

EVALUATION OF THE INCIDENCE OF PINK DISEASE IN RUBBER
PLANTATIONS IN KANJIRAPPALLY TALUK,
KERALA STATE

By
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DISSERTATION

Submitted in partial fulfilment of the requirements for
the Post Graduate Diploma Course in Natural Rubber
Production

DEPARTMENT OF PLANTATION CROPS AND SPICES
College of Horticulture

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DECLARATION

I hereby declare that the dissertation entitled "Evaluation of the incidence of pink disease in Rubber Plantations in Kanjirappally Taluk Kerala State" is a bonafide record of research work done by me and that the dissertation has not previously formed the basis for the award to me of any degree or diploma or other similar title of any other University or Society.

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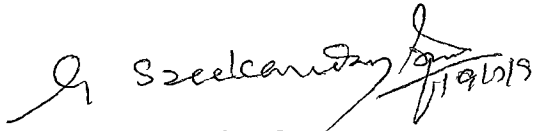
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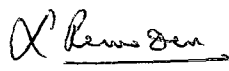
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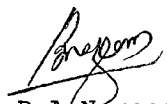
Certified that this dissertation entitled "Evaluation of the incidence of pink disease in Rubber Plantations in Kanjirappally Taluk, Kerala State" is a record of research work done independently by **Sri.P.M.Jain** under our guidance and supervision and that it has not previously formed the basis for the award of any degree or diploma to him.

We the undersigned members of the Advisory Committee of **Sri.P.M.Jain**, a candidate for the Post Graduate Diploma in Natural Rubber Production, agree that the dissertation entitled "Evaluation of the incidence of pink disease in Rubber Plantations in Kanjirappally Taluk Kerala State" may be submitted by **Sri.P.M.Jain** in partial fulfilment of the requirement of the diploma.


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INTRODUCTION

Rubber Plantation Industry in India has undergone tremendous improvement in the last couple of decades. Area under rubber plantations has increased from 1.5 lakh hectares during 1957-58 to 4.48 lakh hectares in 1989-90 and production increased from 24.3 thousand tonnes to 297 thousand tonnes.

Obviously many factors are responsible for the remarkable growth of natural rubber industry in India. One of the most important factors in the modernisation of rubber plantation industry is planting of high yielding clones like RR11-105, RR1M 600 & GT. Out of these RR11-105 has occupied about 90% of the total replanted and newly planted area.

Pink disease is one of the major stem diseases of rubber plant especially during immature period leading to drying up, breakage of trunks and stunted growth.

As this disease is one of the most serious diseases, attempts to develop new methods for its control are always welcome. Recovery from the disease depends mainly on the ability of the grower to detect the disease at early stages and proper application of fungicides at initial stages of disease development.

Kanjirappally Taluk of Kerala State is a traditional area for rubber, having both high and low elevation plantations and hence selected for this study.

Results of this survey can be beneficially used to evaluate the comparative tolerance of the different clones to formulate more effective control measures and to identify appropriate time for adoption of control measures.

REVIEW OF LITERATURE

Pink disease is caused by the fungus Corticium Salmonicolar (Berk & Br). The earliest record of pink disease was on coffee from Sri Lanka in 1870. On rubber it was first reported from Java in 1901 and from India in 1908 (Pillai and George, 1980). It is noticed on rubber plants of all ages, but infection is more damaging on two to twelve year old plants. No clone is reported to be free from infection.

Nature of infection

Incidence of disease is noticed during south west monsoon periods and infection will be widespread during June to September. In young plants infection is noticed on main stem at different heights in the region of brown bark. In older trees infection is mainly on the forking region and branches. Pink disease is sometimes noticed even at the base of young plants and on the tapping panel of mature trees.

During initial stages of infection superficial cobweb like mycelia are noticed on the bark surface. Mycelium is hyaline and the mycelial growth may extent

to a distance of 30-90 cm both upward and downward from the point of infection. Because of the ramification of pathogen inside the bark and wood regions, extensive damage is caused to the internal tissues. By this time, exudation of latex is observed from the infected site. At this stage due to extensive damage to the bark and internal tissues, the upward and downward translocation of water and food materials in the plant system is checked, resulting in initial yellowish discolouration of foliage and final drying up of the distal portion of the affected region. A number of sprouts arising from portions just below the infected region is yet another important symptom of this disease.

In advanced stages of infection, small pink coloured cushion like structures called 'pustules' are seen. These pustules consist of irregularly polygonal pseudo parenchymatous cells which develop in the unicellular hyaline spores called 'necater spores'. Another characteristic development in highly advanced stage is the formation of crusts on the lower surface of the affected branches.

When young plants are infected on the main stem or on the forking region and if left untreated, the portion above the point of infection or the entire canopy may dried up and get reduced to mere stump. Hence incidence of pink disease in young plants results in

considerable reduction in stand per hectare and stunted growth of surviving plants (Ramakrishnan and Pillai, 1962).

Control measures

Spraying Bordeaux mixture on main stem, forking region, main branches etc. was recommended to control this disease in the first decades of this century in all rubber growing countries. Now application of 10% Bordeaux paste is recommended. In advanced stages of infection Bordeaux paste may be applied on affected region. When it dries up, the bark surface may be scrapped to remove all infected and decayed bark and the fungicide applied again up to 30 cm above and below the affected region. Calixin 20% mixed with ammoniated rubber latex is also recommended (Edathil and Jacob, 1983). Application of 0.2% Thiride incorporated with petroleum compound like mahathotex was also found effective (Edathil and Radhakrishna Pillai, 1970). A new fungicide carrier pidivyl china clay compound was recommended with calixin 1% or propiconazole (Jacob and Edathil, 1986).

MATERIALS AND METHODS

The survey was conducted from the Kanjirappally Taluk. A questionnaire had been designed in consultation with Pathology Division of Rubber Research Institute of India, Kottayam. Special care was taken to incorporate all necessary details. A sample of the proforma is given in Annexure I.

The major clones taken for survey were RR11-105, PB - 235, PB - 311, RR1M - 600, and RR1M - 623. Fifty representative units in this Taluk were visited and all available informations were collected from the records maintained by the growers and from visual observations. Personal interviews were made with the growers to seek clarifications wherever necessary. The units were re-visited to collect additional informations, when required. Plantations of one to two year old were deleted in the survey as the infection noted was very low at this stage. Collected informations were tabulated for evaluation and analysis of data. Average rate of infection in five clones were assessed and percentage of incidence of disease at different age group were also studied. Various control measures adopted by growers and methods of application of control measures were also

recorded. Adoption of prophylactic treatment and frequency of treatments were evaluated. External factors affecting the disease intensity such as proximity to infected plantations of susceptible clones and nature of canopy etc. were also evaluated. Detection of disease at an early stage is an important factor in controlling disease and hence a thorough study was made about the ability of the growers to detect the disease at initial stages of development and correctness of the methods of application of fungicides and rate of recovery after treatment. Impact of disposal of infected plant parts on disease was also estimated.

RESULTS AND DISCUSSION

Out of the five clones surveyed, RR11-105 shows high incidence of disease the rate of incidence ranging from 2 to 15.6% in individual units, the average percentage being 6.17. Eventhough incidence of disease is high in RR11-105, the intensity of incidence is rather low.

Table 1. Clonewise details of pink disease and total number of trees (50 Units)

Sl.No. of Unit	Name of clone	No. of trees observed	No. of affected trees	Percentage of infection
1	2	3	4	5
1	RR.11-105	675	24	3.58
2	"	198	31	15.60
3	"	280	23	8.20
4	"	105	13	12.30
5	"	82	04	4.80
6	"	350	24	6.80
7	"	50	04	8.00
8	"	260	15	5.70
9	"	250	7	2.80
10	"	250	8	3.20
11	"	220	22	10.00
12	"	108	7	6.40
13	"	50	5	10.00
14	"	120	13	10.80
15	"	220	11	5.00
16	"	170	6	3.50
17	"	300	24	8.00
18	"	300	16	5.30
19	"	215	25	11.60
20	"	85	10	11.76
21	"	220	14	6.36
22	"	250	21	8.40
23	"	270	18	6.66
24	"	215	16	7.44
25	"	200	4	2.00

(Contd.)

Table 1 (Contd.)

1	2	3	4	5
26	RR.11-105	110	07	6.36
27	"	110	6	5.45
28	"	40	5	12.50
29	"	330	15	4.54
30	"	250	17	6.80
31	"	110	7	6.36
32	"	450	10	2.22
33	"	120	10	8.33
34	"	310	16	5.16
35	"	420	11	2.62
36	"	180	12	6.60
37	"	210	18	8.57
Total		8083	499	
Mean		218.46	13.49	6.17
1	PB. 235	190	7	3.68
2	"	120	2	1.66
3	"	100	4	4.00
4	"	58	2	3.44
5	"	250	5	2.00
Total		718	20	
Mean		143.6	4.0	2.78

(Contd.)

Table 1 (Contd.)

1	2	3	4	5
1	PB-311	525	16	3.0
2	"	200	6	3.0
3	"	100	2	2.0
4	"	490	29	5.9
5	"	705	8	1.13
6	"	812	7	3.30
Total		2232	68	
Mean		372.0	11.33	3.04
1	RR 1 M 600	250	9	3.60
2	RR 1 M 623	200	6	3.00

Table 2. Clonewise range of infection and average percentage in five clones

Clone	Range of infection %			Average %
RR 11 105	2	to	15.6	6.17
PB 235	2	to	4	2.78
PB 311	1.13	to	5.9	3.04
RR1M 600	-		9.0	3.60
RR1M 623	-		6.0	3.0

The severity of disease was more in RR1M 600 i.e. 55.55% and low in RR11 105, i.e. 29.46%. Among the five clones evaluated RR11 105 is seen highly susceptible to pink disease and PB 235 is less susceptible in the area surveyed (Table 3).

On agewise study less incidence is noticed in 4th year, i.e. 2.23% and maximum incidence is in 7th year i.e. 6.6%. But in individual units maximum incidence of 15.1% is observed in the 6th year (Table 4).

Table 3. Nature of infection of pink disease in different clones

Sl. No.	Clone	Mild	Medi-um	Severe	Total infected plants	Total plants observed	Per-centage
1	RR 11 105 Percentage	181 36.28	171 34.20	147 29.46	499	8083	6.17
2	PB 311 Percentage	28 41	19 27.94	21 31.0	68	2232	3.04
3	PB 235 Percentage	7 35	6 30	7 35	20	718	2.78
4	RR1M 600 Percentage	2 22.22	2 22.22	5 55.55	9	250	3.60
5	RR1M 623 Percentage	2 33.33	2 33.33	2 33.33	6	200	3.0

During the 7th year maximum incidence in individual unit observed was 11.62%. Generally older trees show more incidence which may be due to the larger size of the canopy which provides more susceptible loci for infection by the pathogen.

Table 4 . Nature of infection of pink disease according to the age of trees in each surveyed plantations

Age	Mild	Medium	Severe	Total Inf. plants	Total plants observed	Percentage
(1)	(2)	(3)	(4)	(5)	(6)	(7)
4th year	2	4	0	6	110	5.45
	12	0	4	16	705	2.26
	2	5	1	8	525	1.15
Total	16	9	5	30	1340	2.23
5th year	1	2	5	8	250	3.20
	-	1	6	7	108	6.48
	3	2	5	10	85	11.76
	2	5	10	17	250	6.80
	3	2	2	7	110	7.00
Total	9	12	28	49	803	6.1
6th year	18	7	6	31	198	15.1
	5	5	5	15	260	5.76
	11	5	6	22	220	10.0
	3	1	2	6	170	3.5
	5	7	12	24	300	8.0
	8	6	0	14	220	6.3
	3	7	8	18	270	6.60
	3	1	0	4	200	2.00
	1	2	4	7	110	6.30
	1	9	5	15	330	4.50
	4	2	4	10	450	2.20
	1	7	8	16	310	5.16

(Contd.)

Table 4 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
6th year	6	3	3	12	180	8.66
	0	1	1	2	100	2.0
	9	12	8	29	490	5.9
	3	1	3	7	212	3.3
	2	2	5	9	250	3.6
Total	83	78	80	241	4270	5.64
7th year	1	4	0	5	50	10.0
	5	3	15	13	120	10.8
	4	1	6	11	220	5.0
	9	9	7	25	215	11.62
	6	12	3	21	250	8.40
	2	0	4	6	200	3.00
	0	2	2	4	100	4.00
	2	3	0	5	190	2.63
Total	29	34	27	90	1345	6.6
8th year	15	5	4	24	675	3.5
	15	5	4	24	350	6.8
	8	4	4	16	300	5.3
	6	5	5	16	215	7.40
	2	2	1	5	40	12.50
	4	2	4	10	120	8.30
	7	5	6	18	210	8.57
	5	0	2	7	250	2.80
	0	0	2	2	58	3.4
	0	1	1	2	120	6.66
	2	2	2	6	200	3.0
Total	64	31	35	130	2538	5.12

(Contd.)

Table 4 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
9th year	4	18	1	23	280	8.2
	3	10	0	13	105	12.3
	1	1	5	7	250	2.80
Total	8	29	6	43	635	6.07
10th year	5	5	1	11	420	2.60
12th year	2	2	0	4	82	4.80

In the fifty units surveyed, it is found that 80% of the growers are using Bordeaux paste against this disease while 12% ~~are using~~ Thiride and 8% ~~are using~~ ^{using} Fytolan (copper oxychloride) which is not included in the recommendation. Percentage ^{of} success is observed to be low in cases where Bordeaux paste and Fytolan were used during heavy rainy season. These fungicides are having low sticking property and are easily washed away by rain water in wet conditions when compared with Thiride. This may be the reason why they are less effective than Thiride when used during rainy season.

Only 67.5% of growers are noted to prepare Bordeaux paste in the correct method while 32.5% of growers are not aware of the recommended method of preparation. The low percentage of recovery after the application of this fungicide in many cases can be attributed to the faulty preparation of the fungicide.

Regarding the method of application of Bordeaux paste, only 42.5% of growers are properly applying the fungicide. Hence, the faulty method of application is also attributing for reduction in success in many cases. (Table - 5)

Prophylactic spraying of the branches and fork with Bordeaux mixture while the trees are sprayed for control of abnormal leaf fall disease is found to reduce incidence of pink disease. In the survey it was observed that only 42% of growers are spraying on the trunk and forking region with Bordeaux mixture during prophylactic spraying against abnormal leaf fall disease. Lack of prophylactic treatment also favours the incidence of disease in 58% of units surveyed. (Table - 7)

With regard to the frequency of inspection only 52% of growers are inspecting their plantation weekly while 30% of them

Table 5. Control measures adopted against pink disease in surveyed plantations (50 Units)

	Bordeaux paste	Thiride	Others Fytolan	Total
No. of units	40	6	4	50
Percentage	80	12		

Table 6. Method of preparation and application of Bordeaux^d paste in surveyed plantations (40 Units)

	Proper	Improper	Total
1. Method of preparation	27	13	40
Percentage	67.5	32.5	
2. Method of application	17	23	40
Percentage	42.5	57.5	

are inspecting fortnightly and remaining 18% are conducting only monthly inspection (Table-8) Early detection and treatment bring down the intensity of disease.

Out of ^{the} 50 units surveyed 46% of them are near to the infected mature plantations and hence the intensity of disease is also high. Rao (1971) observed that lesser the distance of a young plantation to mature infected area higher the intensity of disease. Basidiospores can travel 100 meters away from the source of inoculum (Rao, 1971).

Fifty eight percent of the units are having thin canopy 38% thick canopy and 4% heavy canopy. Nature of canopy is seen to be having not much effect on incidence of disease.

Recovery without removal of branches, was seen maximum in RR1M 623 and RR1M 600, ie, 66.67% and 55.83% respectively whereas recovery with branches removed, is seen maximum in PB 235 (35%) and minimum in RR1M 623 (16.66%) maximum crown damage is noticed in PB 311 (25%) followed by RR11-105 (22%) (Table - 11)

Only 36% of growers are able to detect the disease at initial stages (Table - 11). In 56% holding the growers were disposing the infected plant parts in a way which favour the spreading of disease (Table - 12). The failure of majority of growers in early detection of disease and poor field sanitation are two important reasons for the spread of disease.

Table 7. Evaluation of prophylactic spraying on trunk and forking region against pink disease

	Sprayed	Unsprayed	Total
No. of units	21	29	50
Percentage	42.0	58.0	

Table 8. Frequency of inspection of rubber trees for the detection of pink disease

	Weekly	Fortnightly	Monthly	Total Units
No. of units	26	15	9	50
Percentage	52.0	30.0	18.0	

Table 9 Proximity of surveyed holdings to another infected plantations

	Present	Not present	Total
No. of units	25	27	50
Percentage	46.0	54.0	

Table 10. Nature of canopy in different surveyed clones

Name of clone	Nature of canopy			Total Units
	Thin	Thick	Heavy	
RR11-105	21	14	2	37
Percentage	56.0	37.8	54.0	
PB 311	3	3	0	6
Percentage	50.0	50.0	-	
PB 235	3	2	-	5
Percentage	60.0	40.0		
RR1M 623	1	-	-	-
BR1M 600	1	-	-	1
No. of Units	29	19	2	50
Percentage	58.0	38.0	4.0	

Table 11 Recovery of rubber trees from pink disease

Sl. No.	Clone	No. of units showing recovery			Total No. of infected and recovered	Total No. of plats observed
		Branches not removed	Branches removed	Crown removed		
1.	RR11-105	231	158	110	499	8083
	Percentage	46.2	31.6	22.0		
2.	PB 313	29	22	17	68	2232
	Percentage	46.65	32.35	25		
3.	PB 235	9	7	4	20	718
	Percentage	45.0	35.0	20.0		
4.	RR1M 623	4	1	1	6	200
	Percentage	66.67	26.6	16.6		
5.	RR1M 600	5	3	1	9	250
	Percentage	55.55	33.3	11.1		

Table 12. Ability of grower to detect pink disease

	Early detection	Late detection	Total
No. of units	18	32	50
Percentage	36.0	64.0	-

Table 13. Method of disposal of infected plant parts in plantations.

	Removed/ burnt	Retained in the tree	Total
No. of units	22	28	50
Percentage	44.0	56.0	

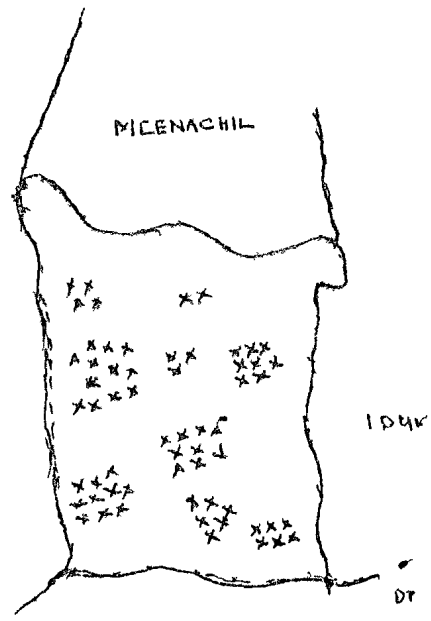
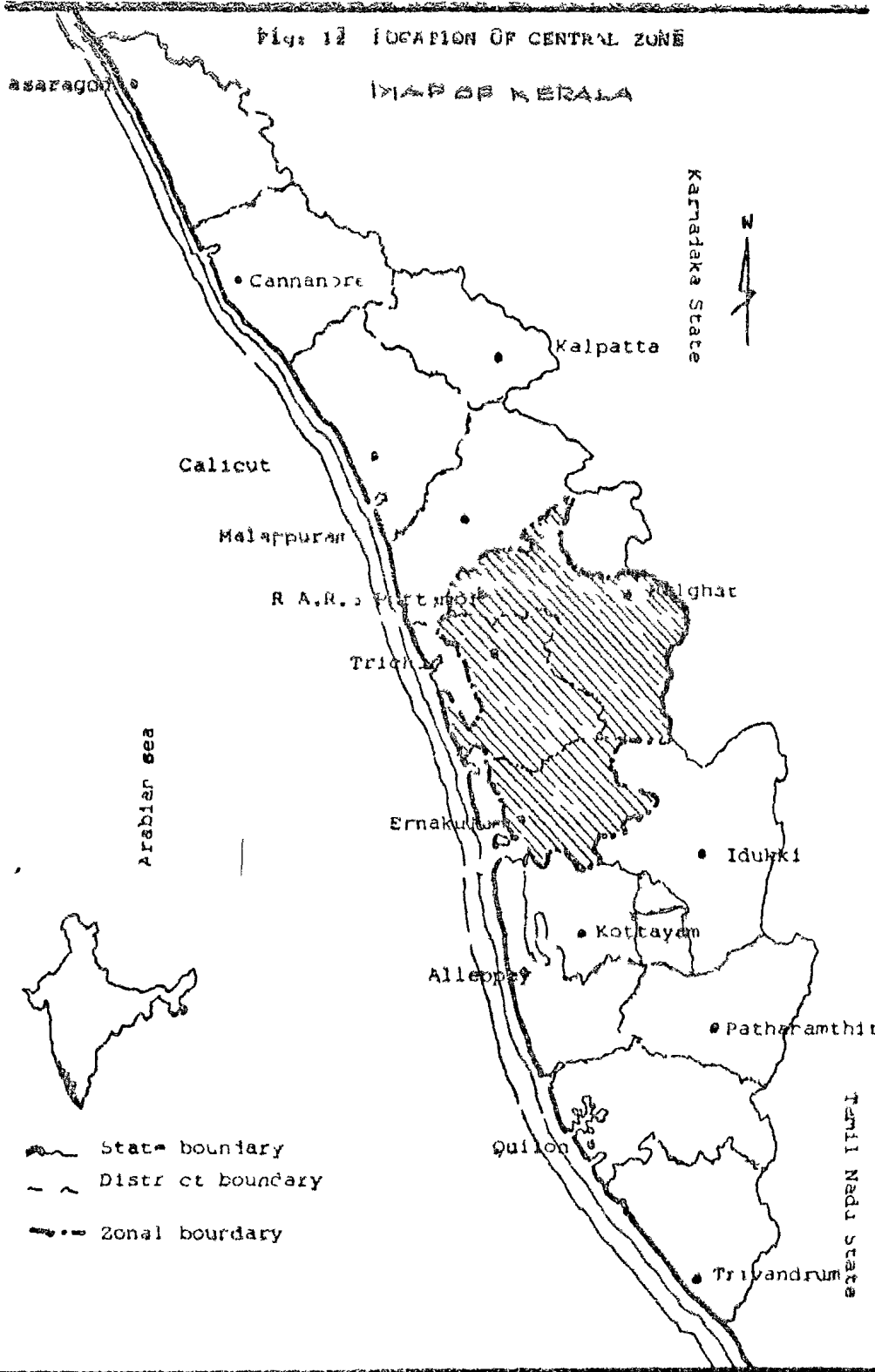
SUMMARY AND CONCLUSION

A survey was conducted to study the intensity of the incidence of pink disease in Rubber Plantations of Kanjirappally Taluk, Kerala State. The clonal susceptibility, percentage of damage, control measures adopted by growers and recovery were also evaluated. Maximum incidence is noticed in RR11 105 and minimum in PB 235. The disease incidence is maximum in the 7th year. Bordeaux paste is the common fungicide used against this disease. But only few growers know the correct method of preparation and application of Bordeaux paste. Careless disposal of infected plant parts provide large inoculum for the spread of the disease. The growers fail to detect the disease sufficiently early to carry out effective control measures. Therefore need for an intensive extension education to create awareness in small growers about the disease and its timely control is evident from this study.

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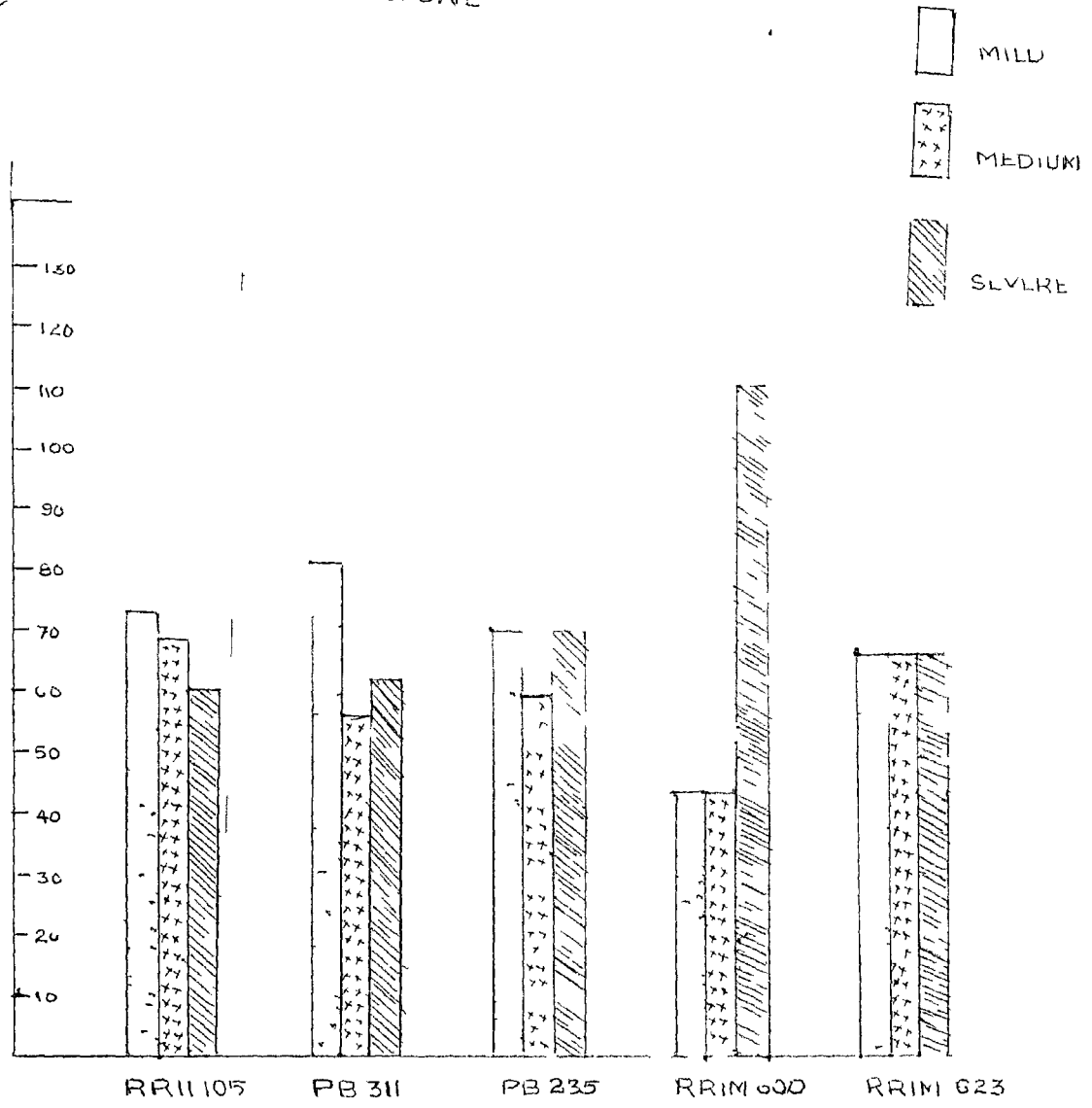
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Fig: 12 LOCATION OF CENTRAL ZONE



MAP OF KANJIRAPPALLY TALUK SHOWING OBSERVED PLANTATIONS

NATURE OF INFECTION OF PINK DISEASE IN DIFFERENT CLONE



Annexure-I

Proforma for survey of the incidence of pink disease of
rubber in Kanjirappally Taluk

Name and address of grower :
 Register No. :
 Year of Planting :
 Extent of area :
 Terrare sloppy flat :
 Proximity to water resources :
 Clone * :
 Total No. of trees :
Nature of infection :
 Mild :
 Medium :
 Severe :
Extent of damage :
 No.of trees affected :
 Trees with crown chopped :
 Control measures adopted :
 Bordeaux paste used method of :
 preparation :
 Method of application :
 Whether sprayed on trunk, fork, :
 branches etc. (with 1% Bordeaux :
 mixture) :
Nature of inspection :
 Insp: strat :
 Frequency :
 No.of Labour :

(Contd.)

If any infected pln. seen nearby :
state asge

Canopy, thick, thin, heavy :

Recovery from disease

Br. not removed :
Br. removed :
Chopping of top :
Total :

Ability of grower to detect the :
disease at early stages

Mild

Whether removed part is burnt :

Add. infor. :

Remarks :

Mild - Infection on secondary and tertiary branches.

Medium - Infection on primary branches which are removed
after drying

Severe - Infection on trunk, and fork resulted in chopping
of top and sprouting from the lower portion of
infected area.