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EFFECTS OF POST-HARVEST TREATMENT ON THE PREVENTION OF  
DASHEEN CORM ROT

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ABSTRACT

Dasheen (*Colocasia esculenta* var. *esculenta*) has a great potential as an export commodity in the East Caribbean. The major constraint was found to be dasheen corm rot. Fungicides treatments at different intervals after harvest, and residue levels, were investigated. Low levels of metalaxyl and benomyl prolonged storage of dasheen corms up to four weeks with acceptably low residue levels. The most effective fungicidal dip was on clean undamaged corms treated within six hours after harvest.

INTRODUCTION

Dasheen corms rot rapidly, within two or three days of harvesting. With the volume of dasheen produced in the Eastern Caribbean annually estimated at 17,526 metric tons, valued at EC\$12 million, an increase in exports could be realized if this single most important constraint of dasheen corm rot were removed. The objectives of the work herein reported were to determine the most effective and appropriate fungicides to extend the shelf life of dasheen corms to a minimum of three weeks at ambient conditions, and to ascertain that the residue levels of the fungicide(s) in the corm pulp were acceptable.

METHODOLOGY

Fungicide Trial I

Small batches of corms were washed in running tap water and cleaned of roots and debris. They were then dipped momentarily in 500 ppm a.i. of 10 fungicidal treatments, and 25-35 corms were then stored in open top plastic crates at ambient conditions in a well ventilated room for three weeks. Observations on corm rot were done at weekly intervals using a 0-4 scoring scheme.

Fungicide Trial II

The second trial investigated the timing of application with two levels of the best fungicidal treatments found in the first trial. Corms were treated at 4, 24 and 48 hours after harvest. Clean corms with tail pieces cut were dipped in a suspension of 500 ppm a.i. metalaxyl (Ridomil MZ 58 containing 10% metalaxyl and 48% mancozeb) and 500 ppm benomyl, or in a suspension containing 250 ppm a.i. metalaxyl and 500 ppm a.i. benomyl. Storage was the same as in the first trial. The second trial was replicated thrice. Controls were dipped in water alone. Data on corm rot were taken at 4 and 6 weeks after treatment.

### Fungicide Trial III

This third trial examined lower levels of metalaxyl and benomyl. Five fungicide suspensions containing 250, 250, 100, 50 or 0 ppm metalaxyl, were mixed, respectively, with suspensions containing 500, 250, 250, 250 and 0 ppm benomyl. Metalaxyl was available from Ridomil MZ 58, containing 10% metalaxyl, and benomyl from Benlate WP 50.

Sound corms, free of damage and with tail end cut off, were trimmed of all roots prior to dipping in the appropriate fungicide suspension for 5-10 seconds. Ninety-six corms were used in each treatment and these were divided into four replicates. Eight corms from each replicate batch were destructively sampled and examined for symptoms of rotting after 2, 4 and 6 weeks of storage. Corms were stored in plastic crates under ambient conditions.

The corm rot scores in all the trials were converted to the rotting disease index (RDI) using the McKinney's modified formula:

$$\text{RDI} = \frac{\text{the sum of observed rating per treatment}}{\text{the total number of corms per treatment}} \times \frac{100}{\text{the maximum disease category}}$$

Residue levels of benomyl and metalaxyl in the pulp of treated corms were determined by the Tropical Development Research Institute in U.K. Corms were shipped by boat the U.K. as a normal dasheen shipment and by air.

### RESULTS AND DISCUSSION

#### Fungicide Trial I

Dipping corms in the mixture of Ridomil (metalaxyl + mancozeb) and Benlate (benomyl) was the most effective treatment. Ridomil alone gave satisfactory control up to 21 days, with rotting indices ranging from 0 at 7 days to 15 at 21 days. At 22 days, the rotting index was observed to be 50. With benomyl dips, the rotting disease index was in excess of 25 after 8 days in storage. The second component of Ridomil, mancozeb, gave satisfactory rot control up to 8 days but at 22 days rot control was erratic. Alasan showed little promise after 8 days with scores ranging between 53 and 73 (Table 1).

The treatment based on Ridomil and Benlate showed the most promise in this preliminary test.

#### Fungicide Trial II

Dasheen corms treated 4 h after harvest and 24 h after with both mixtures kept satisfactorily for up to 4 weeks but not up to 6 weeks: the rotting indices were above 30. Corms treated 48 h after harvest did not store satisfactorily either to 4 or 6 weeks at ambient conditions (Tables 2 and 3).

Table 1. Disease indices of dasheen corm rot in storage (7-22 days) at ambient conditions after treatment with different fungicides.

Treatments	Rotting disease indices at indicated days after treatment <sup>1/</sup>						
	7	8	12	14	15	21	22
Control	28	58	67	48	65	82	75
Alasan (A)	18	20	69	68	53	75	73
Benlate (B)	25	25	83	65	98	34	81
Manzate (M)	23	28	60	18	60	50	58
Ridomil (R)	00	5	25	08	30	15	50
A + B	33	28	67	43	78	61	52
A + R	3	28	60	8	38	52	61
A + M	00	00	36	00	13	32	54
B + R	00	00	25	00	00	00	13
B + M	13	35	60	38	68	50	47
A + B + R	00	00	25	00	00	00	00

<sup>1/</sup> Disease Indices 25 = acceptable  
 25-40 = satisfactory  
 40 + = not acceptable

Table 2. Effect of two fungicidal dips on dasheen corm rot after 4 weeks storage under ambient conditions

Time of treatment after harvest (hours)	Rotting disease indices			Mean
	Control	250 ppm metalaxyl + 500 ppm benomyl	500 ppm metalaxyl + 500 ppm benomyl	
4	46.2	15.9	18.6 <sup>d</sup>	26.9
24	73.3	24.1	29.6 <sup>d</sup>	42.3 <sup>b</sup>
48	69.3	46.3	35.5	50.4 <sup>c</sup>
Mean	62.9	28.8 <sup>a</sup>	27.87 <sup>a</sup>	

a = Significantly different from the control (P = 0.01).

b = Significantly different from the 4 hr. treatment (P = 0.01).

c = Significantly different from both the 4 hr and 24 hr treatment (P = 0.01).

d = Significantly different from the control (P = 0.01).

Table 3. Effect of two fungicidal dips on dasheen corm rot after 6 weeks storage under ambient conditions

Time of treatment after harvest	Rotting disease indices			Mean
	Control	250 ppm metalaxyl + 500 ppm benomyl	500 ppm metalaxyl + 500 ppm benomyl	
4	61.7	36.0	34.2	44.0
24	75.7	33.2	41.2	50.0
48	80.3	44.2	38.4	54.3
Mean	72.6	31.8 <sup>a</sup>	37.9 <sup>a</sup>	

a = Significantly different from the control (P = 0.01).

#### Fungicidal Trial III

Two weeks after storage, dasheen corms treated with fungicides had significantly lower rot indices than the untreated corms which were almost 50% rotted as indicated by a rotting index of 46.9 (Table 4). After four weeks of storage, a similar trend was observed, with the second highest level of rot in corms dipped in 50 ppm metalaxyl + 250 ppm benomyl. This level (26.7) was acceptable by consumers. Corms not dipped in any fungicide had rotted almost 100% (Table 4). At 6 weeks, only those corms dipped in the 250 ppm metalaxyl + 500 ppm benomyl had an acceptable rot level. The other treatments were significantly better than the control, but higher than an acceptable level (Table 4).

Table 4. Effects of dipping dasheen corms in metalaxyl + benomyl suspensions, on dasheen corm rot at 2, 4 and 6 weeks after treatment

Treatment	Rotting disease		
	2 weeks	4 weeks	6 weeks
metalaxyl + benomyl			
250 + 500	0	3.9	29.8
250 + 250	0.9	12.5	39.6
100 + 250	0.8	9.4	41.4
50 + 250	0	26.7	57.1
0 + 0	46.9	89.3	90.6
S.E. (diff. between mean)	6.4	4.4	8.5

It therefore seems that the treatment with 50 ppm metalaxyl + 250 ppm benomyl can be recommended on the basis of low rot indices.

## Residue Levels of Fungicides

The residue levels of both metalaxyl and benomyl in the dasheen pulp 7 days after treatment were in excess of the maximum residue levels (MRL) found in potato. However, 21 days after treatment, the residue of metalaxyl in the pulp was satisfactory at 0.07 mg per kg (0.10 mg per kg). The benomyl residue of 0.18 mg per kg on the other hand was almost twice the permissible MRL of 0.10 mg per kg (Table 5).

Table 5. Residue level of two fungicides in dasheen corms after air and sea shipments to the U.K. <sup>1/</sup>

Days after treatment	Residue (mg/kg)	
	Metalaxyl <sup>2/</sup>	Benomyl <sup>3/</sup>
7	0.27	0.29
21	0.07	0.18
Maximum acceptable residue level	0.10	0.10

<sup>1/</sup> Analysis by the Tropical Development and Research Institute (UK).

<sup>2/</sup> From Ridomil MZ 58 at 250 ppm a.i. treatment.

<sup>3/</sup> From Benlate WP 50 at 500 ppm a.i. treatment.

The residue levels of metalaxyl and benomyl in dasheen pulp treated with 50 ppm metalaxyl and 250 ppm benomyl, were far below the permissible MRL 3 weeks after treatment (Table 6). Dasheen corms treated with fungicide should not be consumed before 3 weeks after treatment.

Table 6. Residue levels (mg per kg) of metalaxyl and benomyl in dasheen corms treated with 50 ppm metalaxyl and 250 ppm benomyl contained in Ridomil mbc 60 WP<sup>1/</sup>

Sample	Metalaxyl		Benomyl	
	Week 1	Week 2	Week 1	Week 2
A	0.10	<0.05	0.08	<0.05
B	<0.05	<0.05	0.08	<0.05
C	0.10	<0.05	0.10	<0.05
Mean	0.08	<0.05	0.08	<0.05

<sup>1/</sup> Analyses by K. Kilminster of the Chemical Control and Pesticides Analysis Section, TDRI, Slough, U.K.

## CONCLUSIONS AND RECOMMENDATIONS

Dasheen corms, free of any unnatural damage and dipped in a fungicidal mixture of 50 ppm metalaxyl and 250 ppm benomyl, stored satisfactorily for 4 weeks. It is recommended that corms be dipped as soon as possible after harvest and preferably within 6 hours but not longer than 24 hours after harvest.