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INCIDENCE, SYMPTOM DEVELOPMENT AND TRANSMISSION OF TARO FEATHERY MOSAIC DISEASE

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ABSTRACT

A survey of taro-growing areas in Eastern and Central Visayas showed about 10% infection with taro feathery mosaic disease (TFMD). TFMD-infected plants produced the characteristic feathery mosaic with or without mottling of leaves. The symptoms would sometimes be a slight green streak/irregular spots along or in between leaf veins. Symptoms of infection may disappear from a mature leaf and then reappear on the young leaf. Using the Kalpao variety of taro, manual inoculation showed 70% infection after 12.4 days of incubation while insect inoculation gave 63% infection after 15.2 days. The taro planthopper, *Tarophagus proserpina* Kirk., was found to be a vector of taro feathery mosaic disease.

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KEY WORDS: *Colocasia esculenta.* Kalpao taro. *Tarophagus proserpina.* Disease distribution. Symptomatology. Feathery mosaic disease.

INTRODUCTION

Taro (*Colocasia esculenta* (L.) Schott) is an important and popular crop in the Philippines. It is a highly adaptable crop which can survive in environmental conditions adverse to other crops (Leon, 1976). However, recent production constraints include the presence of diseases and insect pests.

A mosaic-like disease of taro has been observed in the Kalpao variety grown in the experiment station of the Visayas State College of Agriculture (ViSCA), Baybay, Leyte and in the Takudo variety planted in Eastern Samar. A disease with similar symptoms has been reported in other Pacific countries and in the British Solomon Islands and Carribean Islands (Gollifer et al., 1975).

Before an adequate control measure can be initiated, it is necessary to have a basic knowledge of this disease. Therefore, benchmark information on symptomatology and transmission are important considerations in determining the causal agent of taro feathery mosaic disease. Information on disease incidence is also necessary to determine the severity of the disease in taro-growing areas.

MATERIALS AND METHODS

Survey and Collection of Specimens. Surveys on the occurrence of feathery mosaic disease in taro-growing areas of Eastern and Central Visayas were made. Insects, especially aphids, leafhoppers and planthoppers in and around taro plants in ViSCA, Baybay, Leyte were collected and mass-reared in the laboratory for transmission studies.

Care and Planting of Taro. Small suckers of healthy taro (Kalpao variety) plants collected from the field were defoliated and then planted in pots with sterilized soil and kept in the screenhouse. The new leaves which developed from these suckers were observed daily for the appearance of disease symptoms for at least three weeks. Healthy taro seedlings were transplanted into tin cans after two weeks. Only those plants that remained healthy were used as test materials.

Manual Inoculation. Leaves with well-developed symptoms of the disease were ground in a mortar and pestle and the sap was extracted. Young and rapidly growing plants approximately 3 to 4 weeks old were selected for inoculation. The leaf to be inoculated was rubbed on its upper surface with a cotton ball moistened with a mixture of the extract and celite. A stream of tap water was used to remove excess inoculum on the leaves.

Insect Transmission. Probable arthropod vectors (nymphs and/or adults) were allowed to feed on diseased plants for 24 hours and then transferred to healthy taro plants where they remained for the same period.

RESULTS AND DISCUSSION

Survey

Figure 1 shows the different localities in Eastern and Central Visayas surveyed for the occurrence of taro feathery mosaic disease (TFMD). Infection ranged from 0 to 20%, with 10% being the most common rate (Table 1). This indicates that the incidence of TFMD in these areas is low and that it is not yet a serious problem.

The infection of taro with TFMD per unit area in BPI, Salcedo, Southern Samar was significantly higher than in Northern and Western Samar, Bohol, Leyte and Southern Leyte. The differences in percentage infection could be attributed to the differences in the taro varieties used and the varying population densities of the vector in these areas.

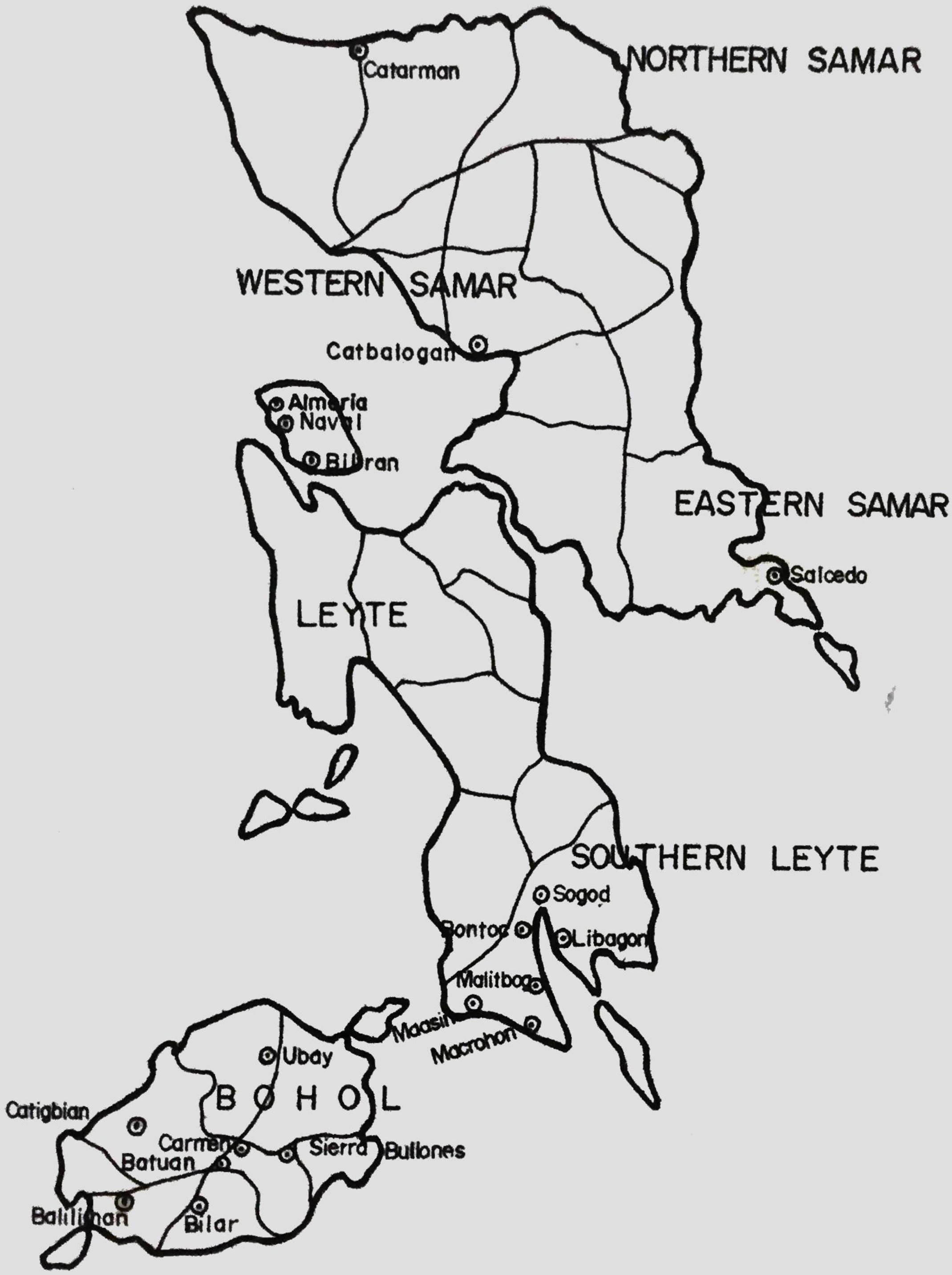


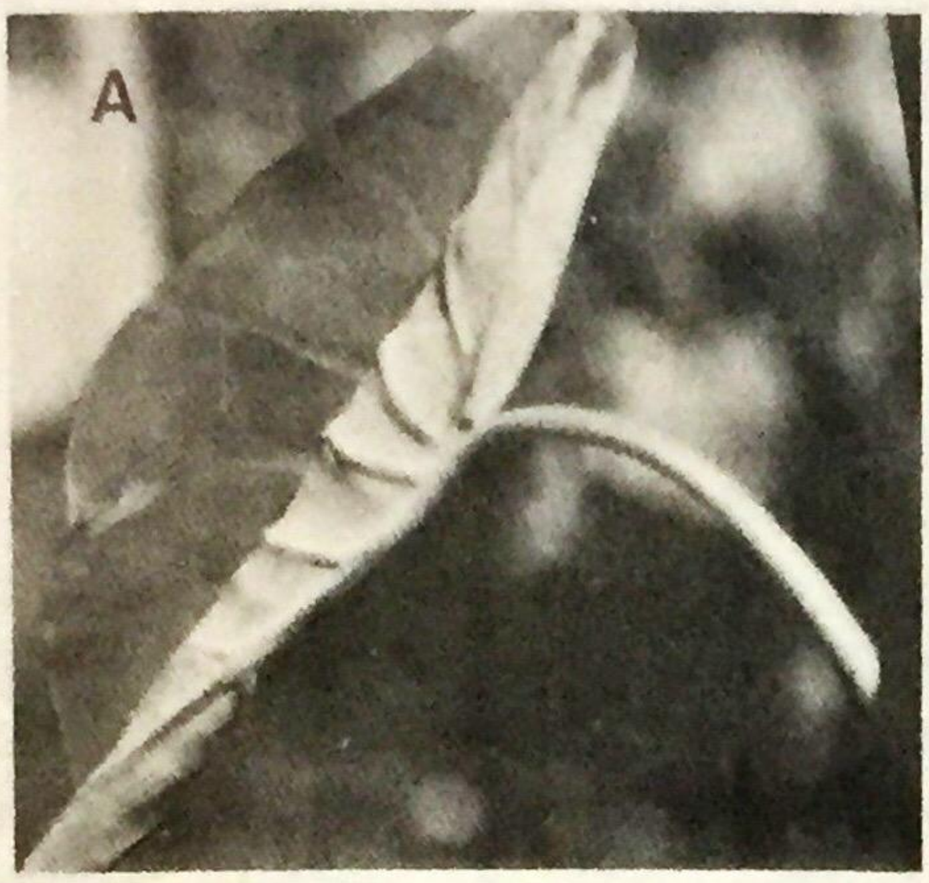
Fig. 1. Distribution of taro feathery mosaic disease in Eastern and Central Visayas.

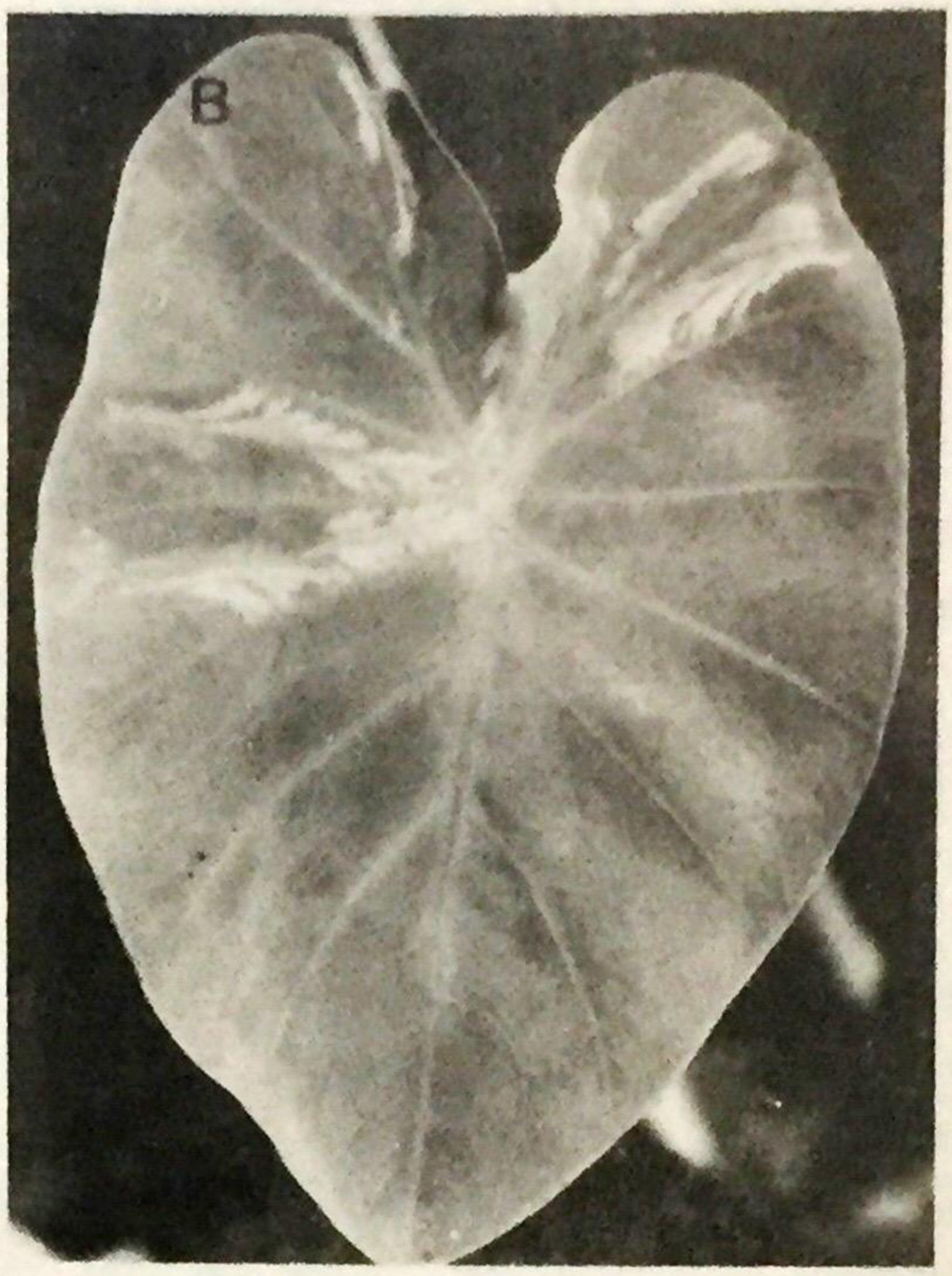
Table 1. Percentage infection of taro feathery mosaic disease in Eastern and Central Visayas, 1979-1980.

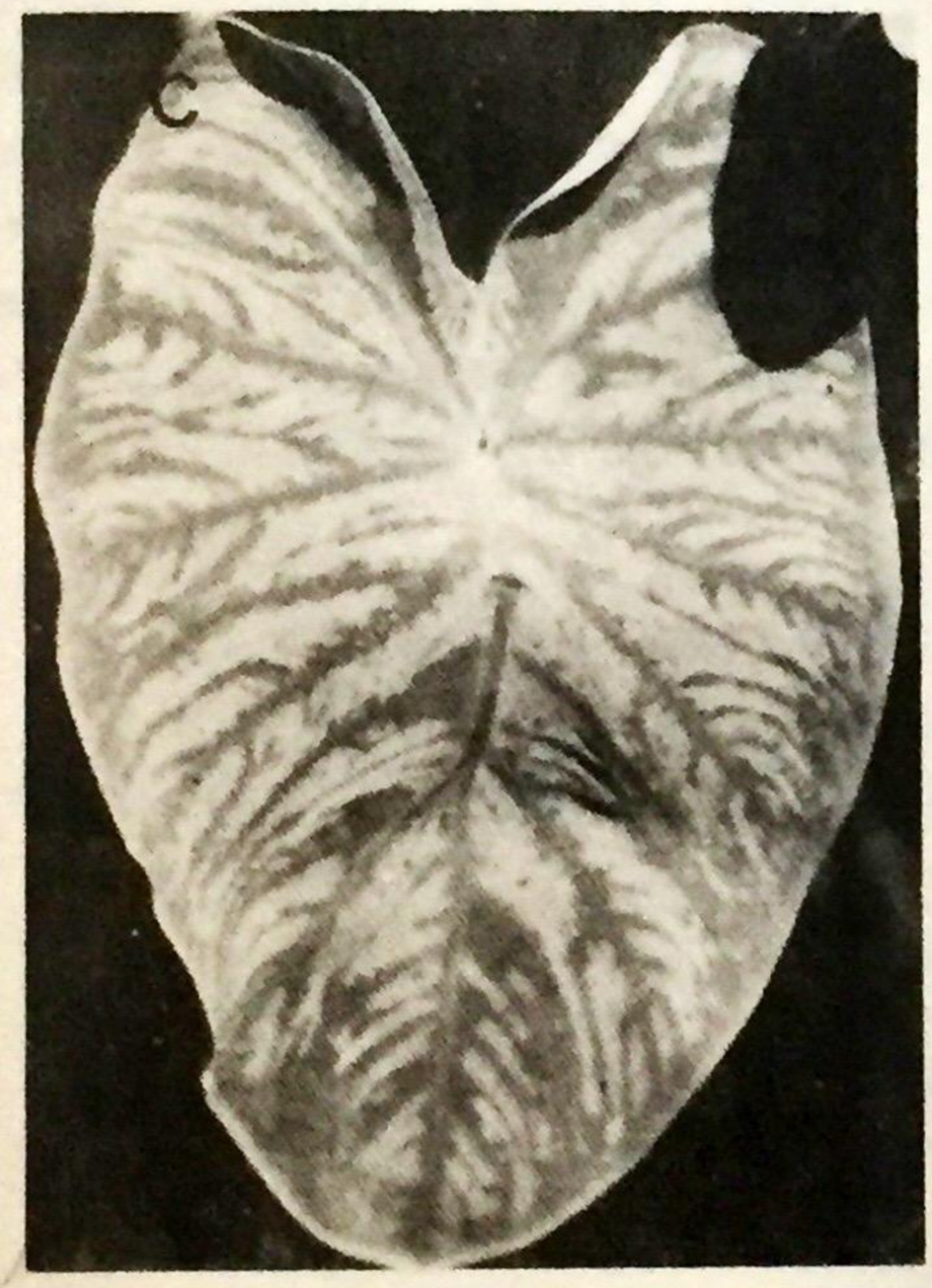
Province	Location	Area (ha)	Infection (%)
SAMAR			
Northern	UEP, Catarman	0.50	10
Southern	BPI, Salcedo	0.10	15
	Southern Samar Agric. College, Salcedo	0.10	10
Western	BPI, Catbalogan	0.25	10
BOHOL			
	Baang, Catigbian	0.25	10
	Balilihan	0.33	10-15
	Bohol Agric. College, Bilar	0.13	10
	Batuan	0.25	5
	Carmen	0.25	10
	Sierra Bullones	0.13	0
	Ubay	0.50	20
LEYTE			
(Biliran	Almeria	1.50	10
Subprovince)	Naval	0.50	10
	Biliran	0.50	5
SOUTHERN			
LEYTE	Maasin	0.30	0
	Macrohon	0.20	0
	Malitbog	0.50	0
	Bontoc	0.80	0
	Sogod	0.70	10
	Libagon	1.00	10

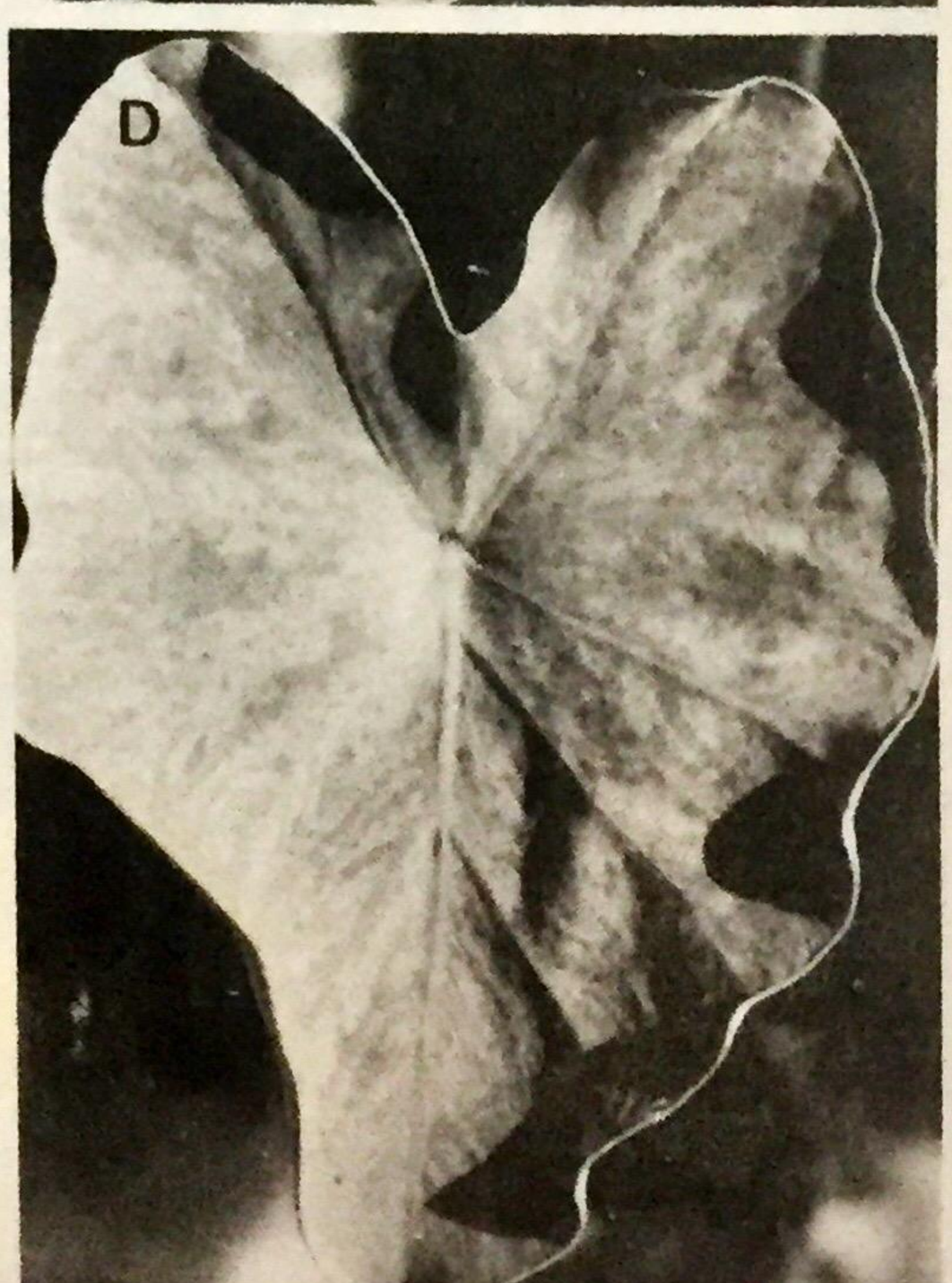
Symptomatology

Taro feathery mosaic disease symptoms varied from severe to slight feathery mosaic pattern with or without mottling of leaves. The color of the mosaic ranged from whitish to yellowish green. The slight feathery mosaic pattern was usually observed on an unfolding taro leaf (Fig. 2A).









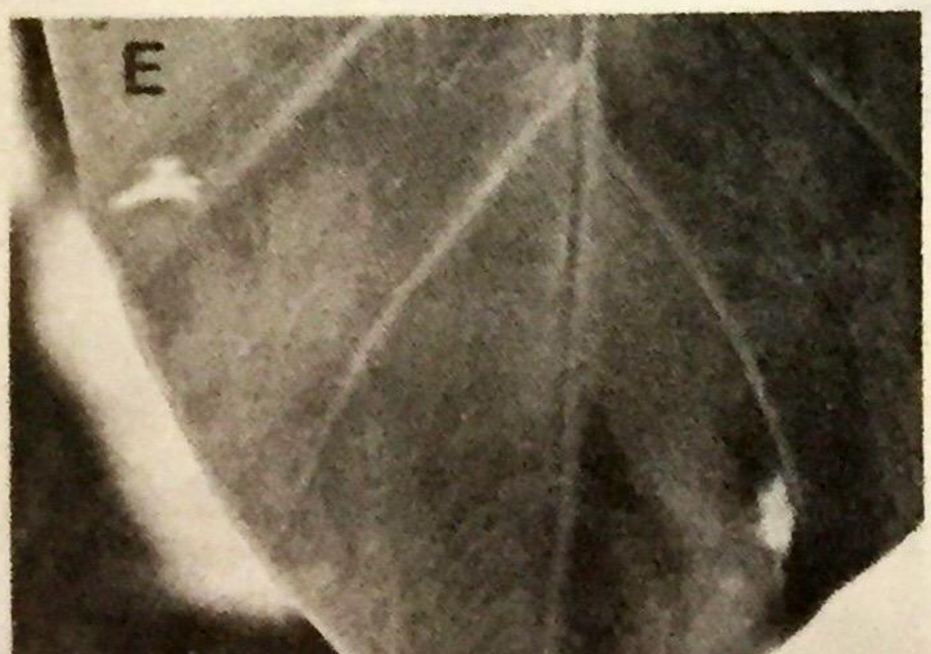


Fig. 2. Symptom development of taro feathery mosaic disease in a taro leaf. A. Slight feathery mosaic pattern on an unfolding leaf. B. Newly unfurled leaf showing developing infection. C. Severe feathery mosaic spread all over the leaf area. D. Infected leaf where symptoms of infection have started to disappear. E. Localized spot symptom due to taro feathery mosaic.

Sometimes the symptom would be a light green streak or an irregular spot along or in between leaf veins (Fig. 2B). As the leaf unfurls, the spot becomes larger and spread all over the leaf area in cases of severe feathery mosaic (Fig. 2C). Symptoms on severely infected leaves may gradually disappear (Fig. 2D). However when the symptoms appear in the form of slight feathery mosaic and streaks/spots, the spots are localized and did not increase in size (Fig. 2E). Symptoms of infection may also disappear in such cases.

The TFMD symptom disappeared in the following manner: The fully expanded taro leaf showed severe feathery mosaic pattern. In the next younger leaf, a slight feathery mosaic pattern was observed, while on the following younger leaf, the spot/streak was present. The plant appeared healthy looking but when it was partially defoliated, either the feathery mosaic or the streak/spot symptom reappeared on the youngest leaf. Likewise, the streak/spot symptom disappeared as follows: The fully expanded leaf showed at first the streak or spot symptom. It disappeared on the next younger leaf and the young leaves in succession did not show any symptom. However, when the healthy looking leaves were thinned, the streak/spot symptoms reappeared on the youngest leaf. Removal of leaves not showing symptoms of the disease stimulated the reappearance of the disease on the youngest leaf.

Table 2. Number of plants showing disease infection after manual or insect inoculation.

Trial	Number of Plants	
	Manual	Insect
I	10/10[1]	13/20
II	3/10	10/20
III	6/10	13/20
IV	28/30	8/10
V	8/20	7/10
VI	8/10	–
Total	63/90	51/80
%	70	63

[1] Numerator is the number of plants showing infection while denominator is the number of plants used in the experiment.

Table 3. Incubation period of taro feathery mosaic disease in Kalpao variety after manual or insect inoculation.

Trial	Incubation Period (days)	
	Manual	Insect
I	16.5	18.7
II	13.3	24.4
III	13.3	18.9
IV	7.8	12.5
V	11.0	11.3
Average	12.4	15.2

Manual Transmission

The percentage of infected plants and the average incubation period of the disease were 70% and 12.4 days, respectively (Tables 2 and 3). The infected test plants showed various symptomatological expressions from purely feathery mosaic symptoms to slight feathery mosaic and streak/irregular spot symptoms. Plants treated with inoculum from plants showing purely feathery mosaic and streak/irregular spot symptoms were also observed on those treated with inoculum from plants with streak/irregular spot symptom alone. This suggests that both symptoms are related. The pattern of symptom "loss" was observed to be typical of TFMD on manually inoculated plants.

Insect Transmission

The percentage of infected plants and the average incubation period of the disease were 63% and 15.2 days, respectively. (Tables 2 and 3). This suggests that TFMD could be transmitted by ***Tarophagus proserpina*** Kirk. As in manually inoculated plants, symptoms of TFMD disappeared after a month but reappeared when the plant was defoliated. Jackson and Gollifer (1975) observed a similar phenomenon in a taro disease occurring in Santa Ysabel, British Solomon Islands,* wherein infected plants recovered from infection.

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