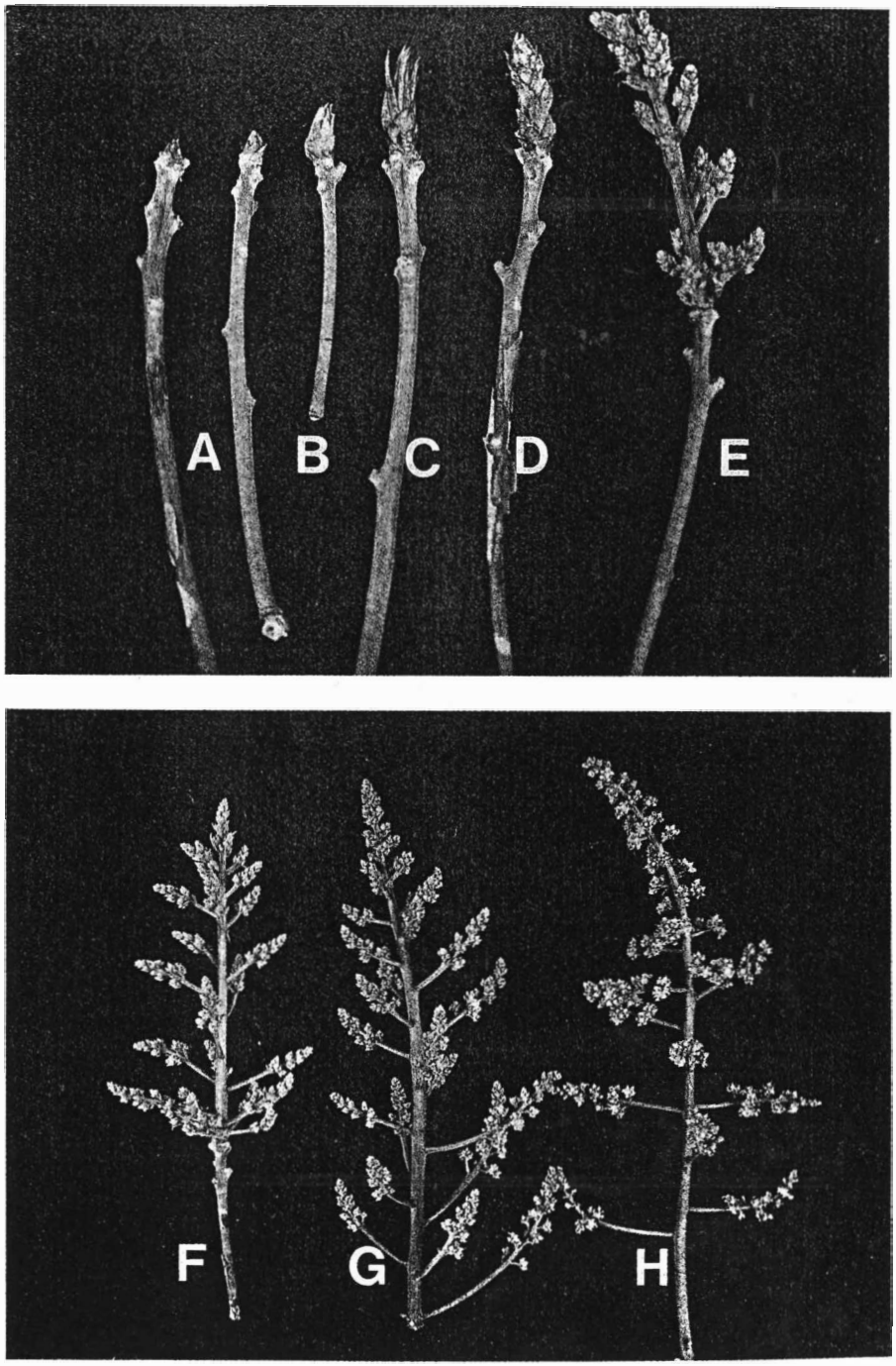
Disease incidence

Powdery mildew disease incidence was studied in the unsprayed area of the Tommy Atkins orchard at Nelspruit during the 1990 season. Seventy inflorescences were marked early in the season. Disease incidence was monitored by calculating the area of inflorescence covered by mildew as a percentage of the total inflorescences monitored.

Phenology

The phenology of the 70 marked inflorescences was also studied during the 1990 season. Inflorescences were examined weekly and classified into one of the following stages of development (Figures 1 and 2).

A. Closed bud;
B. Bud break;
C. Mouse ear;
D. Protected stage;
E. Green coloured;



Figs 1 and 2 Different developmental stages of mango inflorescences. A = Closed bud, B = Bud break, C = Mouse ear, D = Protected stage, E = Green coloured, F = Red coloured, G = Red open, H = Full bloom.

F. Red coloured — all individual flowers closed;
G. Red open — flowers start to open;
H. Full bloom — all individual flowers on inflorescence open.

›ESULTS

wdery Mildew

n two successive years, the first spores ap- ared in the unsprayed area of the Tom- / Atkins orchard at Nelspruit during the last week of July (Figure 3). The peak in spore release occurred during the first to :cond week of September. At the end of ctober the disease disappeared. The same pattern of spore release occurred in the sprayed area of the Tommy Atkins chard.

When the spore releases of the 1989 and 1990 seasons in the unsprayed area, were compared, it was found that spores were released at the same time. Therefore it could be possible to predict the time of spore release, as well as disease appearance.

In the Sensation orchard, which is a late season cultivar, the first spores also appeared at the end of July in the two successive years, although the peak was lower due to the spray program (Figure 4). An average of 16 spores occurred in the middle of September during 1989. During the 1990 season three peaks were formed due to additional spray applications. The number of spores was however lower than in 1989, not more than an average of 12 spores. It appears that the disease occurred later in the Sensation orchard. The reason for this is possibly the unavailability of susceptible tissue due to climatic factors at the time when spores were released.

In two Kent orchards at Tzaneen, a sprayed and a poorly sprayed orchard, the first spores were released at the end of July.

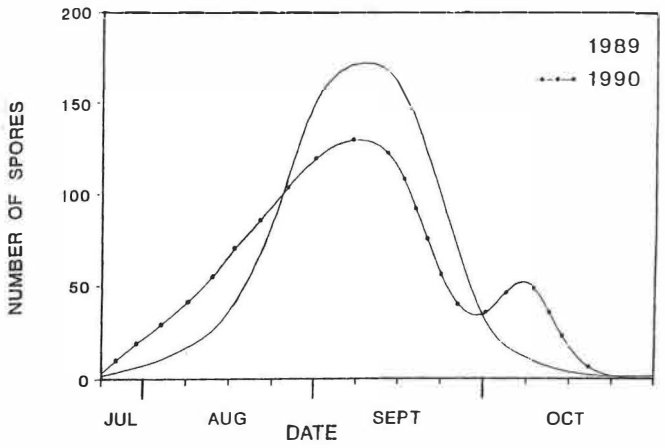


FIGURE 3: Average number of powdery mildew spores on traps in an unsprayed Tommy Atkins orchard at Nelspruit.

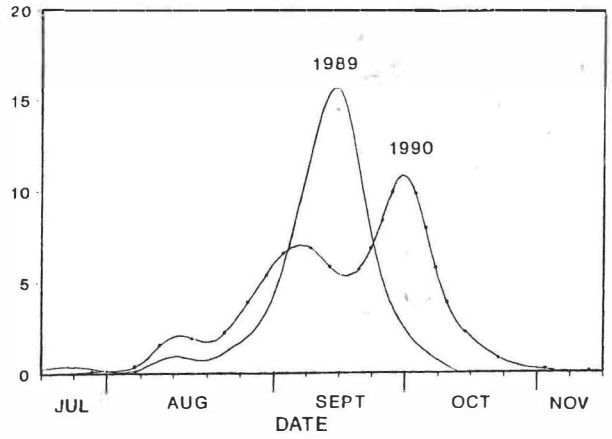


FIGURE 4: Average number of powdery mildew spores on traps in a sprayed Sensation orchard at Nelspruit.

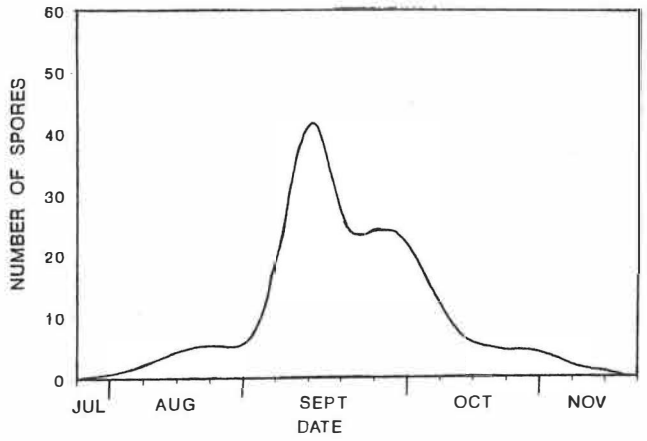


FIGURE 5: Average number of powdery mildew spores on traps in a poorly sprayed orchard at Tzaneen.

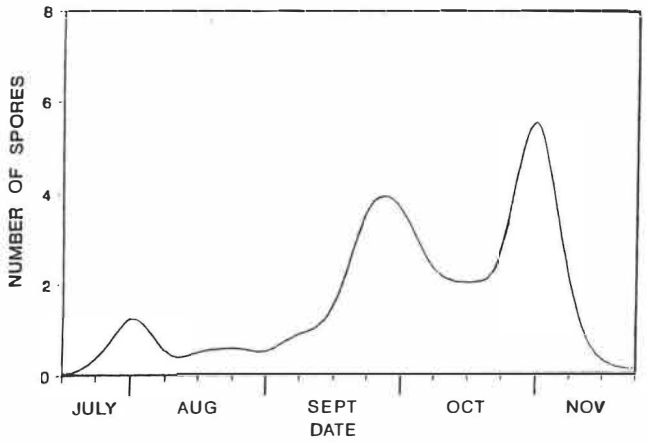


FIGURE 6: Average number of powdery mildew spores on traps in a sprayed orchard at Tzaneen.

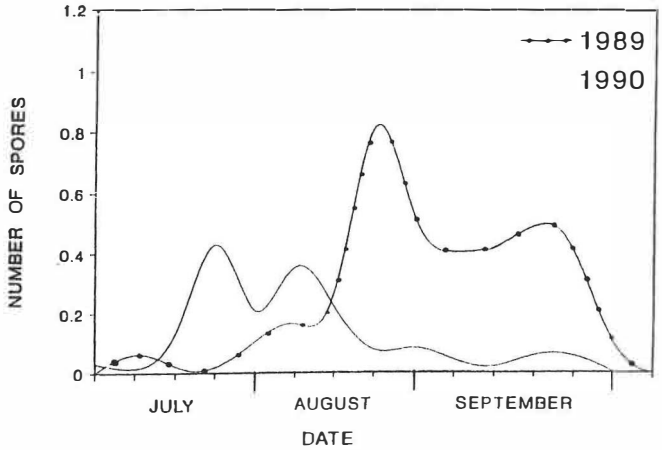


FIGURE 7: Average number of powdery mildew spores on traps in a sprayed orchard at Kaapmuiden.

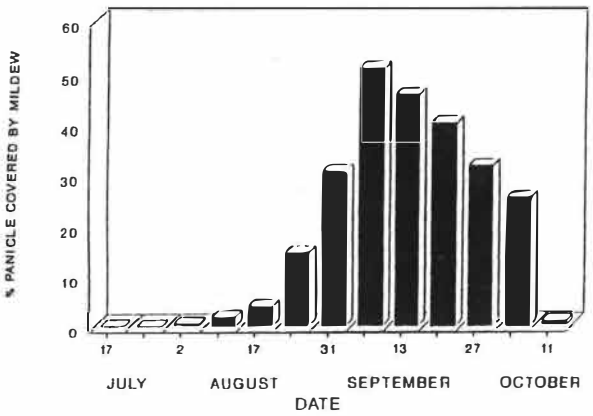


FIGURE 8: Powdery mildew disease incidence in an unsrayed Tommy Atkins orchard at Nelspruit.

As a result of the spray programme, more than one peak was formed. In the poorly sprayed orchard (Figure 5) a peak formed during the second week of September, not much later than in Nelspruit. The number of spores released in the sprayed orchard (Figure 6) were so low that the disease never really became established, only an average of 5 — 6 spores were counted at the peak time.

At Kaapmuiden the number of spores in two successive years was extremely low (Figure 7). The average number of spores counted was never more than one spore per week. The difference in weather conditions, cultivar and a better spray programme is possible the reason for the low occurrence of spores.

Disease incidence

The first symptoms of disease could be seen at the beginning of August, approximately one week after the first spores were released (Figure 8). A peak in disease incidence appeared during the first week in September, the same time when spore release reached a maximum.

Phenology

More than 50% of the inflorescences were in the full bloom stage at the end of July when the first spores appeared. During the other stages of development there were few spores and disease incidence was low. The full bloom as well as the fruit set to pea-size stages were the most susceptible.

MATERIAL AND METHODS

ANTHRACNOSE

The epidemiology of anthracnose was studied in the laboratory using detached mango leaves. Leaves in four different stages of development, namely bronze-brown, brown-green, light green and dark green, were inoculated with *Colletotrichum gloeosporioides* and incubated at 26°C for five days. This was done to determine at which developmental stage leaves are the most susceptible to anthracnose infection.

RESULTS

ANTHRACNOSE

Two days after inoculation lesions developed on the bronze-brown and brown-green leaves. After five days there was still no lesion development on the other leaves (Figure 9).

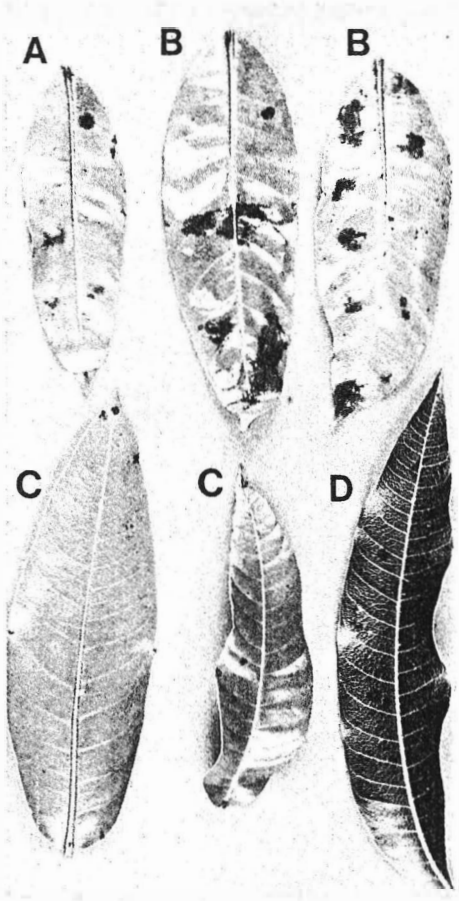


Fig 9 Different stages of leaves with lesions on bronze-brown leaves five days after inoculation (A) bronze-brown (B) brown-green (C) light-green (D) dark green.

DISCUSSION

It is possible to determine when and to what extent powdery mildew spores are release in the different climatological areas. Whether the time of spore release and disease development can be correlated to availability of susceptible tissue, weather conditions or both, must still be determined. It is aimed to develop a forecasting model for optimum disease control.

The results obtained from the laboratory studies on *C gloeosporioides* may have important implications in the future. Present spray programmes for the control of anthracnose focus on the protection of the flowers and fruits. As lesions on the leaves serve as important sources of inoculum for the more destructive phases of infection on blossoms and fruit, it is important to spray the susceptible leaves as well. Spraying the last flush of the season (bronze-brown leaves) may reduce the inoculum to such an extent that the percentage infection of the next seasons flowers and fruit will be much less. With this information it is expected to get closer to optimum disease control for antracnose.

REFERENCES

OSTRY, M E & NICHOLLS, T H, 1982. A technique for trapping fungal spores. Research note NC-283. USDA Forest Service.