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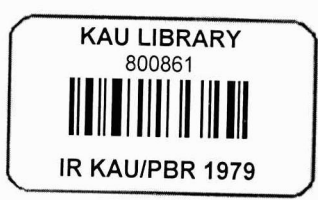
KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Agronomy

- 1. Name of the Research Centre : Coconut Research Station, Kumarakon.
- 2. Project No. : Ag.2.9. Agron. 8
- 3. Title of the Project : Influence of tapping on the yield of uneconomic coconut palms under rainfed condition.
- 4. Name and designation of
 - a) Project leader : Abraham C.T., Junior Instructor (Agronomy)
 - b) Associate : G.Mathai, Asst.Professor (Plant Pathology)
- 5. Objectives : To improve the yield of uneconomic palms by tapping for 2 years, since preliminary trials conducted elsewhere indicated that tapping increases the yield of poor bearers.
- 6. Practical utility : In every coconut plantation, about 10 to 15% of the palms are very poor yielders. Results of the present study will throw light on the economic maintenance of such palms.
- 7. Short review of literature:

Tapping has been found to improve the yield of medium and poor yielding palms and the beneficial effects were found lasting for 4 years. In India, studies have indicated that tapping increases the yield, but only of poor bearers (Menon and Pandalai, 1953). In Philippines the palms which have been tapped, fruited abundantly the year after tapping was stopped and for a few years thereafter. But the copra from such trees showed comparatively lower oil content (Thampan, 1975). Similar results were reported from Malaya also (Jack and Dennet, 1925). In the studies at C.P.C.R.I. tapping was found to slightly reduce the barren but production (Chacko Mathew, 1976). However, detailed studies on these aspects are lacking.



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KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Agronomy

1. Name of the Research Centre : Coconut Research Station, Kumarakom.
2. Project No. : Ag.2.9. Agron 10 (111)
3. Title of project : Trial cultivation of banana as an inter crop in coconut garden.
4. Name and designation of:-
 - a) Project leader : Station Project
 - b) Associate : Instructor (Agronomy)
5. Objectives : To find out the variety of banana suitable for cultivation as intercrop of coconut.
6. Practical utility :

Increased production from unit area of land per unit time or both can be obtained by practising mixed farming. The wide range of crop plants seen growing in many coconut garden was proof enough to support the above concept. Thus growing banana is found to increase total income from coconut garden. Finding out the most profitable variety of banana that can be cultivated as an intercrop in coconut garden assures much prosperity.

7. Short review of literature:-

Cultivation of inter crops with proper cultivation to manuring, irrigation etc. marked by improved the performance of the palms (Mohammed P.P.S. and Krishna Moorthy, K 1959). It was a popular practice in Andhra Pradesh to grow profitable intercrops like banana, turmeric etc. in bearing coconut gardens. Coconut being a widely spaced crop and as all these crops love partial shade growing these remunerative crops had become extremely popular.

8. Technical programme :-

Coconut trees are planted on single row bunds alternated by channels. Under planting of coconut seedlings were done. Banana suckers will be planted in between the coconut trees.

Treatments

1. Palayankodan
2. Padatty
3. Kannan
4. Poovan
5. Monthan
6. Nendran
7. Sanzibar
8. Robusta
9. Grosnichel

All the cultural operations will be carried out as per package of practice.

Lay out : R.B.D.

Replication : 4

Plot size : 4 banana suckers

Observations to be recorded:-

1. Yield obtained from each treatment plots including that of coconut.
 2. Suckering habit of banana. No. of suckers produced for each variety under mixed cropping system to be recorded.
9. Date of start : Immediately after approval of the project.
10. Likely date of completion: 1979
11. Additional facilities required : Nil
12. Approximate cost : Rs. 1,500/-.
13. Signature of:-

Sd/-
Project Leader

Sd/-
Head of Department

Sd/-
Director of Research

Fourth FRC S.No. 301

Check up the slope?

- 5 -

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture Department of Agronomy

1. Name of Research Centre : Coconut Research Station,
Kumarakom.
2. Project No. : Ag.2.9. Agron 10 (IV)
3. Title of the project : Trial cultivation of fodder
varieties as an intercrop in
coconut garden.
4. Name and designation of:-
 - a) Project Leader : Station Project
 - b) Associate : Instructor (Agronomy)
5. Objective : To find out the variety of fodder
suitable for cultivation as
intercrop of coconut.
6. Practical utility : Coconut inter spaces afforded
sufficient space for fodder and
food crops. Mixed farming was
proved to lead to greater
Agricultural prosperity.
7. Short review of literature:-

Cultivation of fodder in the inter spaces of coconut garden is part of the programme of mixed farming. Experiments conducted at C.P.C.R.I., Kasaragod indicated that fodder grasses can be grown under coconut shade and they were reported to give very good yields by preventing loss of nutrients from the field, by adding Nitrogen to the soil by symbiotic nitrogen fixation and by more effective utilisation of irrigation water.

8. Technical programme:-

The area available in single row bunds can be utilised for fodder cultivation.

Treatments

1. Hybrid Napier N.B. 21
2. Guinea grass
3. Para grass
4. Setaria
5. Cow pea
6. Style Santhas
7. Desmodium.

Cultural operations will be carried out as per package of practices.

- Lay out : R.B.D.
- Replication : 4
- Plot size : 4 x 3 m.

Observations to be recorded:-

- 1. Growth measurements at monthly intervals.
- 2. Days to first cutting/harvesting.
- 3. Yield of green fodder/plot.
- 4. Days to cutting after each harvest.

*nutrient analysis
collected in the
nutrient Dept.*

- 9. Date of start : Immediately after approval of the Project (1977).
- 10. Likely date of completion : 1979
- 11. Addl. facilities required : Existing facilities can be utilised.
- 12. Approximate cost : Rs. 1,500/-
- 13. Signature of:-

Sd/-
Project Leader

Sd/-
Head of Department

Sd/-
Director of Research.

- 7 -

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Agronomy.

1. Name of the Research Centre : Coconut Research Station, Kunnarakon.
2. Project No. : Ag.2.9. Agron 10 (v)
3. Title of project : Studies on the suitability of annual crops as inter crops in coconut garden.
4. Name and designation of:-
 - a) Project Leader : Station Project
 - b) Associate : Instructor (Agronomy)
5. Objectives : To study the suitability of the annual crops as an intercrop in coconut garden in relation to its cost economics.
6. Practical utility : The inter spaces available in the widely spaced coconut garden and the solar energy received are wasted. This can profitably be utilised by growing suitable annual crops.
7. Short review of literature:-

In the early stages of coconut plantation when the seedlings are still young and the garden is unshaded there is no harm in raising annual crops, provided sufficient care is taken to see that the subsidiary crops are well manured and that they are not grown to the very base of the palms. Likewise in adult plantation of about 25 years of age, growing of subsidiary annual crops have been found to considerably benefit the coconut palms (Menon and Pandalai 1958).

8. Technical Programme:-

The area available in between the coconut trees can be utilised for the cultivation.

- Lay out : F.B.D.
Replication : 4
Treatments : 7

just be careful

-8-

1) Pineapple

purpose.

2) Banana

Red glen (P. Red)

3) Elephant foot yam

4) Colocasia

5) Ginger

6) Turmeric

7) Tapioca

Plot size : 4 x 3 m. (in between 2 coconut palms grown in single row bunds)

Note:- Cultural practice will be carried out according to package of practices.

Observations to be recorded:-

1) Total yield obtained from each plot.

2) Cost economics of each treatment plots.

3) soil fertility aspects to be studied

9. Date of start : Immediately after approval

10. Likely date of completion : 3 years

11. Addl. facilities required : Nil

12. Approximate cost : Rs. 2000/-.

13. Signature of:-

Sd/-
Project Leader

Sd/-
Head of Department

Sd/-
Director of Research

Fourth FRC. S.No. 303

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture

Department of Agronomy

1. Name of the Research Centre : Coconut Research Station, Kuzhakkon.
2. Project No. : Ag.2.9. Agron. 11(i)
3. Title of the project : Trial on mixed cropping coconut with tree species. *Bees - 7/2/67*
4. Name and designation of:-
 - a) Project Leader : Station Project
 - b) Associate : Instructor (Agronomy)
5. Objectives : To study the performance of coconut trees and tree spices like Nutmeg, cloves, Cinnamon and Cocoa under mixed cropping system.
6. Practical utility : Most of the coconut gardens are giving poor returns to the cultivators due to root (wilt) disease of coconut. The interspaces of coconut trees can be utilised for the cultivation of tree spices and it will enhance the income of the farmers.
7. Short review of literature:-

Production per unit area of agricultural land, time and inputs can be increased by improving efficiency of rate and extent to which solar energy was converted into economic produce. In plantations which commit the land to the main crop for decades, the strategy for maximising production had to be intensive cropping involving annual and perennial crop mixtures and different cropping system (Bavappa, K.V.L. 1975). Coconut being a widely spaced crop and as these tree spices love partial shade growing these remunerative intercrops had become extremely popular (Anonymous 1964). The manuring and irrigation provided to the spice crops will indirectly benefit the palms and give increased yield (Bala Sundaram and Aiyaduri 1963).

Replication :

will be responsible
to get 70 affected palms

Ten numbers of affected palms will be given the treatment as above. The efficacy of the treatments will be assessed in terms of the grubs egg, adults (dead and alive) counts in soil at monthly intervals.

Insecticides (Chlordane dust and Phorate granules) will be applied at an interval of 45 days. All the insecticides will be applied in the entire interspaces of coconut. Observations will be made counting the grubs, egg, adults (dead and alive) from pits taken at 60 cms, 90 cms and 120 cms. Size of the pit will be 15 x 25 x 10 cms. The pre treatment and Post-treatment conditions of experimental palms including the yield data will be recorded for the entire period of the experiment.

- 9. Date of start : 1977
- 10. Likely date of completion : 1979
- 11. Additional facilities required : Nil
- 12. Approximate cost : Rs.750/-
- 13. Signature of

Sd/-	Sd/-	Sd/-
Project Leader	Head of Department	Director of Research

Fifth ERC. S.No. 328.

Interim assessment in respect of the palms of CACRI
methodology

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Entomology.

1. Name and address of Research Centre : Coconut Research Station, Pilicode.
2. Project Number : Ag.2.8.Ent.5.
3. Title of the project : Rodent Control in coconut gardens
4. Name and designation of
 - a. Project Leader : P.C. Radhakrishnan, Asst. Professor.
 - b. Associate : ----
5. Objectives : To find out an effective method of control of rat's damage in the coconut gardens.
6. Practical utility : If an effective method is devised it can be advocated to coconut growers in areas where rodent problem exists.
7. Review of literature :

Among the non insect perennial pests of coconut, rats are considered as a major pest, damaging the tender coconuts even upto 50 percent in the yield. Recent studies indicated that Warfarin as blocks or mixed with baits are effective in eliminating the problem and damage over 90% in Laccadive island (Tanpan 1975). Then they don't have bait shyness.

8. Technical programme :

A preliminary trial will be conducted on acceptance of habits by the rats attacking coconut palm, with following treatments.

- T1 Warfarin cake (3 Nos. per palm)
- T2 Warfarin mixed with fresh tapioca @ 1:19 (proportion 5 Nos. (25 cm cubes) placed in a bamboo tube.
- T3 Warfarin mixed with wheat flour (1:19) in 1% Groundnut oil 1-10 cms/tube.
- T4 Warfarin mixed with rice grain flour (1:19) in 1% groundnut oil (5-10 gm/tube).
- T5 Warfarin mixed with maida flour (1:19) in 1% jaggery.
- // T6 Zinc phosphide 2% mixed with Tapioca.
- T7 Zinc phosphide mixed with wheat flour (1:19) in 1% groundnut oil (5-10 gm/tube)

T8 Zinc phosphide mixed with rice grain flour (1:19) in 1% groundnut oil.

T9 Zinc phosphide mixed with maida flour (1:19) in 1% jaggery.

T10 Control (no chemical baiting control).

These baits in tubes will be placed on the crowns of palms which are frequented by rats.

Based on the results of the above preliminary trial and information gathered on preference acceptance of baits by rats the following trial will be conducted, with the following treatments.

T1 Metal banding with 30 cm wide 0.1 sheet on trunk of the palms.

T2 Baiting on the crown on palm (the suitable bait will be selected from the previous trial)

T3 Baiting on the ground.

T4 Rat trap on crown of palms (wonder trap)

T5 Gillotins trap on crown

T6 Rat trap on ground.

T7 Control (No treatments)

Pre-treatment data on yield of palms will be collected, Post-treatment observations on rats died, increase in yield etc. will be recorded.

9. Date of start : September 1977

10. Likely date of completion : 1979

11. Facilities required : Nil

12. Approximate cost : Rs.1000/-.

13. Signature of

Sd/-	Sd/-	Sd/-
Project Leader	Head of Department	Director of Research

Fifth FRC. S.No. 330.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology

1. Name of the Research Centres : Coconut Research Station, Kumarakom.
2. Project No. : Ag.2.9.Path.2(ii)
3. Title of Project : Relationship between night temperature and the incidence of bud rot of coconut.
4. Name and designation of
 - a) Project leader : G.Mathai, Assistant Professor (Plant Pathology)
 - b) Associate : P.K.Sathia Rajan, Associate Professor (Plant Pathology)
5. Objectives : To study the relationship between night temperature and the incidence of bud rot infection in field conditions as a preliminary to forecasting the disease.
6. Practical Utility : Bud rot disease of coconut is causing serious damages to the coconut palms as a whole. The information obtained will be useful as a preliminary to forecasting the disease.
7. Short review of literature:

The occurrence of bud rot disease was directly related to the microclimate of the palms, relative humidity and temperature in the leaf axils. The micro climate of young palms 5 - 20 years old was more favourable for the incidence of the disease. The pathogen survived in the infected tissues for over 5 months (Radha, Thomas Joseph, 1974). It is found necessary to ascertain the night temperature and humidity which are critical for the initiation of the disease.

8. Technical Programme :

- 1) 100 coconut palms of the age group 5 - 20 years available in the coconut research station farm, Kumarakom will be located and marked as test plants. Incidence of bud rot disease will be recorded at fortnightly intervals by noting the symptoms.

- 2) The minimum day and night temperature will be recorded daily.
- 3) Relative humidity will also be recorded daily.
- 4) The incidence of the disease will then be correlated with the weather data so obtained.

9. Date of start : September 1977

10. Likely date of completion : 3 years

11. Additional facilities required : Nil

12. Approximate cost : Nil

13. Signature of

Sd/-

Project Leader

Sd/-

Head of Department

Sd/-

Director of Research

Fifth FRC. S.No. 333

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

- Faculty of Agriculture Department of Plant Pathology
1. Name of the Research Centre : Coconut Research Station, Kumarakom.
 2. Project No. : Ag.2.9. Path 2 (iii)
 3. Title of Project : Role of bacterial in the incidence of bud rot disease of coconut and its relationship with Phytophthora palmivora in causing the disease.
 4. Name and designation of
 - a) Project Leader : Associate Professor (Plant Pathology)
 - b) Associate : Assistant Professor (Plant Pathology)
 5. Objectives : It is suspected that the bacteria are secondary invaders and they play a major role in aggravating the symptoms. The project aims to confirm the role of bacteria in causing and aggravating bud rot diseases.
 6. Practical utility : To take appropriate measures for the control of the disease.
 7. Short review of literature:

Radha and Thomas Joseph (1974) reported that the incidence of the disease is related to micro climate of the palm, relative humidity and temperature in the leaf axil. Micro climate of young palms (5 to 20 years old) was more favourable for the incidence of disease. Infection cycle on coconut was completed in 6 days under favourable condition of temperature (22 - 24°C) and relative humidity (98 - 100%) Phytophthora palmivora caused dry rot of coconut crown. The wet rot observed in later stage of the disease was probably due to the activity of secondary invaders like species of *Pseudomonas*, *Xanthomonas* and *Erwinia*.
 8. Technical Programme :
 - a) Isolation of the causative organism: All the organism associated with the disease will be isolated and purified by the usual methods.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

- 1. Project Code No. : Ag.2.8. Path. 3.
- 2. Name and address of the Research Institute : COCONUT RESEARCH STATION, PILICODE.
- 3. Title of the project : Studies on Stem Bleeding in Coconut.
- 4. Name and designation of Principal Investigator : P.Varadarajan Nair, Assistant Professor (Plant Pathology)
- 5. Name(s) and designation(s) of Associates : Dr.P.K.Narayanan Nanbiar, Associate Professor (Chemistry)
- 6. Location : Coconut Research Station, Pilicode, Nileshwar.
- 7. (a) Objectives : To find out the causes and control measures of the stem bleeding disease.

(b) Practical Utility :

Stem bleeding, which has become one of the major coconut disease, is known to occur in nearly all coconut growing regions of Kerala. It may occur sporadically in isolated palms or gardens or endemically in certain areas. The extent of damage varies from reduction in yield to complete death of the palms.

The cause and cure of this disease remain understood yet. Detailed investigations proposed at present aim to find out lasting solutions to this devastating disease.

8. Technical Programme.

(A) SYMPTAMATOLOGY

- a) Age of the palm and relation to disease development.
- b) Bearing capacity in relation to disease occurrence.
- c) Excavation of root sector - study of the root-system of healthy and diseased palms. It is proposed to compare the rot system of healthy and diseased palms for:

- 1. Extent of damage to roots if any
- 2. Root regeneration capacity
- 3. Spread of root system.
- 4. Any other important differences noticed.

Stem bleeding -
detailed programme
all symptoms are
covered in A.P.
(Details AP)

Half yearly observations to be taken up.

- d) Leaf petioles - Examination for discolouration or necrosis.
- e) Bud portion - Examination for discolouration or necrosis.
- f) Nut shedding - Observations to see whether nut shedding is the initial symptoms and examination of such shed nuts.
- g) Tender nuts - Examination of husk to find out any perforations or internal necrosis.
- h) Stem - (1) Splitting root to crown portion for locating necrosis or browning.
(2) Examination of vascular bundles to find out whether clogging of conducting tissues present.

B. Analysis of soil and leaf samples.

Soil and leaf analysis to be conducted to compare healthy and diseased palms for NPK, Ca, Mg and trace elements content.

C. Observations on the seasonal variation on symptom expression on sandy and laterite soils.

Monthly observations to be recorded on the number of leaves, number of spathes opened, number of nuts, extent of increase in the bleeding patch etc. at Pilicode and Nileshwar.

D. Pathogenicity studies.

Isolation of pathogens (Fungal or Bacterial) from roots, stem and oozing fluid of the affected palms and pathogenicity studies.

9. Date of start : 1977

10. Likely date of completion : 1980

11. Estimated man months : 30

12. Facilities required :

Laboratory facilities for conducting pathological studies are not available at present.

Minimum requirement of the equipments and chemicals for carrying out the work is to be met. Proposals are being sent separately. No special equipment is proposed.

Soil and leaf samples analysis will be conducted at the chemistry laboratory attached to the Coconut Research Station, Pilicode.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture Department of Plant Pathology

1. Name of the Research Centre : Coconut Research Station, Kunnarakon.
2. Project No. : New Ag. 2.9. Path. 4(v)
3. Title of Project : Disease resistance trial.
4. Name and designation of
 - a) Project Leader : P.K.Sathia Rajan, Associate Prof. (Plant Pathology)
 - b) Associate : G. Mathai, Assistant Professor (Plant Pathology)
5. Objectives : To study the Root (wilt) disease tolerance of progenies obtained from the crosses Dwarf orange x Tall Green and Dwarf Green x Tall.
6. Practical Utility : The efforts made to screen out a variety/hybrid resistant or tolerant to Root (wilt) disease has become the subject of study during the current period. Evolution of such strain will be of greatest importance in finding out a solution for the dreaded root (wilt) disease.
7. Short review of literature: Orton (1900) obtained lines of 'Sea Island' cotton resistant to wilt (Fusarium oxysporum) by continued screening and selection (Malayan Dwarf' variety of coconut appeared to be resistant to lethal yellowing of Jamaica where, as the indigenous 'Jamaica Tall' palms were found highly susceptible (White head, 1966).
8. Technical programme :
 - Lay out : Completely Randomised
 - Plot size : 4 palms
 - Treatments/
Varieties : 21



11/11/66

Sl.No.	Tr.No.	Details of hybrid progenies	Cross
1	V1	132 x 27S/954	Dwarf Orange x Tall Green
2	V2	B.23 x 27S/1016	"
3	V3	107 x 27S/1016	"
4	V4	127 x 27S/954	"
5	V5	144 x Tall 12	"
6	V6	215 x 41/405	"
7	V7	144 x 27S/954	"
8	V8	188 x TC 13	Dwarf orange x Tall Green
9	V9	182 x 41/613	"
10	V10	175 x 39/3B/531	"
11	V11	208/19 x 39 3B-492.	Dwarf green x Tall Green
12	V12	213/10 x Tall 12	"
13	V13	213/11 x 27 S - 908	"
14	V14	239/1 x 41/405	"
15	V15	189/13 x 27 S/908	"
16	V16	211/10 x Tall 10	"
17	V17	133/11 x 2/27	"
18	V18	B41 x Tall 12	"
19	V19	208/20 x VII/18	"
20	V20	211/11 x VIII/16	"
21	V21	Standard	Tall x Yellow Dwarf.

Observations to be recorded:

Morphological characters like number of fully opened leaves, height and girth at Collar are recorded before planting and at half yearly intervals for 3 years.

Observations on the disease conditions of the palms to be recorded at half yearly intervals starting from the 1st year of planting. The palms will be left for the natural incidence of root (wilt) disease. No fungicidal treatment is advocated. Necessary insecticidal treatments should be given as and when found necessary. All the cultural operations to be followed as per package of practices.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture Department of Botany.

- 1. Name of Research Centre : Agricultural College, Vellayani.
- 2. Project No. : Ag.2.18. Path 4 (vii)
- 3. Project No. and Title : Diagnostic tests on early detection of root wilt diseases in coconut.
- 4. Name(s) of:-
 - (a) Project leader : A.T.Abraham, Associate Professor
 - (b) Associate : N.Gopinathan Nair, Associate Professor.
- 5. Objective : Standardization of technique for early detection of Root wilt disease in coconut by sap analysis.
- 6. Practical Utility : A tissue analysis technique will enable the detection of disease, in the very early stages of development and will make possible the adoption of suitable control measures.
- 7. Review of literature :
- 8. Technical Programme :
 - 1. Tissue analysis for the proportion and content of different nutrients.
 - 2. Electrical conductivity and PH of sap extracted from fronds, leaflets, stem & root from, root wilt infested palms, apparently healthy ones in infested areas and healthy ones in disease free areas.
- 9. Date of start : 1978
- 10. Likely date of completion: 1981
- 11. Additional facilities required : Nil
- 12. Approximate cost : Rs. 6,000/-
- 13. Signature of:

Sd/-
Project Leader

Sd/-
Head of Department.

Third ARC. S.No. 342.

Interim report on the progress of the project may be submitted. The assessment standards are the same as in the previous year.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology.

1. Name of Research Centre : College of Agriculture, Vellayani.
2. Project No. : Ag.2.18.Path.4(viii)
3. Title of the Project : Studies on root (wilt) disease of coconut.
4. Name & Designation of
 - (a) Project Leader : Dr.M.Ramanatha Menon,
Professor of Plant Pathology.
 - (b) Associates : Sri.P.K.Sathia Rajan,
Associate Professor of Plant
Pathology, Coconut Research Station,
Kumarakom.

Assistant Professor/Instructor,
Rice Research Station, Kayankulam.
5. Objectives :

The exact etiology of root (wilt) disease of coconut is still unidentified and hence measures are undertaken to maintain the vigour of the trees by adopting proper agronomic and cultural practices. As there are ~~xxx~~ no preventive or curative measures against root (wilt) disease, the other alternative is to eradicate the declining palms and to replant with less susceptible varieties of coconut seedlings. The aim of the present study is to rejuvenate the declining, root (wilt) affected palms by inducing fresh root development by providing proper environments. As a result of the development of fresh healthy roots, the tree will grow more vigorously giving a higher yield and thus making the cultivation economical.

6. Practical utility :

The root (wilt) affected coconut trees became unproductive and so the cultivation has become uneconomical. The results of the study can be recommended to the cultivators and the loss due to the disease can be minimised.

7. Short review of literature :

The coconut palm, a typical monocot, having an adventitious root system, produces numerous roots from its base region throughout its life.

Normally, roots are not formed above the bole region. But due to senescence or water logging the older roots die and under such circumstances the tree produces new roots from the trunk above the soil level. Such roots are termed as aerial roots (Menon et al., 1955). Davis (1958) reported that air layering of the trunk near the crown (gootying) can induce rooting from the stem so that oldern plants can be rejuvenated. He suggested that the crown of an older palm can be separated after sufficient roots were induced and replanted as a young palm. Thampan and Markose (1976) reported that old, severely affected palms could be rejuvenated by inducing root development above bole region. It is reported that the treated palms produced six new leaves within a period of 7 months and the new leaves were healthy without any symptoms of leaf rot or root (wilt). The old fronds showed general improvement.

8. Technical Programme :

Root (wilt) affected palms of different age group like 15-30, 30-45 and above 45 years will be selected in two locations, i.e. at Kayankulam - sandy area and Kumarakon - reclaimed area, with clay loam. Four metre square brick walls will be constructed on all sides of the trees to a height of 1 m above the soil level with adequate provision for drainage and aeration. The bark of the trees will be ringed around at two levels just exposing the atellar region. The rings will be 3 cm wide with an approximate depth of 2 to 2.5 cm. The first ring will be made at 15 cm above the ground level and the second 12-15 cm above the first ring. The exposed regions (rings) and the base of the palms will be covered with river sand and cow dung and the embarkment will be filled with a mixture of well rotten organic matter or green matter, cow dung and sand.

The recommended dose of N:P:K fertilizer mixture and 2 Kg delomite will be applied for each tree (the quantity of delomite can be increased depending on the pH of the soil). At Kayankulam one set of trees will be irrigated at the rate of 45 litres of water twice a week. At Kumarakon, instead of irrigation, one set of trees will be sprayed with one per cent Bordeaux mixture, thrice a year (January, April, May and September). Necessary control trees will be maintained with usual agronomic and cultural practices as per the recommendations of package of practices. The treatment will be continued for a period of five years.

Details of experiment:-

Lay out	: Randomised Block Design.
Treatments	: 6 (listed below).
Replications	: 6
Plot size	: Single tree
Note:	: Trees are selected after calibration for disease intensity and age.

1) Kayankulam;

Treatments:-

- T1 - Control. Usual Package of Practices. NPK at recommended dose + organic matter + delomite.
T2 - T1 + irrigation.
T3 - Ringing + construction of retaining wall + filling with sand, cowdung and organic matter + NPK and delomite.
T4 - T3 + irrigation.
T5 - Ringing + filling + NPK and delomite + construction of retaining wall with coconut leaves.
T6 - T5 + irrigation.

(Quantities of FYM, Delomite and NPK are the same under all treatments).

2) Kumarakom:-

The above treatments will be followed but irrigation will be replaced by spraying with 1% Bordeaux mixture, three times a year. The number of plots and replications will be the same as above. It is suggested that the retaining wall in T5 at Kumarakom can be made of mud instead of ~~fx~~ coconut leaves.

A separate observational trial (2 trees) can be tried using the sheets of tar drums with sufficient provision for drainage and aeration to know the feasibility of using them in place of constructing brick walls around the palms.

The condition of the palm at the time of starting the treatment will be recorded.

- (a) No. of leaves. (The youngest fully opened leaf will be tagged)
- (b) Root (wilt) disease intensity
- (c) Leaf rot disease intensity
- (d) Yellowing of leaves (intensity)
- (e) No. of inflorescence
- (f) No. of female flowers.
- (g) Percent setting.
- (h) Yield last year.

The following observations are to be recorded at an interval of six months after starting the treatment.

A. Observations on root development (Excavate 1/8 portion of the area and record the following).

- (a) No. of fresh roots formed.
- (b) Length of newly formed roots.
- (c) Decay or rotting of roots (area affected).

B. Observations of leaf formation.

- (a) No. of leaves formed after starting the treatment.
- (b) Rate of leaf formation.
- (c) Symptoms of diseases (intensity)

- i. Root (wilt)
- ii. Leaf rot.

C. Observation on inflorescence formation.

- (a) No. of inflorescence. (emerged/cone out/opened)
- (b) No. of female flowers in each.
- (c) Percent setting.

E. Observation on yield.

Yield/Tree/Harvest.

9. Likely date of start : September, 1977.

10. Likely date of completion : September, 1982.

11. Additional facilities & estimated cost:

The existing facilities at Rice Research Station, Kayankulam and Coconut Research Station, Kumarakon can be utilised. The staff working at the respective research institutions will be responsible for the conduct of the treatment and recording the observations.

Land:

Equipment:

Cost of construction brick	0	
Walls, sand, cowdung, compost,	0	
delomite, fertiliser, fungi-	0	
cide etc., cost of application	0	Es. 22,030.00
and other expenses.	0	

12. Signature of:

Sd/-
Project Leader

Sd/-
Head of the Department

Sd/-
Director of Research

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology.

1. Name of the Research Centre : Coconut Research Sub-Station, Balaramapuram.
2. Project No. : Ag.2.10. Path. 5.
3. Title of the project : "Control of grey leaf blight of Coconut caused by Pestalotia-palmarum Cooke by using newer fungicides".
4. Name and designation of :
 - (a) Project leader : B.Rajagopalan, Asst.Professor.
 - (b) Associates : 1.Dr.S.Balakrishnan, Associate Professor, College of Agriculture, Vellayani.
2.Dr.James Mathew, Assistant Professor College of Agriculture, Vellayani.

5. Objectives:-

To evaluate newer fungicides for the control of grey blight disease caused by Pestalotia palmarum.

6. Practical utility :

This disease has spread far and wide and is seen in many of the coconut plantations. This disease reduces the general vitality of the palm and causes a burnt appearance of the leaves. The aim is to test newer fungicides against the pathogen and to utilize the results for the effective control of the disease.

7. Short review of literature :

Byyge (1930) has reported that cutting and burning of the affected trees spraying with Bordeaux mixture and growing the palms under sanitary conditions will control the disease. Copeland (1931) has reported that improving the drainage condition will control the leaf spot disease. Wilson and Peethambaran (1970) has reported that Cuman was superior to five other fungicides in checking the in vitro growth of Pestalotia palmarum, the cause of coconut leaf spot. Radha (1976) has reported that of the general fungicides tested Bordeaux mixture was the most effective fungicide.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology.

1. Name of Research Centre: College of Agriculture, Vellayani.
2. Project No. : Ag.2.18.Path.7.
3. Title of project : Investigation on a new disease of coconut palm - Mid crown yellowing.
4. (a) Name and designation of project leader : Shri.P.V.Paily.
(b) Associates : 1. Dr.M.C. Fair.
2. Dr.M.Ramanatha Menon.
5. Objectives: : To find out the etiology and control measures for the disease.
6. Practical utility:

This disease eventhough noted at Chirayinkil and Varkala similar type of disease occur in various parts of Kerala, especially in the root (wilt) disease affected belt. It will be of immense use to coconut growers if this new disease is identified and proper control measures evolved.

7. Short review of literature:

No reports are available regarding the occurrence of mid crown yellowing in coconut palm. A similar disease is reported for oil palm.

8. Technical programme in brief:

- 1) Study of pathogens associated with the disease. Root stem and leaf samples will be critically examined for the presence of pathogens.
- 2) Nutrient status of the affected palms will be studied by foliar analysis.
- 3) Effect of different fungicides along with nutrients will be studied in controlling the disease.

Observations to be taken:

- 1) Symptomatology of the disease.
- 2) Pathogens associated with the disease.
- 3) Seasonal Variation if any, in the symptom picture.
- 4) Effect of different chemicals on the control of the disease.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology.

1. Name of Research Centre: Rice Research Station, Moncompu.
2. Project No. : Ag.2.5.Path.8 (i).
3. Title of the project : Relative tolerance of Hybrid varieties of coconut to diseases.
4. Name(s) and designation of
a) Project leader : P.Varadarajan Nair, Asst.Prof.(PP)
b) Associate : Dr.K.M.Rajan, Associate Prof.(PP)
5. Objective : To study the relative tolerance of different hybrid varieties of coconut to root-wilt, leaf rot, bud rot and stem bleeding.
6. Practical Utility :

A knowledge of the above will give an idea about the best hybrid combinations which can be successfully grown in the tract.

7. Short review of literature:

It is reported that some of the hybrid varieties possess some amount of natural tolerance to the dreaded root-wilt of coconut.

8. Technical Programme :

A field experiment has been laid out in July 1973 with five replications and 10 treatments.

Treatments are different crosses viz. TxD, TxG, TxLD, TxSS, YDxLO, TxNYG, CCxG, TxTembli and W.C.T.(control).

Observations

1. Annual growth measurements.
2. Disease indexing will be done for root-wilt symptoms at 6 months interval. The occurrence of other diseases such as leaf-rot, bud-rot, stem bleeding etc. will be recorded as and when noted.
3. The yield data of individual trees will also be recorded.

9. Date of start : July 1973.

10. Likely date of completion: ---

11. Additional facilities required : Nil.

12. Approximate cost : ----

12. Signature of:

Sd/-

Sd/-

Sd/-

Project Leader

Head of Department

Director of Research.

Third PRC. S.No. 347.

*As per order of Departmental
and all the instructions from the 1973*

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology

1. Name of the Research Centre: Coconut Research Station, Kunarakom.
2. Project No. : ~~New~~ Ag.2.9. Path. 8 (iv)
3. Title of Project : Disease resistance trial.
4. Name and designation of
 - a) Project leader : G.Mathai, Assistant Professor.
 - b) Associate : P.K.Sathiarajan, Associate Prof.
5. Objectives : To study the performance of the progenies of apparently healthy W.C.T. palms available at the Coconut Research Station, Kunarakom.
6. Practical Utility :

It was observed that certain W.C.T. varieties of coconuts available at the Coconut Research Station, Kunarakom shows hardly any symptoms of the root (wilt) disease for quite along time. These apparently resistant trees are assumed to carry a gene governing the resistance character. The study proposed will give a clue whether any of the progenies of these palms bear a resistance character.

7. Short review of literature:

Study of the distribution of root (wilt) pathogen in developing seed coconuts conducted by Gopinathan Pillay et al (1970) indicated that inoculum from the nuts of severely infected palms gave positive sign of infection on cowpea indicator plants where as that from healthy palms gave negative results. Not much work has been done on the inheritance of disease x resistance character on coconut.

8. Technical Programme :

Six W.C.T. Palms of the age group 40 - 45 years which are found to be apparently healthy were selected as mother palms. The whole of mature nuts available for harvest during 5/76 were harvested and they were sown in nursery during 7/76. Seventy progenies were obtained from these palms and they were planted during September 1977.

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology.

1. Name of the Research Centre : Coconut Research Station, Kumarakom.
2. Project No. : New Ag.2.9. Path. 8 (vi).
3. Title of Project : Study of the intensity of various diseases affecting coconut and assessing the loss in yield due to the disease.
4. Name and designation of
 - a) Project leader : G. Mathai, Assistant Professor (Plant Pathology)
 - b) Associate : P.K. Sathia Rajan, Associate Prof. (Plant Pathology).
5. Objectives : To find out the intensity of various diseases affecting coconut in the coconut research station, Kumarakom and to assess the loss in yield due to the disease.
6. Practical utility : The information obtained will through light on the nature and occurrence of the disease so that timely control measures shall be adopted to minimise the loss.
7. Short review of literature:
 - 1) Pillay and Pushpadas (1965) reported that the Kerala root (wilt) disease is restricted to peaty reclaimed areas.
 - 2) A survey conducted by Pillay and Pushpadas (1966) in the vicinity of rivers revealed that the root (wilt) disease was more in river bank plantations, the spread of disease was slower where the river water become more saline and acidic. According to them most wilt affected palms were severely attacked by leaf blight and many by leaf rot.
 - 3) Lal (1968) reported that Root (wilt) and leaf rot diseases caused major losses in yield. But rot, stem bleeding, Improper farm management etc. are added to losses.
 - 4) Palms affected by leaf rot yielded on average of 70% less than healthy palms, and palms affected by root (wilt) disease yielded 43-82 percent loss depending on the stage of development of the disease (Radha et. al. 1962.)

It may be seen that intensity and losses due to the disease vary in different locations and as such the study is taken up in the reclaimed kari areas of Kuttanad.

8. Technical Programme :

The intensity of the disease like root (wilt), leaf rot, Bud rot, stem bleeding and grary blight prevalent in the grown up bulk palms in Field Nos. I, II, III and IV of Coconut Research Station, Kumarakom will be assessed by using standard intensity scores as described below.

1. Root (wilt):

Flaccidity	0-5
Yellowing	0-3
Necrosis	0-2

Disease Index is to be calculated by the formula described by George and Radna (1973).

$$DI = \frac{(F + Y + N) 10}{\text{Total No. of leaves.}}$$

2. Leaf rot:
- i) All healthy leaves = 0
 - ii) Upto 25 percent of leaf are affected = 1
 - iii) " 30 " = 2
 - iv) above 50 " = 3
3. Bud rot:
- i) Healthy = 0
 - ii) Initial stage of attack = 1
 - iii) Attacked badly, tree recoverable = 2
 - iv) Attack resulting in the death of plant = 3
4. Stem bleeding:
- i) Healthy = 0
 - ii) Initial bleeding symptom = 1
 - iii) Partial coalition of bleeding patches = 2
 - iv) Advanced stage of infection = 3

5. Grey blight:

- i) Healthy with less than
5 percent leaf area infected = 0
- ii) Above 5 percent and below
25% leaf area infected = 1
- iii) above 25 percent and below
50% leaf area infected = 2
- iv) Above 50% leaf area infected
(Advanced stage of infection) = 3

The observations on disease intensity will be recorded at quarterly intervals and continued for three years. The yield of nuts of the test palms are also recorded.

- 9. Date of start : Immediately after approval of the project.
- 10. Likely date of completion: 3 years
- 11. Additional facilities required : Nil
- 12. Approximate cost : Nil
- 13. Signature of :

Sd/-
Project Leader

Sd/-
Head of Department

Sd/-
Director of Research

KERALA AGRICULTURAL UNIVERSITY

RESEARCH PROJECT

- Faculty of Agriculture : Department of Plant Pathology
1. Name of Research Centre : College of Agriculture,
Vellayani.
 2. Project No. : Ag.2.18.Path.9.
 3. Title of Project : "Scheme for the control of yellow
leaf disease of arecanut palm".
 4. Name(s) and designation
of (a) Project leader : Sri.P.V.Paily, Associate Prof.
of Microbiology.
(b) Associates : 1. Dr.M.Ramanatha Menon, Prof.
of Plant Pathology.
2. Smt.L.Rema Devi, Assistant
Professor of Plant Pathology.
 5. Objectives : To find out the etiology of
yellow leaf disease of arecanut
palm in order to evolve suitable
control measures.
 6. Practical utility : The etiology of the yellow leaf
disease of arecanut palm is not
known. The disease is prevalent
in the central parts of Kerala
State (in the Districts of
Trivandrum, Kottayan, Quilon,
Alleppey, Ernakulam and Trichur)
and also in the Malanad area
of Karnataka State. Eventhough
the disease affected palms are
not killed on right, the
production of nuts get reduced
both in quality and in quantity and
within a few years the palm succumb
by the disease. As a result of
the incidence of the disease,
the cultivation of arecanut has
become uneconomical. The
results of the studies will
throw more light on the etiology
of the disease which will be
helpful in formulating suitable
control measures.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

Faculty of Agriculture : Department of Plant Pathology
Section in Microbiology.

1. Name of Research Centre : College of Agriculture,
Vellayani.
2. Project No. : Ag.2.18.Proc.Tech.i(iii).
3. Title of the Project : Microbial studies on coconut
products.
4. Name and designation of
(a) Project Leader : To be posted.
(b) Associates :
5. Objectives :

*Project aims to
reduce the
tech. paper*

- (1) Study of extent of microbial damage of plaited coconut leaves used for thatching. If the damage is to a considerable extent, a method for preventing it would be worked out.
- (2) To study the effect of application of non toxic organic acids on copra as a protectant during drying.
- (3) To study the extent of bacterial spoilage of cut coconut stored in kitchen and to find a remedy.

6. Practical Utility :

- (1) If the problem is mainly microbial in origin, an adequate protectant should prolong the life of thatched roofs.
- (2) Prevention of microbial growth on copra - especially growth of fungi like Aspergillus flavus and other toxin producers should reduce chances of contamination of the final product (oil) by toxins and other carcinogens. Also off flavours of microbial origin could be eliminated from the oil extracted from the copra.
- (3) Cut coconut stored in the kitchen for culinary purpose often succumbs to microbial attack. In order to increase the shelf life of such coconut, a suitable protectant should be of value.

7. Short review of literature:

- (1) Experiments conducted at C.F.C.R.I. Kasargode suggest that coconut leaves soaked in saline water prior to plating withstand the combined action of rain, wind and sun better than the unsoaked leaves or those soaked in non-saline water.

2. Acetic acid has been suggested as a "preservative for preventing deterioration of co'ra during drying.
3. No information is available regarding prevention of spoilage of coconut used for culinary "ur"oses. Bacterial like Serratia marcescens have often been reported associated with such coconut, to be responsible for the deep pink colour that is often encountered on storing cut coconut in Kitchen.

8. Technical Programme:

1. Samples of "laid leaves will be collected at monthly intervals from thatchings and microbes associated with them will be isolated and characterised. Their ability to disintegrate leaves individually and synergistically will be studied under naturally existing conditions and selected conducive conditions. Their cellulose and lignin decomposing ability will also be assessed. Suitable protectants like mineral oil, coal tar etc will be screened for their efficacy in preventing spoilage. "re-soaking of the leaves in saline and fungicidal solutions will also be tried out.
2. Co'ra, prior to drying will be treated with different non-toxic organic acids and their efficacy in preventing microbial damage will be assessed. Rising co'ra in brine and other food preservatives will also be studied for their efficacy in preservation.
3. The methods in item 2 above will also be studied on coconut to be used for culinary "ur"oses.

.....

Since the different organic acids or other food Preservatives to be tried might interact with compounds in the coconut to give rise to new compounds which may or may not be toxic, safety tests will have to be carried out with the Preserved Products. To check for this, Preserved samples or extracts thereof will be fed to or inoculated into small animals, preferably white mice, and toxicity symptoms, if any, will be observed and studied. Only if lack of toxicity of these Products is established by such tests will they be fit for human consumption.

9. Date of start : When the requisite staff is posted.
10. Likely date of completion Three years from the date of start.
11. Additional facilities required:
One Associate Professor and one Instructor to be Posted. Small animals and an animal house will have to be maintained. Required Chemicals and Preservatives.
12. Approximate cost : Rs.1,00,000 for 3 years, including staff expenses and laboratory facilities.
13. Signature of
SD/ Project Leader. SD/ Head of Department. SD/ Director of Research.

KERALA AGRICULTURAL UNIVERSITY
RESEARCH PROJECT

1. Name of the Centre : Coconut Research Station,
Nileswar.
2. Project No. : Ag.1.8. AGRON. 12.
3. Title of the experiment: Studies on the possibility of
multiple cropping including rice
in unirrigated coconut gardens
using a moisture modulation
(water harvesting) technique.
4. Date of commencement : May, 1977.
5. Expected duration : 2 years.
6. a) Name of project
leader and designation: N. Neelakantan Potty, Associate
Professor of Agronomy.
b) Associates : ---
7. Objectives :
 1. To find out the possibility of
multiple cropping including rice
in coconut garden. The
experiment envisages exploring
the possibilities of
 - i) Taking two rice crops in
coconut gardens.
 - ii) Intensive land utilisation
in dry areas.
 - iii) Most economic cropping pattern
in coconut garden.
 - iv) Effect of intensive cropping
and moisture modulation
(water harvesting).
8. Practical Utility :

Successful raising of annual intercrops in unirrigated coconut gardens is practically impossible due either to excessive moisture after monsoon has recorded. Therefore, any method which will facilitate raising of two or more crops successfully will be of benefit to the cultivators as it will increase the net return/acre. In addition successful raising of rice in coconut garden will reduce the gap/requirement and production of a food crop. Over and above, the residual management study may provide valuable

information on productivity improvement of coconut gardens. The present study may also give a viable cropping pattern for unirrigated coconut gardens.

9. Review of literature :

Periher (1972) had formulated a technique of water harvesting to raise one crop each in successive kharif and rabi season in areas of low rainfall. The principle involved is to create slopes on either sides from which rain water will flow down from sides to the cultivated area.

10. Technical programme principle:

The land in between coconut rows will be laid out in to trenches of (4 x 4m x 35 cm) and beds. This will create a moisture gradient to the trench. This moisture gradient will help to take the second crop in trenches. In rainy season (1st crop) moisture of the beds will be thus controlled for successful raising of crops with less water requirement. In the trench rice will be taken. In the first season the most suitable variety and fertilizer dose will be identified. In the second season suitability and adaptability of crops including rice will be studied in trenches. The system of land transformation is expected to completely tap the rainfall resource to the maximum advantage. It is expected to tap the meagre North East Monsoon also to full advantage. Thus possibility of raising successfully two or three crops (under unirrigated condition) will be investigated. The crop and the cropping pattern most economically suited will thus be selected.

Treatments

On Beds	Ist crop season	II nd season
	Ginger	
	Turneric	
	Tapioca	
	Cowpea	Sweet potato
	Groundnut	Sesamum
	Sweet potato	Cowpea

