

FINAL REPORT

1. Institute Code No.

Path X (231).

2. I. C. A. R. Code No.

Pl - 8416 - ICI - H 20/0311

3. Name and Address of Research Institute/Centre:

Central Plantation Crops Research Institute
Kasaraged - 671 124, Kerala.

4. Project Title:

Crown choking disease of Coconut in Assam/West-Bengal.

5. Name and Designation of Project Leader:

A.K. Ray, Scientist-in-charge, CPCRI, Research Centre,
Kahikuchi.

6. Name(s) and Designation(s) of Project Associates including Project Leader and work to be done:

Sl. No.	Name and Designation	Time spent	Work done
1.	A.K. Ray Scientist-in-charge, CPCRI, Kahikuchi, Assam.	8 yrs. (4 mm/year)	Survey of the incidence of disease in the coconut belts in Assam. Isolation & identification of organism if any.
2.	R.K. Singh SIC, CPCRI, Mohitnagar.	2 yrs. 1984-85 & 85-86 (3 mm/year)	Large scale field control trials in Assam. Compilation of data of the project for writing annual/ final report.
3.	V.K. Barnwal, SIC, CPCRI, Mohitnagar, W.B.	3 yrs. 1986-87 & 1988-1989 (4 mm/year)	Survey of the disease in coconut growing areas at West-Bengal & field control trials at West-Bengal.

7. Location of Research Project with complete address (Division/Section/Sub-Centre)

4. P. Manikandan, 1 year. Micronutrient analysis of Soil Scientist, 1986-87, soil and leaf tissue of the CPCRI, Kasaraged (3 mm/year) diseased and healthy palm.
5. V.M. Reddy, 1 year. Field control trials at CPCRI SIC, CPCRI, Mohitnagar, 1989-90 Mohitnagar, W.B. West-Bengal. (1 mm/year)

1984-85

1991-92

0. (a) Objective (Not more than 150 words)

- 1 To study the extend of disease occurrence in different areas of Assam and West Bengal.
- 2 To isolate organism associated (if any).
- 3 To study the micronutrient analysis of soil and plant tissue and healthy palms.
- 4 To work out suitable control measure.

(b) Practical Utility including background information (Not more than 150 words)

As reported by BK Chakravarty et al (1969), the crown choking (crown rooting) disease of coconut was first noticed in Assam in 1964 at the Regional Coconut Research Station, Kahikuchi, Assam. About 13% of the coconut palms were affected by the malady. In 1980-81, the disease was also reported from the coconut Research Station, Kharua under Assam Agricultural University. In 1984, a rapid survey was conducted in the coconut growing areas under Kamrup district (Assam). From the survey it is revealed that about 5-10% of coconut palms (all under 12 years of age) in the village 'Kudra-chenikuchi' and 'Nankarbhaira' were affected by this disease.

Since, no much work has been performed in this disease, the exact cause of the disease and its control measure are not clearly known.

Hence, the proposed study will be useful for the management of the coconut plantation.

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

KASARAGOD-670 124, KERALA

R P F III

Project No.

11. Technical Programme ✓

Date of Start: 1984

1) Selection of disease occurrence areas in the coconut growing tracts of Assam and West-Bengal through State Agricultural Department/University.

2) Survey of the disease affected areas of Assam and West-Bengal in collaboration with Department of Agriculture/ Agricultural University, Assam and Department of Agriculture, West-Bengal respectively.

3) Micronutrient analysis of soil and plant tissue of diseased and healthy coconut palms.

4) Isolation and identification of organism (if any) from the affected tissues.

~~5) Soil application of Borax @ 50 gm per hectare for every interval in the basin showing recovery of the diseased palms in the early and middle stages of disease recovery when Borax is applied over a disease area.~~

5) Field control trials using different levels of Sed. Borate (Borax) to the diseased palms at different intervals.

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

KASARAGOD-670 124, KERALA

R P F III

Project No.

Date of Start-1984.

12. Final Report: 1984-85-1991-92.

Materials and Methods:-

1. A collaborative field survey was conducted in Kamrup, Kokrajhar, Barpeta, Goalpara and Newgaon districts of Assam. Three stage sampling procedure was used with sub-division as stratum. 25 percent of the VLEW Elakas were selected as the primary sampling unit. 20 percent of the serially numbered homestead was selected as the second stage unit by systematic cluster. All the coconut palm in the selected cluster of 5 homesteads were counted and examined for the incidence of disease and classified them under different age groups in both non bearing and bearing stages. The approximate age and estimated yield of the palms of both healthy and diseased were recorded by randomly selecting 2 healthy and 2 diseased palm from each cluster. Other information such as cultural practices, cropping patterns etc. were also collected.

2. Micronutrient analysis of soil and plant tissues of both healthy and diseased coconut palm:-

Soil and leaf samples from both healthy and diseased coconut palms were collected from 19 locations in Assam and from 14 location in Jalpaiguri area of West-Bengal.

Two soil samples at the depth of 0-25cm and 25-100cm were collected from the base of each diseased and healthy palms. Leaf samples representing from number/ in the crown of a palm were also collected. Soil samples collected, were analysed for PH, organic Carbon, exchangable Ca, Mg, P, K & B, as per standard procedures (Jackson, 1976). Cu, Zn, Mn & Fe were extracted by DTPA technique. Leaf samples collected, were analysed for estimation of total NPK by Jackson (1967). Other nutrients such as beron, Cu, Zn, Fe & Mn were also estimated for the method described by Jackson (1967).

3. Isolation and identification of organism if any:-

To isolating organism (if any) responsible for the disease, the diseased leaf samples were collected and plated in PDA (Potato Dextrose Agar) using the normal isolation methods. The plates were incubated at $30^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 7-15 days for observation.

4. Disease indexing:-

The indexing of disease was evaluted by studing the severity of disease symptoms and other associated characters observed among 210 diseased palms. DI-0 stand for healthy palm where as, DI : 1 for early stage, DI : 2 & 3 for middle stage & DI : 4 & 5 was grouped for Advance stage of diseased condition.

Contd.....2.

5. Field control:-

Three field control trials were laid out in Assam in different locations using three levels of Borax (sodium borate) to the diseased coconut palms grouped into three treatments. (viz. 25g/palm = T1; 50g/palm = T2 and 75g/palm = T3). Indixing of disease was recorded in both pre-treatment period and post-treatment period to study the rate of recovery observed among the treated palm. Borax was applied to the soil basin of the palm at six monthly intervals (Feb/March and Sept/October) and incorporated in the soil by forking followed by light irrigation. Morphological observation for improvement of the disease was recorded at regular intervals. Altogether 84 diseased palms were studied under three field trials.

RESULT AND DISCUSSION:-

Survey:-

a) Incidence and intensity of disease:-

Out of total 806 VLEW Elakas of the five selected districts, 117 Elakas were surveyed. The total estimated plant population of the survey area comprised of 1884164 nos of healthy (Free from crown choke disease) and 228103 nos of diseased palms. Out of total plant population, 862605 nos palm were non bearing and remaining 1250602 palm were in bearing stages. The percentage of disease incidence in Kamrup district was highest (14.3%) which was followed by Nowgaon (6.14% - Mari-gaon sub-division only), Barpeta (6.14%), Goalpara 4.83% and lowest in Kokrajhar (3.23%). The intensity of disease incidence calculated in different age groups showed that palm under young age group (less than 3 yrs. and 3 to 7 yrs.) were highly affected by the disease (1.56% to 28.42%) whereas in adult palm the incidence is found to be less (0.68% to 13.74%). Out of 2.11 million estimated palms, about 0.23 million palms were found diseased, of which 0.18 million was in Kamrup district alone. It was also noticed that about 92 percent of total diseased palms estimated in all the district surveyed were found in Kamrup & Barpeta districts together where as Goalpara and Kokrajhar district together showed less than 8 thousand diseased palms.

b) Production loss:-

Out of total production of 79 million nuts estimated from the surveyed area about 50 million nuts were produced in Kamrup district followed by 19 million nuts in Barpeta district. The production of coconut from Goalpara and Kokrajhar district were estimated to be 2.5 million and 3.1 million nuts only which may be due to more number of non bearing palms than the bearing palms. The loss of productivity over total yield due to disease showed that maximum loss was in Kamrup district (11.16%) which was followed by Kokrajhar (6.0%), Goalpara (3.73%), Barpeta (2.78%) and least in Nowgaon.

c) Chemical analysis of soils and plant tissue samples:-

Result of the analysis of the plant tissue (leaf samples) in Assam showed that P, Ca, Mg and B concentration were significantly differed between healthy and diseased palms. B, Cu and K were found to be less in diseased palms. The samples collected from West-Bengal also ~~showed~~ showed the same trend but significant difference was observed in 'B' and total number of leaves only. In analysing the pooled value and also keeping in view the 'concentration effect' that would operate in diseased palms, the only nutrients that were found low in diseased palms in spite of 'concentration effect' were K & leaf boron concentration of the palms was much less.

area (5.4 to 7.4 ppm) than in palms under healthy areas (9.4 to 10.2 ppm).

In diseased areas, the Ca/B ratio of leaf rank at N/2 or $(n + 1)/2$ in diseased palm was 145.4 and in healthy palm was 95.0 respectively. Whereas the Ca/B ratio of healthy palms in healthy area was found to be 71.0 only. Normally plant grow only when certain balance exists in the intake of Ca & B. The Ca/B ratio is found to be very high in the leaves of diseased palms and there by suggesting that 'B' might be a limiting factor in 'Crown choke' disease of Coconut. Analysis of soil samples indicated that the soils of the diseased palms had lower content of all the available nutrients as compared to the soils of healthy palms. Leaching of B in soils in the diseased area might also be responsible for low content of soil boron.

Attempts to isolate any fungal and bacterial pathogen from the diseased leaf samples met with failures only similar observation was also made by earlier workers (Chakravarty et al 1970).

d) Field control management:-

The diseased palms under the three field trials (plots) were serially numbered and indexing of disease were recorded at the pre-treatment period (i.e. before application of first recommended doses of Borax) and thereafter every six monthly intervals till the completion of the experiment. At the pre-treatment period, out of 84 diseased palm selected for the trials, 3 palms were in early stage (DI : 1), 59 palms in middle stage (DI : 2 - 3) and 22 palms were in advance stages of disease (DI : 4 - 5).

After first application of recommended doses of Borax, the sign of recovery ϕ was observed among the treated palm which had lower disease index (DI : 1 to 3) at pre-treatment period. The recovery of palm were observed by emergence of new healthy leaves at the crown.

The response of borax in the recovery of crown choke disease was very much prominent from the data recorded after 5th application of recommended doses of Borax to the treated palms. In treatment ~~XX~~ T1 (25g/palm/application) and T2 (50g/palm/application) about 90% to 100% of total recovery was observed, whereas in T3 (75g/palm/application) the total recovery varied from 60% to 90%.

Post-treatment data showed that out of total 84 treated palm, 75 palms under three different doses of borax treatments (T1 = 25 palm; T2 = 23 palm and T3 = 22 palm) were cured and found healthy (DI - 0). From the remaining palm, 7 palms also showed partial recovery (viz. 3 palm in DI : 1 & 4 palm in DI : 2 - 3). Only 2 palm which had advance stage of disease (DI : 4-5) did not show any sign of improvement at all. The overall percentage of recovery calculated was 89.3% in all the three plots together.

From the result obtained in the field control trials revealed that the diseased palms having early and middle stage of disease at pre-treatment period recovered when borax is applied even at lower doses in the basin at 6 monthly intervals.

CONCLUSION:-

- 1) Crown choking disease of Coconut is a serious malady affecting the production of coconut in Assam and West-Bengal.
- 2) Incidence of disease is prevalent in almost all the districts surveyed in Assam. The maximum disease incidence is found in Kamrup district (14.4%) of which Rangia and Nalbari sub-division showed 18.9% and 17.5% of palms are diseased. In Kokrajhar district, Gossaigaon and Kokrajhar sub-divisions are almost free from this malady.
- 3) The total loss in yield due to disease in the surveyed area is estimated at 6.38 million nuts. The Kamrup district alone accounted for a loss of about 5.54 million nuts.
- 4) Chemical analysis of the soil & plant-tissue samples showed that soils of diseased palm had lower PH and lower content of all the available nutrients as compared with the nutrient content present in soils of healthy palm. The leaf boron concentration is much less (5.4 ppm - 7.4ppm) in palms in the diseased area than in palms of healthy area (9.4ppm - 10.2ppm). Boron might be a factor in Crown choking disorder of coconut, therefore deficiency of B in plant and soil is the cause of Crown choking disease of coconut.
- 5) Soil application of Borax & @ 50gm per palm at half yearly intervals in the basin showed recovery of the disease. Palms in the early and middle stages of disease recovered when Borax is applied even at lower doses.

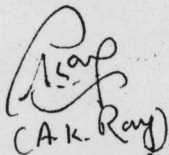

(A.K. Ray)
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Kehikuchi Guwahati-781017

Table:- Diseased palms showing different stages of recovery after Borax treatment.

Disease level (DI)	No of palms in various treatments							
	Pre-treatment				" Post-treatment			
	period				" period			
	T1 (25g/ palm)	T2 (50g/ palm)	T3 (75g/ palm)	Total	T1 (25g/ palm)	T2 (50g/ palm)	T3 (75g/ palm)	Total
Healthy (-0)	0	0	0	0	25	28	22	75
Early disease (1)	3	0	0	3	0	0	3	3
Middle disease (2-3)	22	24	13	59	0	1	3	4
Advanced disease (4-5)	0	5	17	22	0	0	2	2
Total:	25	29	30	84	25	29	30	84

13. Approximate expenditure incurred in the Project: (Give reasons for variation, if any, from original estimated cost)

With the original estimated cost of the Institute.

14. Publications and material (one copy each to be supplied with this proforma)

- a) Research papers 'Crown choke disorder of coconut' - A case of Boron deficiency:- (1989): JPC Vol 17(2) ppm - 114 - 120.
- b) Popular articles 'Crown choke disease of Coconut': (1990):
Indian Coconut J1: Vol XX No.9 (3-6).
'Coconut crown choke disease - Intensity and production loss in Assam' - a survey Report (1990) CPCRI, Kasaragod publication.
- c) Reports

Four.

- d) Seminars and workshops (Relevant to the Project) in which the Scientists have participated:

- e) Material developed (such as new varieties of crops or breeds of farm animals, implements, products, etc.)

15. Details (Nos. etc.) of Field/Laboratory Note books and final material and their location

CPCRI, Research Centre, Kahikuchi, Assam.

CPCRI, Kasaragod, Kerala.

16. Comments/suggestions of Project Leader regarding possible future line of work that may be taken up arising of this project:

Application of Borax @ 50gm/palm at 6 monthly intervals (Feb/March and Sept/October) helps in controlling crown choke disease of coconut.

17. Signatures with name of Project Leader and Associates:

(A.K. RAY)

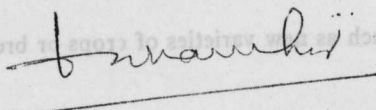
Project Leader

Scientist Incharge

C.P.C.R.I. Research Centre

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18. Signature (with comments, if any) of Head of Division/Section/Station:



19. Signature (with comments, if any) of Director: