

# Observation on the Aerial Application of an Oil based Fungicide against the Leaf rot Disease of the Coconut palm

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The leaf rot is one of the two major diseases of the coconut palm (*Cocos nucifera*) in Kerala. It affects the leaves only when they are in the spindle stage. The disease was found by Menon and Nair (1951) and later by Radha *et al* (1961) to be caused by *Helminthosporium halodes*, *Gloeosporium* sp., and *Gliocladium roseum*, fungi which are commonly found on the affected palms. Based on the results obtained by Menon and Nair (1951) the application of copper fungicides on the crown is recommended for the control of the disease. On account of the importance of the disease, the Government of Kerala is spending nearly Rupees 2.5 million annually for the control operations.

The spraying of fungicides on coconut is usually done with the help of ordinary high volume sprayers. The application of fungicides in extensive areas by this method is a laborious and time consuming process. Specially trained labourers capable of climbing the palm are required for the purpose and they are often not readily available. It was therefore thought that the difficulty could be overcome to a large extent if the fungicide can be effectively applied from the air.

There are numerous reports of successful aerial application of plant protection chemicals. Amsden (1959) has pointed out

that there was a rapid post-war development of aerial spraying in Great Britain. According to him 100,000 acres of potatoes were sprayed aeri ally in 1958. There is also a report of Kerssen (1959) about aerial spraying against late blight of potato in the Netherlands. Agarkov (1960) has mentioned about the application of Bordeaux mixture against the uredial stage of the rust of beet in the U. S. S. R. Leach (1960) found aerial spraying with oil, effective against the leaf spot disease of banana caused by *Mycosphaerella musicola* in Jamaica.

One of the great advantages of aerial spraying is that fungicides can be applied over wide areas in a short time. The Department of Agriculture, Kerala, therefore undertook aerial spraying on coconut as an experimental measure in order to determine whether adequate protection of the spindle leaf could be provided by this method.

## Materials and Methods

A total of 350 acres of cocount gardens in two diseased localities were sprayed aeri ally in December, 1960. The spraying operations were done by the Cambata Aviation Company with a Piper aircraft. The spray material, namely, Shell colloidal copper OF. 26 in OB, 31 oil was provided

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by the **Burmah Shell Company**. The entire experimental area received an average of 1.4 gallon of the spray material containing 6 oz of copper per acre,

The number of **droplets** per unit area on the **fully unfolded leaves** was **determined** by actual count of the **droplets** on the leaves even while the spraying operations were in progress. The number of droplets which fell on the folded spindle leaves could not be traced by direct observation on account of the scales which are present on them. The spindle leaves were therefore covered with white muslin cloth on which the spray droplets left a bluish stain. The number of droplets on the spindle leaves was then determined by counting the number of stains left on the cloth.

The drift was determined by examining the leaves of the vegetation **along** the windward side for the presence of oil.

Other crops like arecanut, pepper, rice, ginger etc were also found in the area sprayed. They were grown **either** inside the coconut gardens or in vacant **spaces** in between the **coconut gardens**. The effect of the fungicide on those crops was determined by direct observation.

## Results

### *The number of droplets per unit area, spread, coverage and phytotoxicity*

The older unfolded leaves received an average of 2 droplets per  $\text{cm}^2$ . The droplets were found to spread rapidly and cover the entire upper surfaces of the leaflets. On partly **unfolded leaves only** the sides of the leaflets which were facing upwards were covered by the oil.

The unfolded spindle leaves received only a lesser number of droplets. The **terminal** portions of the **spindle leaf** received an

average of one droplet per  $\text{cm}^2$ . The basal regions received only **less than** 0.5 droplet per  $\text{cm}^2$ . The droplets on the spindle leaves did not spread. They were **absorbed** by the fine scales on the surface of the spindle which acted as sponge. The spindle was therefore practically unprotected by the fungicide. A few droplets were noted on the upper surfaces of the nuts. These droplets failed to spread.

No **phytotoxic effects** were noted on the coconut palm,

### *Drift*

Drift was detected upto a distance of 950 feet from the sprayed area. This could be greater or lesser depending on the wind velocity **prevalent** at the time of spraying.

### *Penetration of the droplets through the upper canopy of leaves.*

Oil droplets were **able** to penetrate through the upper canopy of leaves of larger trees and fall on the leaves of the smaller trees and seedlings. The downward drift was **exceptionally** good in **areas** where the palms were spaced well apart. In densely planted areas the downward drift was comparatively poor.

### *Effect of the fungicide on other crops*

Good spreading without any adverse effect was noted on the leaves of areca palms (*Areca catechu*), black pepper (*Piper nigrum*), banana (*Musa* sp.), coffee (*Coffea* sp.), breadfruit (*Artocarpus* sp.), mango (*Mangifera indica*), ginger (*Zingiber officinalis*) and cashew (*Anacardium occidentale*). On cassava (*Manihot utilissima*) no adverse effects were noted on the **older** leaves but the younger **leaves** showed malformation. Severe scorching was noted on rice (*Oryza sativa*), pineapple (*Ananas* sp.) and beans (*Phaseolus* sp.)

## Discussion

While **determining** the usefulness of **aerial spraying on** coconut it is necessary to take into **account** the purpose for which the spraying is done. The fungicide **is** applied on coconut to prevent the incidence of the leaf rot disease in healthy palms and to help **the** recovery of the diseased palms. The leaf rot disease affects only the spindle leaves **just** when they are emerging but before they unfold. Once the **leaves** unfold they are not **susceptible** to the disease. A diseased tree **will** have **old** leaves with leaflets partly dried or presenting a bitten off appearance. This condition is the outcome of **infection** of these leaves even while they were tender and **folded**. That portion of the leaf **which** was unaffected at the time of unfolding will remain **unaffected** even after they unfold. This points to the need for protecting the tender folded leaves of the spindle and not the older leaves.

In the usual type of high volume spraying a good quantity of the fungicide is applied on the emerging leaves and the neck. Part of this will seep down as far as it can go, thus protecting as much portion of the tender **folded** leaves as possible. This would help to eradicate the pathogen from the diseased trees and protect the healthy **ones**. In the case of aerial **spraying comparatively** fewer droplets fell in the tender folded leaves **because** they are more or less vertical. Further, these droplets were absorbed by the scales which form a fine coating on the folded **leaves**. Their surfaces are therefore unsuitable for the **spreading** of oil. In **effect**, the tender folded leaves, the only part of the plant which is vulnerable to leaf rot, was not protected by aerial spraying.

Excellent coverage was obtained on the upper sides of the older leaves. The **oil** droplets could also drift down and fall on the leaves of the smaller **plants**. The older leaves were **thus** very well protected by the fungicide. But at the same time it should be pointed out that these **leaves need** no protection.

If it is therefore concluded that the **aerial** application of an oil based copper fungicide cannot be adopted as a control for the leaf rot disease of the coconut palm since proper protection of the spindle **leaf** was not possible by this method.

## Summary

In order to explore the possibilities of adopting aerial spraying on a **large** scale for the control of the leaf rot disease of the coconut **palm**, an area of 350 acres was sprayed experimentally in December 1960. Shell colloidal copper OF 26 in OB 31 oil at the rate of 1.4 **gallons** per acre to give 6 **oz** of active copper was sprayed from a piper aircraft.

The older **unfolded** leaves received 2 droplets per **cm<sup>2</sup>** and the oil was found to spread and cover the upper surfaces of these leaves very **well**. The unfolded **spindle** leaves, however, received only fewer droplets. The apical portions of these leaves received one droplet per **cm<sup>2</sup>** while the **basal** portions received less than 0.5 droplet per **cm<sup>2</sup>**. These **droplets** were immediately absorbed by the fine scales present on the spindle leaves with the result the oil failed to spread and protect **these** leaves.

The leaf rot disease of the coconut palm **affects only** the spindle leaves. Once the **leaves unfold**, they are no more vulnerable to attack. Since aerial spraying failed to provide proper protection to the **spindle**

leaves, this method of spraying is not considered suitable for the control of the disease.

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