INVESTIGATION ON THE CLONAL SUSCEPTIBILITY OF POWDERY MILDEW DISEASE IN RUBBER PLANTATIONS IN MEENACHIL, KANJIRAPPALLY AND PEERMEDU TALUKS OF KOTTAYAM AND IDUKKI DISTRICTS

by

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DISSERTATION

Submitted in partial fulfilment of the requirement for the 'Post Graduate Diploma in Natural Rubber Production'

FACULTY OF AGRICULTURE

KERALA AGRICULTURAL UNIVERSITY

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A C K N O W L E D G E M E N T

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DECLARATION

I hereby declare that this dissertation entitled **"INVESTIGATION ON THE CLONAL SUSCEPTIBILITY OF POWDERY MILDEW DISEASE IN RUBBER PLANTATIONS IN MEENACHIL, KANJIRAPPALLY AND PEERMĒDU TALUKS OF KOTTAYAM AND IDUKKI DISTRICTS"** is a bonafide record of original work done by me during the course of placement/training and that this dissertation has not formed the basis for award of any degree, diploma, associateship, or other similar titles or any other University or Society.

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C E R T I F I C A T E

Certified that this dissertation entitled "INVESTIGATION ON THE CLONAL SUSCEPTIBILITY OF POWDERY MILDEW DISEASE IN RUBBER PLANTATIONS IN MEENACHIL, KANJIRAPPALLY, AND PEERMEDU TALUKS OF KOTTAYAM AND IDUKKI DISTRICTS" is a record of research work done by Sri. K. Augusthy Luka under our guidance and supervision and that it has not previously formed the basis for the award of any degree or diploma to him.

We the undersigned members of the committee of Sri. K.Augusthy Luka a candidate for the Post Graduate Diploma in Natural Rubber Production, agree that the dissertation entitled "Investigation on the clonal susceptibility of Powdery Mildew disease in Rubber Plantations in Meenachil, Kanjirappally and Peermedu Taluks of Kottayam and Idukki Districts" may be submitted by Sri. Augusthy Luka, in partial fulfilment of the requirement of the Diploma.

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CHAPTER I

INTRODUCTION

The Powdery mildew disease caused by Oidium heveae is one among the potentially destructive disease of Heveae. Though the disease was considered to be one confined to the eastern hemisphere only, now it is prevalent in all the rubber growing countries of the world. The incidence of the disease was recorded for the first time in 1918 in Indonesia. Later in 1925, it was reported from Sri Lanka and in Malaysia almost simultaneously. The disease was recorded in India, only in the year 1936, in an estate in Kanyakumari District. Now the disease is noticed in all the rubber growing regions in India with varying intensity. The ravages of the disease have been reported from Congo, Cameroons, Uganda and Tanzania, from Africa and also from Brazil.

Incidence of Powdery mildew of rubber is comparitively severe in Kanyakumari District of Tamil Nadu. But recently its incidence is reported from the high elevation plantations of Meenachil, Kanjirappally and Peermedu taluks in both mature and immature plants and thereby causing loss in yield and retardation of growth. It is predominently noticed on newly formed tender flushes during the refoliation period of January to March. Tender leaves with the powdery growth of the fungus will curl, with edges rolling inwards. They fall leaving the petioles attached to the twigs giving a broomstick appearance. After a few days, the petioles also fall. Die back of twigs follows. On older leaves the fungus produces necrotic spots which reduces

the photosynthetic efficiency. Infected flowers and tender fruits shed affecting seed production.

Late wintering trees suffer more. Persistence of the disease is more in nurseries and on partially wintered trees. Cloudy days with light rains and misty nights with dew formation during refoliation favour disease out breaks. The disease persists throughout the year under shaded conditions and in higher elevations.

During the past 10 years many instances of young rubber plants of 2-3 years of age, drying up from top to bottom due to repeated defoliation caused by the infection of powdery mildew disease during March-April and consequent effect of sun scorch were reported. Considerable per cent reduction in yield a loss of 34% annual production was recorded when 50 per cent of the leaves were affected due to the incidence of the diseases. It has been reported that all the clones cultivated in India are sucepitible but the intensity of the disease varies with different clones. Clones like PB 86, GL-1, GT-1 are reported to be tolerant/less suceptible whereas PB-5/139, RRII 116 are most sensitive to this disease (Pillai et al 1980). This is further complicated by different factors like elevation, rainfall humidity and soil fertility.

The present study is aimed to find out the response of different clones to the disease infestation at different stages of growth and in different locations of Meenachil, Kanjirappally and Peermedu taluks in Kottayam and Idukki Districts. The study will indicate the severity

of the disease in relation to altitudes, areas where prophylatic measures are adopted and the reasons for not undertaking plant protection measures. The study also aims at finding the susceptibility of the disease among the different clones like RR II-105, RR IM-600, GT-I, PB 235 and PB 311, the effect of spacing of rubber trees on the severity of powdery mildew and its effect of weed control. Another objective of the study is to collect the details regarding the percentage of refoliation and the constraints in plant protection of rubber plants against the disease among small growers. The percentage of loss in yield due to the infestation of the disease will also be evaluated.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

2.1 CLIMATIC FACTORS

Powdery mildew disease of rubber caused by Oidium heveae affects plants of all ages, from very young nursery seedlings upto mature plants in the field. The young leaves in the bronze, greeny bronze and pale green stages are liable to the infection. The fungul infection is observed between bud break to the time cuticle matures, which varies from clone to clone (Pillai et al 1980). Severity of the disease infection depends on the climatic conditions prevalent at the time when the leaves are in the vulnerable stage.

The casual organism of this disease favours cool weather with intermittent showers. Plantation in higher elevation experiences the disease throughout the year, because of the cool climate, frequent heavy dew formation during night and prevalence of thick mist. (Janes and Hilton 1956). When refoliation of Rubber occurs in wet weather the build up of inoculam of Oidium results in severe epidemics of secondary leaf fall.

2.2 ELEVATION

The elevation at which the plantations are situated affects the intensity of the disease. Though Oidium can be severe even at low elevation it has been observed in South India that the intensity of infection and persistence of the fungus throughout the year are more severe at higher elevations. According to Ramakrishnan and Pillai (1962)

powdery mildew disease was very severe in rubber plantation in Nilgiri (3000-4000') Vandiperiyar (2000') and Wynad (2000-3000').

2.3 FERTILITY STATUS OF THE SOIL

The fertility status of the soil and soil moisture content affect the rapidity of the growth of the foliage after wintering and this in turn influence the intensity of infection. Rubber tree is observed to grow vigorously and rapidly during refoliation when it is planted in fertile vergin soils. In these areas as the leaves pass the vulnerable age quickly and attain maturity at a rapid rate the disease incidence and consequent leaf fall are much less. But the trees growing in poor eroded soils and replanted areas where the soil fertility status is much low, the trees exhibit a much slower rate of growth of the leaves thereby exposing the leaves in a succeptible age for infection for comparatively longer periods. As a result the disease incidence and defoliation are much severe in those areas compared to these in fertile soils (Ramakrishnan and Pillai, 1962)

2.4 MINERAL DEFICIENCY

Pot culture experiments conducted in Malaysia showed zinc deficiency to be a pre-disposing factor to Oidium infection. However, results of leaf analysis of three Hevea clones differing widely in their susceptibility to Oidium infection, are contrary to the hypothesis that Oidium resistance is correlated to foliar zinc content (Constable 1956)

2.5 CLONAL SUSCEPTIBILITY

The intensity of infection is found to vary among the different clones and seedlings trees. But this clonal susceptibilty is influenced by the time of refoliation and environmental factors also. It has been observed that all the clones cultivated in India are susceptible to this disease though the degree of susceptibility varies with different clones. However, it has been observed that clones PB 86, Gl-1 and GT 1 are comparatively tolerant to the disease (Paardekooper 1955). In a field trial conducted at RRII it was observed that among the 9 clones tested PB 5/139 is highly susceptible and AVROS 255 is the least susceptible to the disease. Among the clones developed by the RRII it was observed that RRII 116 was the most susceptible and 114 the least (Pillai et al 1980)

2.6 DAMAGE CAUSED BY THE DISEASE

Repeated defoliation of the tender leaves weakens the trees and resutlt in the rapid depletion of stored reserve food. As the disease destroys large areas of the leaves, the photosynthetic efficiency of the mature leaves is reduced considerably. The food materials removed by the parasite also causes further drain of the assimilation products. The destruction of many branches by die back results in the rapid deterioration of the trees. Work carried out by Many workers had shown that defoliation after refoliation (carried out by hand plucking) produced considerable reduction in yield. The result of artificial defoliation carried out in RRII by clipping off leaves, indicated that 25 per cent defoliation caused no reduction in yield, whereas 50, 75 and 100 per cent defoliation caused reduction

in the yield to the tune of 23, 31 and 42 per cent respectively over the control. Murray (. ·) obtained an increase of 16 per cent in in the dusted plots in an affected area in the first year and 75 per cent in the next season over the untreated control. The extent of loss depends upon the intensity of infection. Results of experiments conducted at the RR1 of India indicated a 58 per cent increase in fruit setting in the treated plot over the untreated in a clone like Gl. 1 (Ramakrishnan & Pillai 1962).

2.7 CONTROL MEASURES

The most economical means of disease control is by the cultivation of clones which are resistant or tolerant to the disease whereby we can save the annual recurring expenses. However all the high yielding clones now under cultivation are susceptible to the disease. Another method of control of the disease is by using fungicides. Sulphur fungicides are the most effective in controlling powdery mildew disease. Dusting with sulphur is the universally adopted method for controlling Oidium. Pure powdered sulphur has been successfully used in India, Malaysia and Sri Lanka. Depending on the intensity of the disease three to six rounds of dusting may be required at an interval of 4 to 10 days to control the disease effectively.

Treatment against fungus improved girth increment and the rate of bark renewal. Girth, bark renewal and yield were increased and weeds were suppressed in the case of trees which has been treated with fungicides for two years (Wastie & Mainstone 1969).

Trials conducted at the RRII have shown that systemic fungicide Bavistin at 0.2 per cent as a water spray is effective to control powdery mildew disease in the nursery and in young plants (Thomson et al 1984).

MATERIALS AND METHODS

CHAPTER III

MATERIALS AND METHODS

The survey was conducted in 12 villages of three taluks in Kottayam and Idukki districts as noted in Table No. I and a total of 105 Numbers of units were surveyed by contacting 105 growers. The total extent surveyed is 276.88 hectares. The altitudes of different regions were measured with the help of altimeter. The altitude at which the units spread ranged from 0 - 600 meters from mean seal level. The details about the disease were collected from farmers from the different zones based on a proforma (Annexures 1). The name and address of the units surveyed is shown in Annexure (No. II). Details like the clones grown, age of trees, spacing adopted, details of cover crops grown, control measures adopted were some of the major observations recorded during the survey. These were collected by asking questions to the growers and also after discussions and clarifications. Necessary corrections or additions were carried out after verifying the permit/registration files kept in the respective Regional offices of the Rubber Board. Out of the 105 units one unit had an area of 202.35 ha. (in Edakkunnam village of Kanjirappally Taluk). The remaining 104 units were small holdings scattered in twelve villages. The intensity of the disease was graded into Mild, (infection from 0-25%) Medium (26-50%) and severe (above 50%) based on the area of the leaves infected by visual observations.

TABLE No. I

DETAILS OF UNITS SURVEYED

Sl. No.	Name of District	Sl. No.	Name of Taluk	Sl. No.	Name of villages	No. of Units
I.	Kottayam	1.	Kanjirappally	1.	Erumely	16
	,,		,,	2.	Chirakadavu	1
	,,		,,	3.	Kanjirappally	2
	,,		,,	4.	Mundakayam	1
	,,		,,	5.	Edakkunnam	1
II	,,	2.	Meenachil	6.	Kidangoor	20
	,,		,,	7.	Kadanad	10
	,,		,,	8.	Poonjar Middle	12
	,,		,,	9.	Poonjar South	14
II.	Idukki	3.	Peermade	10.	Peruvanthanam	23
	,,		,,	11.	Peermade	2
	,,		,,	12.	Vagamon	3
2		3		12		105

RESULTS AND DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSION

The results obtained from the survey is furnished in this chapter.

4.1 THE DISEASE INCIDENCE

The intensity of powdery mildew disease in the surveyed plantation in relation to altitudes is presented in Table 1. The incidence of the disease is severe in higher elevations compared to lower elevation. At elevation above 400 meters severe infection of plants were observed. Similar observations are reported by Ramakrishnan and Pillai (1962). The prevealance of cool climate for longer periods at these elevations predispose the trees to infection.

Clonal variation for the powdery mildew recorded (Table III). It is observed that RRIM 600, and GTI are tolerant to the disease. GT1 is reported to be tolerant to the disease (Pillai *et al* 1980). The disease incidence was low in RRIM 600. This may be because RRIM 600 escapes the disease due to their early wintering character. (Thomson *et al* 1984). RRII 105 ranks third after RRIM 600 and GT 1. It was also noticed that there was severe infection by disease to the clones PB 235 and PB 311.

The details of incidence of powdery mildew disease in young plantations is given in Table 4. It is noticed that the intensity of infection was more in plantation of age group between 5-10 rather than in plantation of age 0-5. The severity of the disease is found to increase with the age of trees upto 10 years. This may be due to the large canopy size of plants of higher age group which provide cooler microclimate.

TABLE No. II

EFFECT OF ALTITUDE ON THE INCIDENCE OF POWDERY MILDEW DISEASE

Elevation	Area (Ha)	Severity	No. of Units	Percentage of total area
0-50	10.29	Mild	20	3.71
50-100	10.92	Mild	15	3.94
100-200	216.57	Mild	15	78.21
200-400	12.86	Medium	15	4.28
300-400	12.46	Medium	15	4.50
400-500	6.73	Severe	15	2.43
500-600	8.05	Severe	10	2.90
Total	276.88		105	100.00

Table III

CLONE-WISE INTENSITY OF POWDERY MILDEW DISEASE INCIDENCE

Clone	Mild		Medium		Severe		Total Units	Total Area in ha.
	No. of Units	Area in ha.	No.of Units	Area in ha.	No.of Units	Area in ha.		
RRII 105	27	12.90	20	13.20	22	9.97	69	36.07
RRIM 600	7	6.43	3	1.96			10	8.39
GT 1	4	3.52	--	--	--	--	4	3.52
PB 235	--	--	2	0.84	9	7.28	11	8.12
PB 311	--	--	1	0.62	3	3.54	4	4.16
Total	38	22.85	26	16.62	34	20.79	98	60.26 (H)

Total units	98
Total ext.	60.26
Mixed planting	216.62
Grand total	276.88

TABLE IV

AGE GROUP OF RUBBER TREES AND DISEASE INCIDENCE

Age	Mild		Medium		Severe		Total Units	Total Area in ha.
	No. of Units	Area in ha.	No. of Units	Area in ha.	No. of Units	Area in ha.		
0-5	10	2.97	9	5.28	2	1.39	21	9.64
5-10	10	4.31	17	10.85	25	13.89	52	29.05

Under severe conditions of disease, die back of twigs are noticed and thereby the whole plants are distroyed. It is noticed that in high elevated areas where plants did not attain tappable girth even in the 10th year of planting as a result of powdery mildew infection. It is evident that the growth of the plants are arrested due to the infection of the disease.

The influence of spacing on severity of powdery midew is indicated in Table V. The severity of the disease is more in areas where contour system of planting (20 x 10') is adopted. Out of 232.70 ha. under square planting only 1.88 ha. had severe infection of powdery mildew. While in Contour planting out of 44.18 ha. 12.90 ha. had severe infection. In Contour planting the stand per hectare is more which in turn aids earlier closing of the canopy and thereby humid condition exist which favour faster multiplication of the casual organisms intensifies the disease infection.

The data in Table VI clearly indicated that in 96.90 per cent of the area surveyed the disease occur during December to March. While only in 3.10 per cent of area it was prevalent throughout the year. The period of occurrence was found to be related to the elevation of the area. The disease was observed from December to March in low elevated areas, whereas the disease was observed throughout the year in high elevated areas (Pillai et al 1980).

Information about the weed control measures adopted in protected and unprotected areas is presented in Table VII. It is clear that in unprotected areas where incidence of disease is more the weed growth is more whereas in protected areas the weeds are suppressed. Out of

TABLE V

THE EFFECT OF SPACING ON THE INTENSITY OF POWDERY MILDEW DISEASE

Severityof disease	SPACING		Total area
	15'x15'	20'10'	
Mild	228.61 ha	9.07 ha	237.68 ha
Medium	2.21 ,,	22.21 ,,	24.42 ,,
Severe	1.88 ,,	12.90 ,,	14.78 ,,
Total	232.70 ,,	44.18 ,,	276.88 ,,

TABLE VI

PERIOD OF OCCURRANCE OF POWDERY MILDEW DISEASE

Period	No. of Units	Area (In Hect.)	Percentage of total area
December-March	94	268.29	96.90
Throughout the year	11	8.59	3.10
Total	105	276.88	100.00

TABLE VII

EFFFECT OF POWDERY MILDEW ON THE WEED CONTROL OPERATIONS

Additional Weeding	Unprotected			Protected		
	No. of Units	Area (Hect)	Percent-age	No. of Units	Area (Hect)	Percen-tage
No weeding	76	56.21	80.08	4	205.63	99.49
One round	14	5.93	8.45	1	1.06	0.51
More than One round	10	8.05	11.47	--	--	--
Total	100	70.19	100.00	5	206.69	100.00

the 100 units surveyed 100 unprotected units required more than one round of additional weeding in protected gardens additional weeding was not necessary. This is because the disease incidence leads to loss of canopy thereby permitting penetration of light which favour the weed growth. In protected areas there is considerable reduction in the cost of cultivation as additional weeding was not required. These observations are in agreement with the findings of wastie and mainstone (1969). The result of the survey indicated in table VIII shos that there is a crop loss upto 10 per cent in 26 out of 105 units. While 10 to 15 per cent crop loss was noticed in 32 units. Only eight units had a cros loss more than 25 per cent. In estates here prophylatic measures are adopted, crop loss leading heavy loss was not noticed. The expenditure incurred for undertaking plant protection measures against the incidence of the disease in this plantation was meagre compared to the loss in the yield.

Details of plant protection measures adopted is furnished in Table IX. This indicated that out of 105 units surveyed prophylatic measures are adopted only in 5 units covering an area of 205.60 hectares. Howwever out of 205.50 ha. 202.85 ha. is owwned by a single owner. It is evident that 95 per cent of the small growers are not adopting plant protection measures against the disease while large groers are aware of the losses caused by the disease, as well as the economic aspects of undertaking plant protection measures.

Information about the refoliation of rubber trees after powdery mildew disease incidence is given in Table 10. It is observed that 75

TABLE VIII

CROP LOSS DUE TO INCIDENCE OF POWDERY MILDEW

Extent of crop loss	No. of unit	area (ha)	Percentage
Upto 10 per cent	26	132.36	47.80
10 to 25 "	32	17.27	6.23
More than 25 per cent	8	2.62	0.95
Immature	39	124.63	45.01
	105	276.88	100.00

TABLE IX

ADOPTION OF CONTROL MEASURES AGAINST POWDERY MILDEW

Control measures	No. of units	Area	Percentage
Adopted	5	205.60	74.25
Not adopted	100	71.28	25.74
Total	105	276.88	100.00

TABLE X

REFOLIATION OF RUBBER TREES AFTER POWDERY MILDEW DIESEASE INCIDENCE

Refoliation (Percentage)	No. of units	area (ha)	Percentage
Less than 50	20	12.42	4.48
50-75	38	25.05	9.05
75-100	46	239.41	86.47
Total	105	276.88	100.00

to 100 per cent refoliation was found in areas where plant protection measures were adopted, while 50 to 75 per cent refoliation was noticed in areas where the incidence of the disease was mild. Less than 50 per cent refoliation was found in estates which was located in high elevated areas with no preventive treatment against the disease.

The constraints for adoption of plant protection measures were identified and presented in Table XI. It is noticed that the plant protection measures were not adopted in 67 per cent of the total area surveyed mainly due to the low intensity of the disease in the traditional area of rubber cultivation. In 17 per cent of the total area surveyed, plant protection measures were not adopted due to lack of facilities such as availabiltity of fungicides and plant protection equipments. Another factor which revealed by the survey is about the ignorance of the farmer about the disease and the control measures. A small percentage of farmers did not undertake plant protection measures out of negligence even though they were well worsed with the plant protection.

TABLE XI

CONSTRAINTS IN CONTROLLING THE POWDERY MILDEW DISEASE

Constraints observed	No. of Units	Area (Hect)	Percentage of unprotected Area
Uneconomic (low disease)	65	47.76	67.00
Lack of facilities	12	12.11	16.99
Ignorance of farmer	19	7.33	10.28
Negligence of farmer	4	4.08	5.72
Total	100	71.28	100.00

SUMMARY AND CONCLUSION

CHAPTER V

SUMMARY AND CONCLUSION

The incidence of powdery mildew disease is common in Kottayam and Idukki Districts. The severity of the disease is more in high elevation plantations located in Meenachil and Peermedu Taluks. The clones RRIM 600 and GT-1 are tolerant to the disease due to their early wintering ..nature. While the clone RRII 105 exhibitedmild to medium infection, the clonse PB 235, PB 311 were highly susceptible to the disease even though they were planted in the lower elevation. The disease infestation was found to be severe in plants under the age group 5 to 10 years. The spacing adopted also affects the intensity of the disease, closer the spacing ... more is the incidence. Period of occurrence of the disease was generally from December to March, while the disease occur throughout the year in high elevated areas. Additional weeding was required in certain es tates where the disease caused repeated defoliation. A crop loss of 10 to 25 per cent was noticed in severally infected plantation causing considerable loss. Plant protection measures are adopted by large growers. On the other hand 95 per cent of the small growers are not adopting plant protection measures against the disease for various reasons such as lack of facilities, ignorance, negligence and economic aspects.

Since the growth, and yield of rubber trees located at elevations above 400 meters MSL is found to be badly affected due to the incidence of powdery mildew disease. Hence it is advisable to discourage planting of rubber in such high elevation areas, where other economic crops

like pepper or cardamom can be successfully cultivated.

As it is found that a considerable section of small growers are ignorant about the powdery mildew disease and about the precautional measures, the Rubber Board's extension wing may be advised to be more vigilant in educating such growers about the incidence of this disease and its control measures.

A group of small growers are not undertaking prophylatic measures since the difficulty in procuring the fungicides and plant protection equipments in time. The Board's assistance, including financial aid to extended to these farmers in areas where the incidence of the disease is serious as is done for the prevention of abnormal leaf fall disease.

At present majority of the small growers favour planting monoclones in their field without knowing the hazards that may happen due to the incidence of some epidemic diseases. To regulate such maladies wide propaganda should be given to plant mixed clones as is done by some of the large growers.

As close planting leads to high disease incidence this practice should be discouraged.

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CHAPTER VI

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ANNEXURE I

RUBBER RESEARCH INSTITUTE OF INDIA

KOTTAYAM - 9

INVESTIGATION ON THE CLONAL SUSCEPTIBILITY OF POWDERY MILDEW DISEASE IN RUBBER PLANTATIONS IN MEENACHIL AND KANJIRAPPILLY TALUKS OF KOTTAYAM DISTRICT

PROFORMA

1. Location
   - District :
   - Taluk :
   - Village :
   - Altitude :
2. Name and address of the owner :
3. Reg. No. :
4. Extent :
5. Year of planting :
6. Clones planted :
7. Spacing :
8. No. of trees ;
9. Tapping system :
10. Details of inter planting/inter Crops :
11. Whether leguminous cover crops established :
12. Plant protection measures adopted
    a) Dusting with power duster :
    b) Spraying with weltable sulpher with rocker sprayer :
    c) Type of fungicide used :
13. Reason for n ot doing plant protection measures :
14. Cultural and manurial practice :
    a) Additional weeding required during leaf fall.
15. Disease incidence
    a) Time of starting the disease :

b) Time of end of the disease :

16. Whether conditions during the disease :

17. Severity of the disease : Severe,'Medium/Mild

18. Recovery from the disease (percentage of refoliation)

19. Yield/Hect.
Whether there is any crop loss :

20. Remarks :

Place :

Date :

Name and signature of the Investigating officer

ANNEXURE II

LIST OF HOLDINGS SURVEYED FOR THE STUDY

Sl. No.	Reg. No./permit No. of the holding	Name and address	District	Taluk	Village
(1)	(2)	(3)	(4)	(5)	(6)
1.	ML.36459	Lizzy Zacharias Cheruthodukayil Kadaplamattam	Kottayam	Meenachil	Kidangoor
2.	ML.36460	Joseph Zacharias Cheruthodukayil Kadaplamattam	,,	,,	,,
3.	ML.18932	Cheriyathu Joseph Cheruthodukayil Kadaplamattam	,,	,,	,,
4.	PD/PL/815-88 ,, 294-84	Suresh, Pattani Kadaplamattam	,,	,,	,,
5.	PD/PL/1424-86	Scaria Joseph Puzhayamkandathil Kadaplamattam	,,	,,	,,
6.	ML 36383	Thresiamma Zacharia Kuttiplamthanath Kadaplamattam	,,	,,	,,
7.	ML 35324	Cheriyathu Ouseph Kuttiplamthanathu Kadaplamattam	,,	,,	,,
8.	ML-36218	Raincy Joseph Kizhakekuruvachira Kadaplamattam	,,	,,	,,
9.	PD/PL 1570-88	Mary Lukose Kizhakkekuruvalichira Kadaplamattam	,,	,,	,,
10.	ML 20190	T.A. Narayanan Thadathil Kadaplamattam	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
11.	PD/PL 1471-88	K.L. George Koovalloor Kadaplamattam	Kottayam	Meenachil	Kidangoor
12.	PD/PL-1568-88	K.L. Joseph Koovalloor Kadaplamattam	,,	,,	,,
13.	NP/PL 659-79	K.L. Joseph Koovalloor Kadaplamattam	,,	,,	,,
14.	PD/PL 75-80	Anandan Pappy Thadathil Kadaplamattam	,,	,,	,,
15.	ML 35988	Ouseph Mariam Kuttiplamthanath Kadaplamattam	,,	,,	,,
16.	ML 22416	Alice Augustine Kizhakkekuruvechira Kadaplamattam	,,	,,	,,
17.	ML-22460	Itty Raghavan Kavanakudiyil Kadaplamattam	,,	,,	,,
18.	ML-15267	Varkey Ouseph Paikattu Kadaplamattam	,,	,,	,,
19.	NK-22462	Janaky Raghavan Kollapalliyil Kadaplamattam	,,	,,	,,
20.	ML 16255	K.P. Antony Karikal Kadaplamattam	,,	,,	,,
21.	KPLY-13127	T.P. Joseph Thadathil Thampalakadu	,,	Kanjirappally	Kanjirappally
22.	KPLY 17956	Thomas Sebastian Thekkumthottam Thampalakadu	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
23.	PLY 21751	Devasia Devasia Mannakuzhiyil Mukkuttuthara	Kottayam	Kanjirappally	Erumely
24.	Unregistered	Surednran Thekumkalatharayil Mukkoottuthara	,,	,,	,,
25.	KPLY 21704	Kurian Joseph Karamullil Erumely	,,	,,	,,
26.	Unregistered	P.N. Gopaladas Punnamattathil Mukkuttuthara	,,	,,	,,
27.	PD/PL 380-89	Joseph Anna Plathottathil Poonjar South	,,	Meenachil	Poonjar.S
28.	ML-34919	Kurian Mathai Mandapathil Poonjar	,,	,,	,,
29.	PD/PL 84-89	Scaria Joseph Thuruthiyil Poonjar	,,	,,	,,
30.	PD/PL 29-89	K.O. Joseph Kochuveettil Poonjar	,,	,,	,,
31.	,, 383-89	Thresiamma Joseph Plathottathil Poonjar	,,	,,	,,
32.	,, 77-89	Satheesh Babu Pazhoor Poonjar	,,	,,	,,
33.	,, 346-89	Varkey George Thuruthiyil Pathampuzha	,,	,,	,,
34.	,, 85-89	Kurian Joseph Kunnel Poonjar	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
35.	PD/PL 207-89	P.C. Chandy Perumpallikunnel Poonjar	Kottayam	Meenachil	Poonjar S.
36.	KPLY 1333	P. Murali Mohan Olickal Ponkunnam	,,	Kanjirappally	Chirakadavu
37.	,, 7535	The Trepical Plantations (P) Ltd. PB No. 4 Kottayam	,,	,,	Edakunnam
38.	ML 15983	Mathai Mangalathil Neeloor.P.O.	,,	Meenachil	Kadanad
39.	RR 872/81	George Mathew Thanniparampil Propor.P.O	,,	Kanjirappally	Erumely
40.	,, 873-81	T.C. Mathew Thanniparampil Erumely.P.O.	,,	,,	,,
41.	KPLY 3616	Mathew Jacob Murickal Mukkuttuthara	,,	,,	,,
42.	RP 874-81	Jacob Mathew Thanniparayil Erumely	,,	,,	,,
43.	RP 875-81	Annamma Mathew Thanniparamyal Erumely	,,	,,	,,
44.	RP 873-83	Saramma George Kandathil Kanakapallam	,,	,,	,,
45.	KPLY 2281	A.T. Varkey Arackal Erumely.P.O	,,	,,	,,
46.	,, 2154	Jessy Chandy Molaparampil Erumely	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
47.	RP 889-84	Valsamma Abraham Ambattu Erumely	Kottayam	Kanjirappally	Erumely
48.	RP 805-84	Chacko Joseph Njallimackal Erumely	,,	,,	,,
49.	KPLY 3380	Devasia Joseph Manjackal Kanakapalam	,,	,,	,,
50.	RP 981-83	Bhaskaran Eravi Block No. 56 Erumely	,,	,,	,,
51.	ML 6412	Narayanan Marutholil Neeloor	,,	Meenachil	Kadanad
52.	ML 30742	Kumaran Janaky Urumpil Neloor	,,	,,	,,
53.	ML 11023	Mariam Ouseph Edattukunnel Neeloor	,,	,,	,,
54.	ML 18972	V.K. Joseph Vellaringattu Neeloor	,,	,,	,,
55.	ML 21080	Ouseph Joseph Pulickal Neeloor	,,	,,	,,
56.	PD/PL 1430-84	Michel Michel Pulickal Neeloor	,,	,,	,,
57.	,, 834-84	Raman Nair Thalapayil Neeloor	,,	,,	,,
58.	,, 830-84	T.S. Rajenndran Thalapayil Neeloor	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
59.	ML 33509	K.G. Gopalakrishnan Kulangara Mattathipara	Kottayam	Meenachil	Kadanad
60.	PD/PLR 828-86	Sibikutty Francis Thonikkuzhiyil Velathusseri	,,	,,	Poonjar Middle
61.	PD/PL 210-86	Sabu Mathew Panakuzhiyil Velathusseri	,,	,,	,,
62.	,, 199-86	Varkey Varkey Madathil Vellikulam	,,	,,	,,
63.	ML 26060	K.C. George Kizhakkethottam Velathussery	,,	,,	,,
64.	ML 4833	Luciamma Sebastian Myladoor Vellikulam	,,	,,	,,
65.	PD/PL 318-88	Marykutty Joseph Naduthottyil Vellikulam	,,	,,	,,
66.	KPLY 5736	Mariam Varkey Alackalparambil Velanilam Koottickal	,,	Kanjirappally	Mudakkayam
67	PEER 2757	T.K. Mathan Thaiparampil Peruvanthanam	Idukki	Peermade	Peruvanthanam
68.	PD/KY 218-83	Antony Thomas Vettikattu Cheruvallikulam	,,	,,	,,
69.	,, 233-83	Ouseph Thomas Arackal Parambil Cheruvallikulam	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
70.	PD/KY 800-87	Ouseph Mathew Pullolil Vellikulam	Kottayam	Meenachil	Poonjar Middle
71.	PD/PL 566-87	Joy Scaria Ambazhathungal Vellikulam	,,	,,	,,
72.	,, 1051-86	Devasia Ouseph Kunnel Vellikulam	,,	,,	,,
73.	ML 34021	Mathai Thomas Kaniyamkunnel Velath ussery	,,	,,	,,
73.	ML 34021	Mathai Thomas Kaniyamkunnel Velathussery	,,	,,	,,
74.	PD/PL 405-88	Ouseph Mathai Thayyil Velathussery	,,	,,	,,
75.	,, 484-88	Joseph Kochuparambil Vellikulam	,,	,,	,,
76.	ML 9186	Joseph Mathew Theempalangattu Kaipally	,,,	,,	Poonjar S
77.	,, 9198	Pothen Ulahannan Varikianikal Kaipally	,,	,,	,,
78.	PD/PL 1564-85	The Trustee St. Antony's Church Kaipally	,,	,,	,,
79.	,, 253-86	Joseph Joseph Vayalikunnel Kaipally	,,	,,	,,
80.	,, 19/86	P.C. Mathew Plathottathil Meempara	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
81.	PD/KY 72-82	Thresiamma Marutholil Kanayankavayal	Idukki	Peermade	Peruvanthanam
82.	,, 461/82	Devasia Joseph Kaithakal Kanayankavayal	,,	,,	,,
83.	,, 496/87	P.H. Mohammed Ismail Puthuparampil Thekemala	,,	,,	,,
84.	,, 259-85	Annamma Joseph Thumkuzhiyil Peloorkavu	,,	,,	,,
85.	Peer 3331	Varkey Augusthy Vellithumkal Paloorkavu	,,	,,	,,
86.	PD/KY 1144-85	Kurian Kurian Vettathu Paloorkavu	,,	,,	,,
87.	,, 1013-82	Chinnamma Mappilakavil Paloorkavu	,,	,,	,,
88.	,, 1186-85	K.A. Joseph Kallammackal Paloorkavu	,,	,,	,,
89.	,, 1195-84	M.K. Joseph Mappalakayl Paloorkavu	,,	,,	,,
90.	,, 842-82	Devasia Chacko Padannamackal Kanayamkavayal	,,	,,	,,
91.	Peer 2872	Kelan Madhavan Kottayil Peruvanthanam	,,	,,	,,
92.	,, 2260	Rosamma Thomas Vayalil Purakayam	,,	,,	,,

(1)	(2)	(3)	(4)	(5)	(6)
93.	PD/KY 703-81	Narayanan Kesavan, Panamoottil Muriyapuzha	Idukki	Peermade	Peruvam thanam
94.	Peer 2185	Mathai Mathew Madathinakath Kanayankavayal	,,	,,	,,
95.	,, 1846	P.S. Aravindakshan Nair NO. XIV/274 Koorkanchery Trichur	,,	,,	,,
96.	PD/KY 279/83	Kurian K. Kuruvinakunnel Edamuttom	,,	,,	,,
97.	,, 1086/93	Trustee St. George's Church Murinjapuzha	,,	,,	,,
98.	,, 191-84	Mathew K Kuruvinakunnel Edamattam	,,	,,	,,
99.	,, 192-84	Jose K. Kuruvinakunnel Edamattam	,,	,,	,,
100.	,, 681-85	Jose K. Kuruvinakunnel Edamattam	,,	,,	,,
101.	PD/KY 225/82	Chacko Kurian Thazhthumkal Vandiperiyar	Idukki	Peermade	Peermade
102	,, 951-82	Mathew Kurian Velikakathu Karitharuvi	,,	,,	,,
103	,, 947-82	Ouseph Devasia Manarvelil Pasupara	Idukki	Peermade	Vagamon

(1)	(2)	(3)	(4)	(5)	(6)
104	PD/KY 423-82	Chacko Chacko Palliveettil Kochukarutharuvi	,,	,,	,,
105	,, 384-82	Mathai Paulose Moozhikulam Cheenthalar	,,	,,	,,