

CP 621

Effect of Timing of Single Applications of Fungicide on Groundnut Yield

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Abstract

Recent research in Zambia has shown that a strategically timed single application of fungicide to control early leaf spot (*Cercospora arachidicola*) in groundnut (*Arachis hypogaea* L.) has resulted in significant yield responses.

The current recommendation for early leaf spot control in some countries is to make six fungicide applications, a practice recently shown to be uneconomic in Malawi.

Investigations at Chitedze Research Station, Lilongwe, Malawi, into the effect on groundnut yield of timing of single applications of fungicide have provided promising results. A single application of chlorothalonil made 50-70 days after sowing resulted in significant yield responses in Malimba groundnut in the 1987/88 and 1988/89 cropping seasons. A single application made 63 days after sowing resulted in a significant yield response in the virginia cultivar ICGV-SM 83708 (ICGMS 42), in the 1988/89 cropping season.

Further research on timing of fungicide applications in relation to progress of the epidemic is warranted.

Sumário

Efeito do Tempo de Aplicações Únicas de Fungicidas no Rendimento do Amendoim. *Investigação recente na Zâmbia mostrou que, para o controlo da mancha temporã (*Cercospora arachidicola*) no amendoim (*Arachis hypogaea* L.), uma aplicação única de fungicida, feita numa data estrategicamente definida, resultou em significativas respostas do rendimento.*

A actual recomendação para o controlo da mancha temporã em alguns países, é fazer seis aplicações de fungicida. Recentemente, esta prática mostrou não ser económica no Maláwi.

Investigações na Estação de Investigação de Chitedze, Lilongwe, Maláwi, sobre o efeito do tempo de aplicações únicas de fungicidas forneceram resultados promissores. Uma aplicação única de chlorothalonil, feita 50-70 dias depois da sementeira, resultou em significativas respostas do rendimento do amendoim Malimba, durante as estações de cultivo de 1987/88 e 1988/89. Uma aplicação única, feita 63 dias depois da sementeira, resultou numa significativa resposta do rendimento do cultivar, do tipo virginia, ICGV-SM 83708 (ICGMS 42), durante a estação de cultivo de 1988/89.

Futura investigação sobre aplicações atempadas de fungicida em relação ao progresso da epidemia é garantida.

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Introduction

Early leaf spot (*Cercospora arachidicola* Hori) is the most important groundnut (*Arachis hypogaea* L.) disease in the Southern African Development Coordination Conference (SADCC) region. Epidemics are consistently severe and, at Chitedze Research Station in Malawi, yields are reduced by 40–80%.

Fungicidal control of early leaf spot is very effective and yields can be increased dramatically by the use of chemicals. However, most groundnut growers in the SADCC region are smallholder farmers who have limited financial and other resources. The current recommendation in some countries of six fungicide applications is very costly and has recently been shown to be uneconomic in Malawi (Mwenda and Cusack 1989):

Researchers in Zambia have shown that a single fungicide application to virginia cultivars at about 75 days after sowing (DAS) has resulted in economic control of leaf spot (Kannaiyan et al. 1989).

The fungicide used in these studies was thiophanate methyl + maneb (Labilite®), a locally formulated fungicide, but more recently a mixture of

mancozeb and benomyl has been shown to be equally effective and more economical (J. Kannaiyan, Legumes Pathologist, Msekera Regional Research Station, P.O. Box 510089, Chipata, Zambia, personal communication).

We have investigated responses of two groundnut cultivars to a factorial combination of up to five applications of chlorothalonil at varying dates.

Materials and Methods

The susceptible spanish cultivar Malimba was sown in a trial at Chitedze Research Station in 1987/88 to assess the effect of a single application of chlorothalonil on the severity of early leaf spot and on yield. The design used was a 2² factorial in incomplete blocks with two replications. The fungicide was applied at 36, 50, 64, 78, or 92 DAS.

In 1988/89 the Malimba factorial trial was sown at two dates to assess the effect of single applications on crops at different stages of growth during the disease epidemic.

The fungicide was applied at 36, 50, 64, 78, or 92

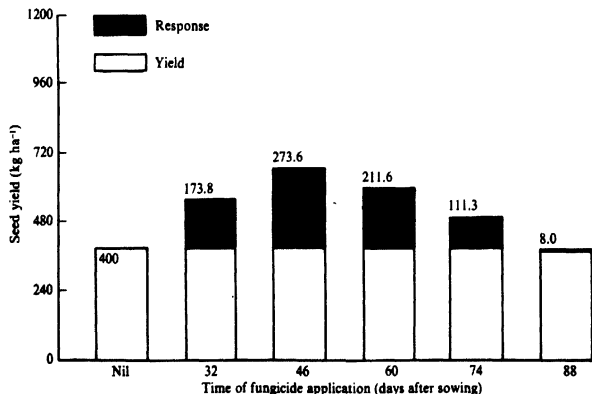


Figure 1. Effect of timing of single applications of fungicide on seed yield of groundnut cv Malimba, at Chitedze Agricultural Research Station, Malawi, 1987/88.

DAS in the early-sown Malimba, and at 34, 48, 62, 76, or 90 DAS on the late-sown Malimba.

In a different experiment, we assessed the effects of single applications of chlorothalonil on the early leaf spot tolerant virginia selection, ICGV-SM 83708 (ICGMS 42). Fungicide was applied at 36, 49, 63, 77, or 93 DAS.

Assessments of early leaf spot severity were made on all trials at regular intervals throughout the season. After harvest, measurements were made on yield, shelling percentage, and seed size.

Results

There were highly significant yield responses in 1987/88 to single applications of fungicide made at 32, 46, 60, or 74 DAS. The largest response was 273 kg ha⁻¹ and resulted from an application at 46 DAS (Fig. 1).

In 1988/89, there were highly significant yield responses to single applications of fungicide made at

36, 64, 78, or 92 DAS on Malimba sown with the first rains. The largest response (122 kg ha⁻¹) was from a spray at 64 DAS (Fig. 2). Sprays at 64, 78, or 92 DAS resulted in significant increases in seed size but shelling percentage was not affected.

On late-sown Malimba, single applications at 48, 62, or 76 DAS resulted in significant yield responses (Fig. 3). The largest response (74 kg ha⁻¹) was from a spray at 62 DAS.

Applications at 62, 76, or 92 DAS increased shelling percentage significantly and sprays at 62 or 76 DAS resulted in significant increases in seed size.

Yield of the late-sown Malimba was considerably lower than that of the early-sown trial (Figs. 2 and 3). This could be attributed to the effect of later sowing and to high leaf spot inoculum levels prevailing at earlier stages of crop development.

On ICGV-SM 83708 (ICGMS 42), only the application made at 63 DAS resulted in a significant yield increase (153 kg ha⁻¹) (Fig. 4). The spray at 92 DAS resulted in a significant decrease in shelling percentage but seed size was not affected by fungicide application.

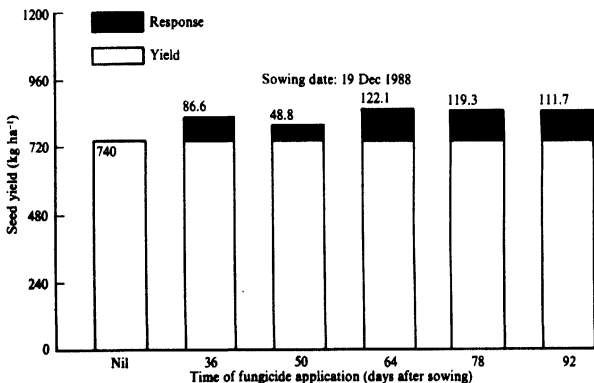


Figure 2. Effect of timing of single applications of fungicide on seed yield of groundnut cv Malimba, at Chitotze Agricultural Research Station, Malawi, 1988/89.

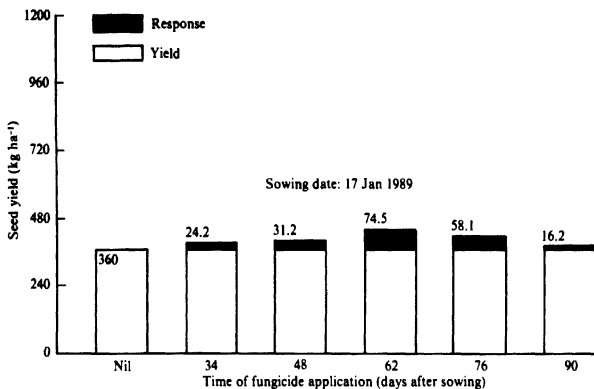


Figure 3. Effect of timing of single applications of fungicide on seed yield of groundnut cv Malimba, at Chitedze Agricultural Research Station, Malawi, 1988/89.

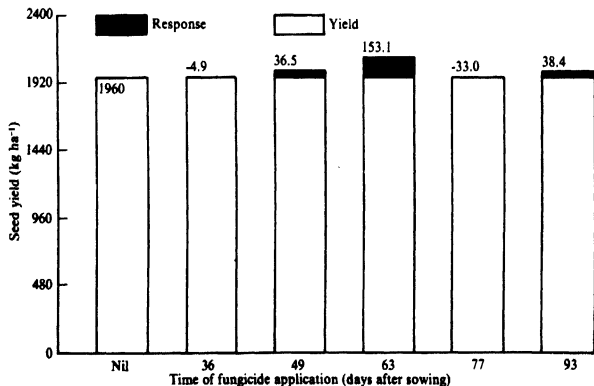


Figure 4. Effect of timing of single applications of fungicide on seed yield of groundnut ICGV-SM 83788 (ICGMS 42), at Chitedze Agricultural Research Station, Malawi, 1987/88.

Discussion

These results support the Zambian findings and indicate considerable promise for yield improvement at considerably lower cost than the current recommendation of six applications.

Although the limited data presented here suggests that fungicide applied to Malimba at 50–70 DAS is most beneficial, regardless of season or sowing date, we have not fully investigated the differences in the epidemic progress among seasons, host genotypes, and sowing dates. Further research is warranted on timing of fungicide application in relation to progress of the epidemic.

References

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Mwenda, A.R.E., and Cusack, T.J. 1989. An economic evaluation of smallholder farmers' use of the fungicide chlorothalonil (Daconil® 2787 W-75) on groundnuts in Lilongwe Agricultural Development Division, Malawi. Pages 65–73 in Proceedings of the Third Regional Groundnut Workshop for Southern Africa, 13–18 Mar 1988, Lilongwe, Malawi. Patancheru, A.P. 502 324, India: International Crops Research Institute for the Semi-Arid Tropics.

Discussion

Subrahmanyam: Did you work out the cost-benefit ratio?

Hildebrand: The results are only preliminary. The cost-benefit ratio was not worked out.

Subrahmanyam: Did you consider the possibility of using other cost-effective fungicides?

Hildebrand: We will consider this for inclusion in future trials.

Rao: Do you have data on the relative disease pressures at different sowing times?

Hildebrand: We have collected the data but have not analyzed it so far. Hopefully the new pathologist would be able to do it.

Rao: Do you feel that an optimal disease pressure is a prerequisite for a positive response of the crop to fungicidal spraying?

Hildebrand: We hope that together with Dr Butler, Principal Microclimatologist, we will be able to explore the relationship of yield (and therefore, disease pressure) and response.

Subrahmanyam: The research on optimizing the fungicide use in early leaf spot management is fascinating and should be continued. Some of the differences in yield response between seasons were probably dependent on the time of onset of the disease and the rate of disease progress.

Hildebrand: Yes, we have sufficient data. It needs to be evaluated.

Mayeux: Apparently your best results from chlorothalonil have been obtained during the drier season of 1988/89. This means that chlorothalonil, being a contact fungicide, was not washed away by rainfall and was able to protect plants for a longer period. Therefore, early treatment at 46 DAS was better—but the peak of the attack should be at about 60 DAS.