

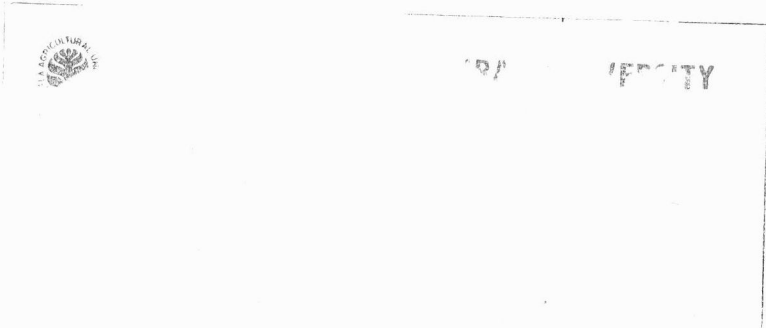
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KERALA AGRICULTURAL UNIVERSITY

Annual Report of the

ALL INDIA CO-ORDINATED FRUIT IMPROVEMENT PROJECT

(Banana and Pineapple)

1975-'76

Banana Research Station & Pineapple Research Centre
Kannara University Main Campus
Vellanikkara

TRICHUR
KERALA STATE

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

Annual report of the Banana & Pineapple Research Station, Kannara,
Trichur District, Kerala for the year 1975-76.

(KERALA AGRICULTURAL UNIVERSITY)

/ALL INDIA CO-ORDINATED FRUIT IMPROVEMENT PROJECT/

S E C T I O N - A.

1. Report period : From 1.4.1975 to 31.3.1976
2. Project Code No. : 8 centre - Trichur, Kerala
3. Report No. :
4. Location : Kannara, Trichur (District), Kerala
5. Project title : All India Co-ordinated Fruit Improvement Project, Trichur Centre

6. Objectives:

To evaluate and select superior varieties of Banana and Pineapple by introduction from within and outside the country and to standardise their cultivation practices by conducting experiments on different aspects like cultural, manurial, weed control, application of growth regulators, plant protection etc.

7. Present staff position : Table--A attached
8. Total sanctioned grant for the centre)
Rs.10.20 lakhs (5 years
1974-75 to 1978-79)

9. Total amount spent

<u>Year</u>	<u>Recurring</u>	<u>Non-recurring</u>	<u>Total</u>
1975-76	Rs.1,69,662.95	Rs.16,265.37	Rs.1,85,928.32

S E C T I O N - B.

10. Approved technical programmes:

BANANA

Project No.2.1.1. Varietal collection in banana.

Objectives:

- a. To test large genetic stocks for evaluation
- b. To test selected clones that have shown promise in certain areas.

.....contd.

Technical:

a. Collection from various sources

b. Varietal testing:-

Varieties: 1. Giant Governor
 2. Robusta
 3. Peddapacha
 4. Monsmarie

No. of replications: 8

Design : Randomised Block
Design

Spacing : 2.4 x 1.8 m

Plants per plot : Gross - 20
Net - 6Project No.2.2.2. Nutritional requirements of banana.

Objectives: : To find out the optimum requirement of NPK to correlate with leaf analysis

Duration : 5 years

Treatments : N at 100, 200 and 300 g/plant
 $P_{25}O_5$ at 0, 40 and 80 g/plant
 K_2O at 0, 200 and 400 g/plant

Spacing : 2.4 x 1.8 m

Design : 3^3 factorial confounded

Treatments : 27

Replications : 2

No. of plants/plot : 12

Variety : Robusta

Time of application : 1st dose : 40-50 days after planting
 2nd dose : 70-80 days after planting
 3rd dose : 110-120 days after planting

Basal dose : 15 kg F.Y.M.

.....contd.

Project No.2.2.3. Trace element studies.

Objectives	: To study the effect of trace elements on growth and yield of banana.
Duration	: 5 years
Variety	: Robusta
Layout	: 20 x 2 RBD
Spacing	: 2.4 x 1.8 m

Manures:

Essential dressing of NPK + 15 kg F.Y.M. NPK fertilizer will be applied in 4 split doses prior to micronutrient application which is done in 4 split doses, i.e. at planting, 40, 70 and 120 days after planting. The effect of trace elements on pre-harvest and post-harvest development of plants and fruits will be studied.

Treatments:

1. Control (NPK 160, 160, 320 g/plant)
2. B (Boron) at 12.5 kg/ha as Sodium borate
3. B (Boron) at 25.0 kg/ha as Sodium borate
4. Zn (Zinc) at 25.0 kg/ha as Zinc sulphate
5. Zn (Zinc) at 50.0 kg/ha as Zinc Sulphate
6. Cu (Copper) at 12.5 kg/ha. as Copper Sulphate
7. Cu (Copper) at 25.0 kg/ha as Copper Sulphate
8. Mn (Manganese) at 12.5 kg/ha. as Manganese sulphate
9. Mn (Manganese) at 25.0 kg/ha. as Manganese sulphate
10. Mo (Molybdenum) at 2.5 kg/ha. as Sodium molybdate
11. Mo (Molybdenum) at 5.0 kg/ha as Sodium molybdate
12. B 12.5 + Zn 25.0 + Cu 12.5 + Mn 12.5 + Mo 2.5 kg/ha.
13. B 25.0 + Zn 50.0 + Cu 25.0 + Mn 25.0 + Mo 5.0 kg/ha
14. B 12.5 + Zn 25.0 + Cu 12.5 + Mn 12.5 kg/ha.
15. B 25.0 + Zn 50.0 + Cu. 25.0 + Mn 25.0 kg/ha.
16. B 12.5 + Zn 25.0 + Cu 12.5 kg/ha.

.....contd.

17. B 25.0 + Zn 50.0 + Cu 25.0 kg/ha
18. B 12.5 + Zn 25.0 kg/ha
19. B 25.0 + Zn 50.0 kg/ha
20. Control (F.Y.M 15 kg/ha)

Project No.2.2.5. Control of weeds in banana with the aid of herbicides.

Objectives:

1. Survey of weed flora
2. To find out suitable herbicides which would control a local spectrum of weeds
3. To study the effect of herbicides on quality and yield of fruits
4. Economics of weed control with herbicides

Duration	: 2 years
Design	: 10 x 3 RBD
Variety	: Robusta
Spacing	: 2.4 x 1.8 m
Treatments	: 10

Pre-emergence applications:

1. Diuron at 2 kg/ha at bimonthly intervals
2. Diuron at 3 kg/ha at bimonthly intervals
3. Diuron at 4 kg/ha at bimonthly intervals

Post-emergence applications:

4. Gramoxone 1.5 L/ha + Diuron 2 kg/ha.
5. ,, 1.5 L/ha + Diuron 3 kg/ha.
6. ,, 1.5 L/ha + Diuron 4 kg/ha
7. ,, 1.5 L/ha + 2, 4-D Na Salt 1 kg/ha.
8. ,, 1.5 L/ha + 2, 4-D Na salt 2 kg/ha.
9. ,, 1.5 L/ha + 2, 4-D Na salt 3 kg/ha.
10. Control (Hand weeding)

Repeated applications:

1st year : 6 monthly intervals
 2nd year : 6 monthly intervals or whenever
 weeds break down in best treatments

Treatments : Same as in first application

Dosages: Gramoxone - same as in the first application

Diuron - $\frac{1}{2}$ kg. first application dosages 2, 4-D Na salt.

PEST AND DISEASES

Project No.2.3.1. Studies on virus disease of banana and their control.

Experiment No.1.

Objective : To inspect banana growing areas to account for the extent of diseases and losses.

Experiment No.3.

Objective : To screen all cultivated and exotic varieties for their disease resistance (Bunchy top disease of banana)

Design : RBD
 Treatments : 10 varieties
 Replications : 3
 No. of plants/plot : 5
 Varieties tested:

Group No.1 Inoculated during March, 1975

1. Ashmonthan	6. High gate
2. Pisang lilin	7. Zanzibar
3. Mas	8. Attunendran
4. Pisang awak	9. Chengazhikodan
5. Nalla bontha batheesa	10. Giant plantain

Group No.II. Inoculated during January 1976

1. Galanamalu	6. Lacatan
2. Malbhog	7. Harichal
3. Booditha bontha batheesa	8. Amritsagar
4. Karpooravalley	9. Kanchikela
5. Nendra padatti	10. Chakarakadali

.....contd.

Experiment No.5

Objective: To control the spread of disease by cultural methods, therapeutic measures, and by use of insecticides.

Design : RBD
 Treatment : 13
 Replication : 3
 Variety : Nendran
 No. of plants/plot : 6

Treatments: 1. Roger 0.05%
 2. Ektox 0.02%
 3. Metasystox 0.02%
 4. Thimet (granules 15 kg/ha)
 5. Dimecron 0.05%
 6. Metacid Combi 0.05%
 7. Malathion 0.05%
 8. Ekatin 0.02%
 9. Thioldan 0.05%
 10. Disyston (granules) 40 kg/ha
 11. Sevin 0.2%
 12. Anthio 0.05%
 13. Control

Project No.2.3.2. Fungal diseases of banana and their control.Experiment No.2.

Objectives: To search for suitable control measures using different fungicides against leaf spot diseases of banana.

Design : RBD

Treatments : 7

1. Blitox (0.5%)
 2. Difoltan (0.3%)
 3. Fycol (1%)
 4. Bordeaux mixture (1%)
 5. Dithane Z-73 (0.2%)
 6. Dithane M-45 (0.2%)
 7. Control

Replications : 4
 Variety : Dwarf Cavendish
 No. of plants/plot : 6

....contd.

Project No.2.3.5. Studies on Nematode parasites of bananaExperiment No.3.

Objectives: Evaluation of suitable nematicides for the control of Radopholus similis and root knot nematodes.

Design : RBD

Variety : Nendran

Treatments : 5

1. Dasanit
2. Carbofuran
3. Temik
4. Thimet
5. Control

Replications : 4

Dose : 2 g active ingredient per plant

No. of plants/plot : 6

PINEAPPLEProject No.3.2.1. Population density trial in pineapple variety 'Kew'.

Objectives: To find out the most optimum population density for 'Kew' variety of pineapple for maximising production.

Duration : 6 years

Treatments : Total 21

- a. Spacing - 7
- b. Methods of planting - 3

Details of spacings (in cms.)(S)

<u>S.No.</u>	<u>Plant to plant</u>	<u>Row to row</u>	<u>Bed to bed</u>
1	30	60	75
2	25	60	90
3	30	45	60
4	25	60	75
5	25	45	75
6	25	45	60
7	20	40	60

.....contd.

- b. Methods of planting (P) : 1. Two row bed
 2. Three row bed
 3. Four row bed
- Type of planting materials : Uniform suckers
- Variety : Kew
- Layout : Split plot design
- No. of replications : 7

Population density per hectare

Treatment	Spacing in cms.	No. of plants per hectare		
		Two row bed	Three row bed	Four row bed
S1	30 x 60 x 75	45,382	51,282	52,253
S2	25 x 60 x 90	53,333	57,143	52,257
S3	30 x 45 x 60	63,492	66,666	68,376
S4	25 x 60 x 75	59,259	61,538	62,745
S5	25 x 45 x 75	61,666	72,727	76,190
S6	25 x 45 x 60	76,190	80,000	82,051
S7	20 x 40 x 60	1,07,030	1,07,135	1,11,121

Project No.3.32.2 Nutritional studies in pineapple variety 'Kew'.

Objectives: To find out the optimum dose of Urea as foliar spray in combination with soil application.

Treatment : Total No. of treatment - 12
 Dose of Nitrogen (N) - 3
 Method of application(M)- 4

a. Doses of Nitrogen/plant(N)

N1 = 8 gm Nitrogen per plant per year
 N2 = 12 gm Nitrogen per plant per year
 N3 = 16 gm Nitrogen per plant per year

Nitrogen will be given in the form of low biuret urea as 4% foliar spray. Phosphorous and potash will be given in the form of super phosphate and Muriate of potash at the rate of 4 and 12 gm respectively per plant per year in soil. Phosphorous will be applied in one dose and Potassium in 3 equal doses.

.....contd.

b. Method of application(M):

M1= 25% N as foliar + 75% N in soil
 M2= 50% ,, + 50% ,,
 M3= 75% ,, + 25% ,,
 M4= All N in soil

Nitrogen in soil will be given in split doses as given below:

75% in N in soil will be given in 3 split doses
 50% N in soil will be given in 2 split doses
 25% N in soil will be given in one dose
 All N in soil will be given in four split doses

Type of planting material : Uniform suckers
 Variety : Kew
 No. of replications : 7
 Plot size : 4.20 x 2.4 Meters
 Spacing : 30 cm x 45 cm x 60 cm
 No. of plants/plot : 64

Project No.3.2.3. Effect of plant growth regulators on fruit size and maturity of pineapple 'Kew' variety.

Objectives:

To find out the best concentration of Planifix and stage of application of the same in increasing fruit size and delaying maturity of fruits

Duration : 6 years
 Treatments : Concentrations of Planifix
 1. 100 ppm
 2. 200 ppm
 3. 300 ppm
 Stages of application: 1. One month after flowering
 2. Two months after flowering
 3. Three months after flowering

Uniform flowering of plants will be induced by applying Ethrel at 100 ppm when the plants are 35-39 leaf stage.

....contd.

Type of planting material : Uniform suckers
 Variety : Kew
 Layout : Randomised Block Design
 No. of replications : 3
 Plot size : 7.50 x 2.10 metres
 Spacing : 30 cm x 60 cm x 90 cm
 No. of plants/plot : 70

Project No.3.2.4. Standardisation of the time of application of growth regulators for materials raised from suckers and crowns.

Objectives:

To find out the best stage of application of growth regulators for getting optimum fruit weight.

Duration : 3 years

Treatments: Application of Ethrel at 100 ppm on suckers and crown at different stages of growth.

a. Suckers: 1. Application at 26-29 leaf stage
 2. " 30-34 "
 3. " 35-39 "
 4. " 40-44 "
 5. " 45-49 "

b. Crowns: 1. Application at 26-29 leaf stage
 2. " 30-34 "
 3. " 35-39 "
 4. " 40-44 "
 5. " 45-49 "

Fertilizer level:

16 gm N, 4 gm P₂O₅ and 12 gm K₂O per plant/year

Type of planting materials : Uniform suckers and crowns
 Variety : Kew
 Layout : Randomised Block Design
 No. of replications : 4

.....contd.

Plot size : 7.5 metres x 2.10 metres
 Spacing : 30 cm x 60 cm x 90 cm
 No. of plants/plot : 70

Project No.3.2.5 Control of weeds in pineapple with the aid of herbicides.

Objectives:

1. T Survey of weed flora
2. To find out the suitable herbicide which would control a broad spectrum of weeds
3. To study the effects of herbicides on yield and fruit quality
4. Economics of weed control with herbicides

Duration : 3 years

Treatments : 14

Application of:

1. Diuron at the rate of 1.5 kg/ha
2. " " 2.0 kg/ha
3. " " 3.5 kg/ha
4. " " 3.0 kg/ha
5. Bromachl at the rate of 1.5 kg/ha
6. " " 2.0kg/ha
7. " " 2.5 kg/ha
8. " " 3.0 kg/ha
9. Diuron at the rate of 1.5 kg/ha + Bromacil @ 1.5 kg/ha
10. " " 1.5 kg/ha + " " 2.0 " "
11. " " 2.0 kg/ha + " " 1.5 kg/ha
12. " " 2.0 kg/ha + " " 2.0 kg/ha.
13. Hand weeded control
14. Unweeded control

Type of planting material : Uniform suckers

Variety : Kew

Labout : Randomised Block design

No. of replications : 3

Plot size : 7.5 metres x 2.1 metres

Spacing : 30 cm x 60 cm x 90 cm

No. of plants/plot : 70

The application of herbicides is to be repeated six months after the first application. Subsequent applications whenever there is breakdown in weed in the best treatments. Dosage will be half of the first application.

Project No.3.2.6 Adaptive trial for induction of flowering in Kew pineapple.

Objectives:

To find out the best growth regulators for induction of flowering in pineapple at different locations

Duration : 3 years
 Treatments : 3
 Application of:
 1. Ethrel at 100 ppm
 2. Ethrel at 25 ppm + 2% Urea + 0.04% Calcium carbonate
 3. Planofix - 1 ml in 4.5 litres of water

Type of planting materials : Uniform suckers
 Variety : Kew
 Layout : Randomised Block Design
 No. of replications : 6
 Plot size : 6.3 metres x 2.4 metres
 Spacing : 30 cm x 45 cm x 60 cm
 No. of plants/plot : 96
 Stage of application : 35-39 leaf stage.

Project No.3.3.1 Survey and assessment of diseases of pineapple.

S E C T I O N - C.

RESULTS

2.1 Banana (Improvement of fruits through selection and hybridisation)

....contd.

Project 2.1.1 (a) Varietal collection in banana.

Varietal collection of the station has been enriched by adding 5 more clones during the year, thus bringing the total number to 144. The five new clones were collected from cultivators' fields within the state during a survey conducted to spot out clonal variations in the cultivators' fields. The special features of these clones as reported by the farmers are given below:

S.No.	Local name	Clone No.	Special features
1.	Pattambi	KNR 2/75	Resistant to bunchy top disease
2.	Pappanamcode	KNR 4/75	Tetraploid with runner suckering habit
3.	Chakkarakunnen	KNR 7/75	Seeded variety, resistant to bunchy top - fruits having medicinal properties
4.	Manjeri Nendran	KNR 8/75	A high yielding Nendran variety
5.	Madhura palayan-kodan	KNR 1/76	A very tall variety of Palayan-kodan with very sweet fruits - high yielder

Detailed observations on these clones are being recorded to evaluate their performance and to confirm the farmers' claims.

Based on taxonomic scoring (Simmonds and Shepherd; 1955) the Banana cultivars grown in this station were tentatively classified as shown in table I.

.....contd.

TABLE I/

Grouping of Banana varieties based on Taxonomic scoring

S.No.	Name of the variety	Grouping based on quality	Remarks
AA GROUP			
1.	<u>Musa acuminata</u>	Wild plant	Tiny non-edible fruits
2.	Paka	Table variety	Zanzibar variety; used for breeding works
3.	Sikuzani	Table variety	-do-
4.	Pisang lilin	Table variety	Malayan variety; short duration; used for breeding work
5.	Namari	Table variety	Tiny plant with small fruits
6.	Pisang mas	Table variety	Malayan variety; sweet fruits; poor yielder
7.	Matti	Table variety	Tasty fruit; fingers closely set; long, thin fruits
8.	Chingan	Table variety	Poor yielder; flesh cream white soft and smooth
9.	Sannachenkadali	Table variety	Red colouration on the under side of young leaves; rind red colour
10.	<u>Musa ornata</u>	Wild plant	Seeded variety
AAA GROUP			
11.	Gromichael	Table variety	Heavy yielder
12.	High gate	Table variety	Semi-tall sport of Gromichael
13.	Dwarf Cavendish	Table variety	Heavy yielder
14.	Mauritius	Table variety	Syn. Dwarf Cavendish
15.	Basarai	Table variety	Syn. Dwarf Cavendish
16.	Vamanakeli	Table variety	Syn. Dwarf Cavendish

....contd.

17.	Binkehal	Table variety	Ceylonese name of Dwarf Cavendish
18.	Monsmarie	Table variety	Mutant of Dwarf Cavendish
19.	Peddapacha arati	Table variety	Heavy yielder
20.	Giant Governor	Table variety	Heavy yielder
21.	Harichal	Table variety	Average yielder
22.	Robusta	Table variety	Heavy yielder
23.	Chenkadali	Table variety	Heavy yielder; fruits slightly flavoured
24.	Red banana	Table variety	Syn. Chenkadali
25.	Pisang Embon	Table variety	Syn. GrosMichel
26.	Pachachingan	Table variety	Low yielder
27.	Vadakkankadali	Table variety	Low yielder
28.	Galanamalu	Table variety	Low yielder
29.	Amritsagar	Table variety	Average yielder
30.	Wather	Table fruit	Individual fruit very big
31.	Nallachenkadali	Table variety	Average yielder
32.	Manoranjitham	Table variety	Fruits with flavour
33.	Chakkarakadali	Table variety	Low yielder
34.	Nakitembe	Table variety	Received from Uganda
35.	Nakabululu	Table variety	Received from Uganda
36.	Nakinyika	Table variety	Received from Uganda
37.	Sira	Table variety	Received from Uganda
38.	Radja siraha	Table variety	Received from Indonesia
39.	Sapumal anemalu	Table variety	Low yielder
40.	Lacatan	Table variety	Low yielder. Tall mutant of Dwarf Cavendish
41.	Anaikomban	Table variety	Low yielder
42.	Ambalakadali	Table variety	Low yielder

.....contd.

S.No.	Name of the variety	Grouping based on quality	Remarks
<u>AAB GROUP</u>			
43	Pisang raja	Table variety	Received from Malaya
44.	Radja	Table variety	Received from Malaya
45.	Myndoli	Table variety	Long duration; big sized fruits
46.	Giant plantain	Table variety	Syn. Myndoli
47.	Changanasseri Nendran	Table variety	Average yielder
48.	Chengazhikodan	Table variety	Fruits of high quality
49.	Nedunendran	Table variety	Fruits big; held out far in the bunch
50.	Thiruvananthapuram	Table variety	Low yielder
51.	Suandal	Table variety	Low yielder
52.	Attunendran	Table variety	Thrives under rainfed conditions
53.	Anilvazhai	Table variety	White streaks on the fruit and leaves
54.	Moongil	Table variety	Sport of Nendran
55.	Palayankodan	Table variety	High yielder; most popular variety
56.	Tomgate	Table variety	Very low yielder
57.	Mas	Table variety	Average yielder
58.	Mottapoovan	Table variety	Mutant of Palayankodan; low yielder
59.	Rasthali	Table variety	Medium yielder; very good keeping quality.
60.	Marthoman	Table variety	Syn. Rasthali
61.	Poovan	Table variety	Syn. Rasthali
62.	Mutheli	Table variety	Syn. Rasthali
63.	Malbhog	Table variety	Syn. Rasthali
64.	Virupakshy	Table variety	Low yielder with very sweet fruits
65.	Ladies finger	Table variety	Syn. Virupakshy

.....contd.

S.No.	Name of the variety	Grouping based on quality	Remarks
66.	Sirumalai	Table variety	Ecotype of Virupakshy
67.	Poochakunnan	Table variety	Low yielder
68.	Kodappanilla kunnan	Table variety	Mutant of Kunnan
69.	Mannan	Table variety	Low yielder
70.	Vannan	Table variety	Ecotype of Virupakshy
71.	Suganthi	Table variety	Low yielder
72.	Krishna Vazhai	Table variety	Black stemmed sport of Virupakshy
73.	Karimkadali	Table variety	Low yielder
74.	Pachanadan	Table variety	Low yielder
75.	Kaali	Table variety	Syn. Pachanadan
76.	Kapur	Table variety	Ecotype of Pachanadan
77.	Nendrapadathy	Table variety	Low yielder
78.	Nendravannan	Table variety	Syn. Nendrapadathy
79.	Wahla	Table variety	High yielder
80.	Chinali	Table variety	Low yielder
81.	Chinia	Table variety	Very sweet fruits
82.	Dakshinagar	Table variety	Average yielder
83.	Pachakadali	Table variety	Average yielder
84.	Charapadathi	Table variety	Low yielder
85.	Chetty	Table variety	Low yielder
86.	Adakkakunnan	Table variety	Mutant of Kunnan
87.	Neyvannan	Table variety	Low yielder
88.	Poomkadali	Table variety	Low yielder
89.	Neymannan	Table variety	Average yielder
90.	Chirapunchi	Table variety	Low yielder
91.	Thiruvannan	Table variety	Low yielder
92.	Pisang seribu	Ornamental	Very long bunch with small fruits.
93.	Zanzibar	Table variety	Big sized fruits with three or four hands
94.	Jamaica	Table variety	Syn. Zanzibar
95.	Java	Culinary variety	Seeded fruits

.....contd.

S.No.	Name of the variety	Grouping based on quality	Remarks
<u>ABB GROUP</u>			
96.	Monthan	Culinary variety	High yielder
97.	Kanchikela	Culinary variety	Resistant to bunchy top disease.
98.	Bluggoe	Culinary variety	Syn. of Monthan
99.	Pachabonthathees	Culinary variety	Bud sport of Monthan having more hands of small fruits.
100.	Boodithabonthathees	Culinary variety	Bud sport of Monthan with waxy fruits and very high yield
101.	Ashmonthan	Culinary variety	Low yielder
102.	Bainsa	Culinary variety	Bunches of medium size
103.	Sambranimonthan	Culinary variety	Sport of Monthan with waxy fruits.
104.	Kuribontha	Culinary variety	Small sized, spindle shaped fruit
105.	Nallabontha	Culinary variety	High yielder with green rinded fruit
106.	Malaimonthan	Culinary variety	Suited for cultivation in higher elevation.
107.	Kallumonthan	Culinary variety	Seeded variety; fruit as hard as stone
108.	Kosthabontha	Culinary variety	Very high yielder
109.	Boodibale	Culinary variety	Very high yielder
110.	Boodi	Culinary variety	Syn. Boodibale
111.	Peyan	Culinary variety	Low yielder
112.	Ennabanian	Culinary variety	Low yielder
113.	Elavazhai	Leafy variety	Grown for leaves
114.	Vemmeettumannan	Table variety	Waxy fruited sport of Neynannan
115.	Thenkunnan	Table variety	Low yielder
116.	Ashybathees	Culinary variety	High yielder

.contd.

S.No.	Name of variety	Grouping based on quality	Remarks
117.	Thellabontha	Culinary variety	Waxy fruited many handed sport of Nallabontha.
118.	Alukehel	Culinary variety	Popular cooking variety in Ceylon
119.	Karpooravally	Culinary variety	Tolerant to bunchy top
120.	Sawai	Culinary variety	A clone of M.balbisiana.
121.	Erachivazhai	Culinary variety	Low yielder
122.	Pisang awak	Culinary variety	Average yielder; seeded when crossed.
123.	Kapok	Culinary variety	Average yielder
124.	Jurmoney Kunthali	Culinary variety	High yielder
125.	Nallabonthathees	Culinary variety	Sport of Nallabontha with numerous hands of small fruits
126.	Gouria	Culinary variety	Average yielder
127.	Mangunery peyan	Culinary variety	Average yielder
128.	Peykunnan	Culinary variety	Average yielder
<u>AAAA GROUP</u>			
129.	Bodles altafort	Table variety	Average yielder; tolerant to bunchy top disease.
<u>BB GROUP</u>			
130.	<u>Musa balbisiana</u>	Wild plant	Fruits with full of seeds.
<u>AB GROUP</u>			
131.	Neypoovan	Table variety	Mutant of Rasthali
132.	Ayirampapoovan	Table variety	Syn. Neypoovan
133.	Njalipoovan	Table variety	Low yielder
134.	Adukkan	Table variety	Low yielder
135.	Nendrakunnan	Table variety	Low yielder
136.	Valiyakunnan	Table variety	low yielder
137.	Venneettukunnan	Table variety	Mutant of Kunnan

.....contd.

S.No.	Name of the variety	Grouping based on quality	Remarks
<u>ABBB GROUP</u>			
138.	Hybrid Sawai	Culinary Variety	Very big bunches
139.	Klueteparod	Culinary variety	Natural tetraploid

Based on the studies made during the year on growth, duration, yield and fruit quality of the above 139 varieties, the following were found to be promising:

A. DESSERT TYPES.

1. Dwarf
 - i. Monsmarie (Medium tall)
 - ii. Giant governor do.
 - iii. Robusta do.
 - iv. Dwarf cavendish (Dwarf)

2. Tall
 - i. Gros Michael
 - ii. Chenkadali
 - iii. Poovan
 - iv. Palayankodan
 - v. Njalipoovan
 - vi. Amritsagar
 - vii. Karpooravalli
 - viii. Poomkalli

3. Nendran group
 - i. Nedunendran
 - ii. Zanzibar

B. CULINARY VARIETIES

1. Monthan
2. Batheesa
3. Kanchikela
4. Nendrapadathy

More detailed studies on the various characteristics of the varieties in the germ plasm collections are in progress.

BREEDING WORK:

Ten seeds collected from one bunch of Poovan variety were sown on 15.11.1975. Two seeds germinated on 15.11.1975. The seedlings when they attained 25 cms height and 13 leaves were transplanted in the main field. Monthly growth observations on these seedlings are being taken to evaluate the performance of these plants.

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Triploid x Diploid crossings of the following combinations are being tried to evolve new hybrid Banana varieties.

1. Palayankodan (AAB) x Pisang lilin (AA)
2. Palayankodan (AAB) x Matti (AA)
3. Palayankodan (AAB) x Paka (AA)
4. Pisang awak (ABB) x Pisang Lilin (AA)
5. Pisang awak (ABB) x Matti (AA)
6. Pisang awak (ABB) x Paka (AA)
7. Kanchikela (ABB) x Pisang lilin (AA)
8. Kanchikela (ABB) x Matti (AA)
9. Kanchikela (ABB) x Paka (AA)

The bunches have not yet come to harvest.



B. VARIETAL TESTING:

Mean observations recorded on plant height, girth, number of leaves, flowering duration, sucker/plant, number of hands/bunch, number of fingers, bunch weight and total duration in days along with C.D. at 5% are presented in Table II.

From the data it can be seen that there is significant difference in plant height and bunch weight due to varieties. Difference in other characters were not significant. Among the 4 varieties tried Giant Governor and Robusta were found to be significantly dwarf compared to Peddapacha and Monsmarie. In bunch weight Monsmarie and Giant Governor formed a superior group compared to Robusta and Peddapacha. The same results were obtained during 1973-74 planting also. This indicates that among the medium tall dessert varieties of Banana, Monsmarie and Giant Governor are the highest yielders. The experiment has been repeated for the third year in succession to get conclusive results. Planting was done on 2.9.1975 and the plants have just commenced flowering.

Project No.2.2.2 Nutritional requirements of banana (Variety: Robusta)

The mean data on morphological characters like height, girth number of leaves at flowering stage, duration for flowering, bunch weight, number of hands and number of fingers are presented in table III.

From the data it could be seen that with the increasing levels of nitrogen there is a decline in bunch weight. While 100 gr. nitrogen per plant gave a bunch weight of 10.8 kg, 300 gr. nitrogen gave a bunch weight of only 10.3. The result is in conformity with

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the previous year's findings. In the case of phosphorous and potassium the bunch weight increased with the increasing levels. More or less the same trend is discernable in respect of the number of hands and number of fingers per bunch also.

From the pooled analysis of the data for 1973-74 and 1974-75 the following inferences could be drawn:

(i) 100 gr. N per plant is sufficient (ii) The effect of P is positively significant on bunch weight. The optimum level of P is 166.8 gr/plant which is outside the maximum limit (80 gr.) tried. (iii) The effect of K is also positively significant. The optimum level of K is worked out to be 1266 gr. which is outside the limit tried (400 gr)

The trial has been repeated for the third year in succession to get conclusive results. Planting was done on 18.9.1975 and the plants have just commenced flowering.

Project No.2.2.3. Trace element studies.

The experiment was planted on 23.9.1974. Fertilizers and micronutrients were applied to the crop as per schedule.

Observations on height, girth, number of leaves and number of suckers were recorded at flower emergence. The data recorded are presented in Table IV.

It could be seen from the table that there is a visible overall response in height, girth, number of leaves and number of suckers produced due to treatment 2 (Boron 12.5 kg/ha) compared with other treatments. But the response is not statistically significant. Similarly there is no significant difference in height, girth, number of leaves and suckers due to other treatments.

The bunch weight, number of leaves and number of fingers were recorded at the time of harvest. The data are presented in table V.

There is significant difference in the bunch weight due to treatments. Treatment 2 (Boron 12.5 kg/ha) has exhibited highest bunch weight followed by treatment 8 (Manganese 12.5 kg/ha.) Treatment 3 (i.e. Boron 25 kg/ha) is least significant. This may be due to Boron toxicity.

Similarly there is significant difference between number of fingers/bunch due to treatments. Here also treatments 2 and 8 showed the highest number.

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As regards to number of hands there is no significant difference due to treatments.

To sum up the application of micronutrients has tended to increase the yield. Except treatment 3 (Boron 25.0 kg/ha) all other treatments have produced higher bunch weights compared to the control. Boron is found to play the most important part in this enhancement of yield, but this nutrient at higher levels seems to have a depressing effect. The experiment is being repeated during 1975-76. The experiment was planted on 27.9.1975. The fertilizer and micronutrients were applied to the crop as per schedule. Observations on growth, flowering and yield are being recorded.

Project No.2.2.5 Control of weeds in banana with the aid of herbicides.

The experiment was planted on 10.9.1974 with Robusta variety of banana with the object of finding out whether herbicides can be used for effective weed control. Cultural and manurial applications were done uniformly for all treatments as per schedule.

The first pre-emergence spraying with Diuron was given on 27.9.1974, for treatments 1, 2 and 3. The subsequent bimonthly sprayings for the same treatments were given on 9.12.1974 and 8.2.1975. Post-emergent spraying for all other treatments were given on 7.10.1974, 15.5.1975 and 22.7.1975 and are presented in table No.VI. *See data*

It could be seen from the data that treatments 5 (Gramoxone 1.5 l/ha + Diuron 3 kg/ha) and 9 (Gramoxone 1.5 l/ha + 2, 4-D Na salt 3 kg/ha) are the best in respect of suppression of weed growth as evidenced by both the weed count and dry weight followed by treatment 3 (Diuron at 4 kg/ha) and 4 (Gramoxone 1.5 l/ha + Diuron 2 kg/ha). In the second sampling treatment 5 recorded the least weed growth followed by treatment 3 and they were on par in respect of dry weight. In the final sampling also treatment 5 maintained its superiority both in respect of number and dry weight of weeds followed by treatment 4.

Statistical analysis of the data revealed that treatments 5 and 9 are significantly superior to other treatments both in respect of number and dry weight of weeds in the first sampling three months after planting. In the second sampling also treatment 5 stood significantly superior to others in the number and dry weight. Treatment 3 was also effective in controlling the weeds. This superiority was maintained in the final sampling also by treatment 5. It is therefore evident that the post-emergence application of gramoxone 1.5 l/ha + Diuron 3 kg/ha. about a month after planting of banana is very effective in controlling weeds.

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The effect of herbicides on the growth and fruiting of banana was also studied and the data collected are presented in table VII. The analysis of the data on the number of leaves and number of suckers showed that there is no significant difference in the rate of production of leaves as well as suckers due to treatments. This indicates that the herbicides diuron, gramoxone or 2, 4-D Na salt had no deleterious effect on the growth of banana and these can be safely used in weed control. In respect of bunch weight treatment 5 tops the list followed by treatment 1. As regards the number of hands treatment 1 has got the highest number followed by treatment 5. This has not contributed in anyway to the bunch weight in treatment 1 while it may be the reason in treatment 5. Similarly treatment 1 has got larger number of fingers followed by treatment 9. But higher number of fingers have not contributed in increasing the final bunch weight. Higher bunch weight in treatment 5 may be due to bigger fingers rather than number of hands.

Analysis of the data indicate that there is no significant difference in bunch weight, number of hands and number of fingers due to treatments. This shows that the herbicides have not in any way affected the final crop yield.

The experiment has been repeated for the second year in succession during 1975-76 and planting was done on 6.9.1975. Spraying of herbicides are being done as per schedule and the *data* on weed growth and plant growth are being collected. The plants are in the flowering phase.

2.3. BANANA - PESTS, DISEASES & NEMATODES:

Project No.2.3.1 Experiment No.I

Title: To inspect banana growing areas to account for the extent of disease and losses.

A survey to assess the extent of infection of bunchy top disease in Kerala was conducted and the percentage of infection in some of the important varieties of banana were noted. The mean figures on this observation are presented in table No.VIII.

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TABLE VIII/

The percentage of infection of bunchy top disease in important varieties of banana grown in Kerala State.

<u>Name of the variety</u>	<u>Infection Percentage</u>
1. Nendran	20.3
2. Palayankodan	10.4
3. Kunnan	6.3
4. Njalipoovan	4.9
5. Robusta	10.4
6. Monthan	3.0
7. Peyan	1.8
8. Poovan	10.8
9. Kodappanillakunnan	1.1
10. Dwarf Cavendish	4.2
11. Padatti	7.3
12. Red banana	15.2
13. Gromichael	4.5

The maximum percentage of infection was found in the popular variety of the state Nendran followed by Red banana, Poovan, Palayankodan and Robusta.

Project No.2.3.1 Studies on virus disease of banana and their control.

Experiment No.3 To screen all cultivated varieties of banana for their disease resistance (Bunchy top)

The results of the experiment laid out during 1974-75 and inoculated during March, 1975 are presented in table IX.

TABLE IX/

Percentage of infection of bunchy top disease as a result of artificial inoculation with infected aphids.

<u>S.No.</u>	<u>Name of the variety</u>	<u>Percentage of infection</u>
1.	Ashmothan	40.0
2.	Pisang lilin	53.3
3.	Mas	26.6
4.	Pisang awak	13.3
5.	Nallabontha batheesa	40.0
6.	High gate	53.3
7.	Zanzibar	66.6
8.	Aytunendran	53.3
9.	Chengazhikodan	73.3
10.	Giant plantain	80.0

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This experiment indicated that Pisang awak has some tolerance against bunchy top disease when compared to other varieties. In the previous year's screening (1973-74) the variety Bodles Altafort showed tolerance to a certain extent.

A third set of following 10 varieties of banana were grown and inoculated with infective aphids during January, 1976.

- | | |
|-------------------------|--------------------|
| 1. Galanamalu | 6. Lacation |
| 2. Malbhog | 7. Harichal |
| 3. Boodibontha batheesa | 8. Amritsagar |
| 4. Karpooravally | 9. Kanchikela |
| 5. Nendra padatty | 10. Chakkarakadali |

The procedure followed for inoculation is as follows:

The aphids Pentalonia nigronervosa reared in healthy plants were first collected and then allowed to feed on diseased plants (bunchy top infected plants) to acquire the virus. They were then transferred to 4½ months old test plants for inoculation feeding at the rate of 100 infective aphids per plant. After inoculation feeding the aphids were killed by insecticidal spraying. The trial is in progress and the results will be reported in due course.

Project No.2.3.1 Experiment No.5 To control the spread of bunchy top disease in banana by the use of insecticides.

The experiment was laid out in September, 1974 with 12 insecticides with a view to find out the most effective insecticide for controlling the aphid vector (Pentalonia nigronervosa) which is responsible for the spread of bunchy top disease. The insecticides used were:

- | | | | |
|----------------------|----------|-------------------------|----------|
| 1. Roger | 0.05% | 6. Metacid combi | 0.05% |
| 2. Ekatox | 0.02% | 7. Malathion | 0.05% |
| 3. Metasystox | 0.02% | 8. Ekatin | 0.02% |
| 4. Thimet (granules) | 15 kg/ha | 9. Thiodan | 0.05% |
| 5. Dimecron | 0.05% | 10. Disyston (granules) | 40 kg/ha |
| | | 11. Sevin | 0.2% |
| | | 12. Anthio | 0.05% |

Spraying with insecticides was done at fortnightly intervals starting with when the plants were one month old and stopped at the time of flowering. Granular insecticides Thimet and Disyston were applied at the time of planting and repeated at an interval of 45 days. Aphid counts were taken at fortnightly intervals and are presented in Table No.X.

The statistical analysis of the data showed that all the treatments except treat 7 (Malathion 0.05%) were significantly superior to control. It is interesting to note that no aphid was found on plants treated with granular insecticide Thimet while in the case of the other granular

insecticide, Disyston infestation was very negligible. The maximum number of aphids were noticed in the control plants. However bunchy top disease was not noticed in any of the treatment plants including control.

The experiment is being continued for the second year in succession and the planting was done on 23.9.1975. Spraying and observations were being continued as per schedule.

Project No.2.3.2 Experiment No.2 To search for suitable control measures using different fungicides against leaf spot disease of banana.

Fungi Cercospora musae and cordana musae were found to be associated with leaf spot disease.

Spraying with six fungicides i.e. (1) Blitox 0.5%, (2) Difoltan 0.3%, (3) Fycol 1% (4) Bordeaux mixture 5:5:50, (5) Dithane Z-78 0.2% and (6) Dithane M-45 0.2% was started as soon as the first symptoms were noted. Fortnightly sprayings were given to the crop. Before the spraying the plants were graded according to the intensity of the infection. The application of Fycol was stopped after two sprayings since the fungicide caused severe phytotoxicity on the leaves.

The yield data for the experiment is given in table XI.

Statistical analysis of the data showed that there is no significant difference in yield between treatments.

The experiment is being repeated during the year under report by planting it afresh on 17.9.1975. In this experiment Fycol was deleted since it caused severe phytotoxicity to the plants.

Project No.2.3.5 Studies on nematode parasites of banana (variety: Nendran)

The experiment was first laid out in September, 1974 with a view to evaluate suitable nematicides for the control of Radopholus similis and root knot nematode. The insecticides used were Dasanit, Temik, Carbofuran and Thimet and 2 gm. of active ingredient were used per plant.

Before planting soil samples were taken from each replication to assess the population of nematodes. First application of nematicides was done at the time of planting. The second application was made four months after planting. Before second application soil and root samples were collected and the nematode population was

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assessed. Final soil and root samples were collected four months after second application. The population of nematodes Radopholus and Meloidogyne in the soil and root samples at different stages are furnished in table XII and table XIII.

From the counts of nematode population in the soil and root samples it is observed that there is reductions in the number of parasites as a result of application of nematicides.

The analysis of yield data (table XIV) showed no significant difference between treatments including control.

The trial has been repeated for the second year in succession and planting was done on 18.10.1975 with three insecticides i.e. Dasanit, Temik and Thimet. The applications were done as per schedule and soil and root samples were collected at different stages for assessing the nematode population. The plants have not yet started flowering.

P I N E A P P L E

Project No.3.2.1 Population density trial in pineapple variety 'Kew'

The trial to find out the most optimum population density for 'Kew' pineapple for getting maximum and economical production was laid out on 20.7.1974. The crop was given a manurial dosage of 8 gm. N, 3 gm P_2O_5 and 12 gm K_2O per plant in two split doses, first dose in July, 1974 and the second dose in September, 1974 in the first year. No manuring was done in 1975-76 (second year).

During the period, observations on the vegetative growth of plants viz. number of leaves produced, length and width of "D" leaf and leaf area and the extent of flowering upto 31.3.1975 were recorded. The data obtained are presented in table No.XV.

Leaf production:

In respect of leaf production, the treatment P_2S_2 continued to maintain its superiority throughout the period of observation followed by treatment P_2S_1 . The treatment P_3S_3 proved to be poor in this respect. Not much difference in leaf production is noticed between different methods of planting. Among various spacings, S_2 spacing (25 cm x 60 cm x 90 cm) and S_1 spacing (30 cm x 60 cm x 75 cm) are the best.

Leaf length and width:

In respect of mean length and width of leaf also, the treatment

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P_2S_5 is the best. The treatments P_3S_3 and P_2S_5 recorded the least leaf length and width respectively. The different methods of plantings did not show any consistency during the various periods of observation. Among various spacings, S_2 spacing and S_5 spacing lead the rest.

Leaf area:

The maximum leaf area was noticed in treatment P_2S_2 followed by P_2S_7 . Treatment P_3S_3 had the minimum leaf area. In the method of planting P_2 group was superior. In different spacings, the data are more favourable towards S_2 and S_5 spacings.

Flowering (upto 31.3.1976):

The data on flowering recorded upto 31.3.1976 revealed that the treatment P_3S_5 followed by P_2S_2 has accounted for maximum percentage of flowering. Least percentage of flowering is noticed in treatment P_1S_1 . In different methods of planting, P_2 group is superior while in different spacings, S_5 and S_2 spacings are best.

Considering the different observations recorded, it can be inferred that S_2 spacings (25 cm x 60 cm x 90 cm) accomodating 57,143 suckers² (Three row method) and 53,333 suckers (two row method) are superior to all other spacings in respect of vegetative growth. However, yield data are to be obtained to draw conclusive results.

Project No.3.2.2. Nutritional studies in pineapple.

The trial was laid out on 8.7.1974. The manures were applied as per schedule during the first year. The soil application of fertilizers was done in four doses at northly intervals commencing from July, 1974. The spraying of area were done within a period of seven months commencing from November, 1974 avoiding the rainy season. During each spraying, one gram of Nitrogen was given per plant. The number and intervals of sprayings were adjusted to suit the total quantity of nitrogen to be given as foliar spray. Commercial urea fertilizer was used for spraying.

Data on vegetative growth of plants viz. number of leaves produced, length, width and leaf area of "D" leaves at intervals of 6, 12, and 18 months after planting, extent of scorching of plants due to urea spray and extent of flowering in different treatments as on 31.3.1976, were recorded.

The data recorded are presented in Table XVI.

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Leaf production:

During the period of observation, maximum leaf production was found in treatment N_3M_4 . Least leaf production was in treatment M_3M_3 . In respect of dosages, both N_1 and N_3 doses were equally beneficial and in respect of method of application, treatment M_4 was uniformly good.

Leaf length, width and leaf area:

The best treatment was M_3M_4 for all the characters followed by treatment M_1M_4 . Among different levels of nitrogen, both N_1 and N_3 treatments are equally good. In respect of method of application, again the data are more favourable to M_4 treatment, the next best being M_1 treatment.

Scorching of leaves:

Spraying of urea, at higher dosage (N_3) at short intervals caused scorching of leaves as evidenced in treatment M_3 . However, the scorching did not cause complete death of plants.

Flowering:

In respect of flowering, treatment M_3M_1 and M_3M_4 were superior and treatment M_3M_3 is inferior. Taking doses of Nitrogen and methods of application into consideration, the data are more favourable to N_1 dose (8 gm N per plant per year) of nitrogen and M_1 method of application (25% N as foliar + 75% in soil) closely followed by N_2 dose of nitrogen (12 gm N per plant per year) and M_4 method of application (All N in soil)

However, the harvesting of fruits has not been done to draw conclusive results.

Project 3.2.3 Effect of plant growth regulators on fruit size and maturity of pineapple 'Kew' variety.

This experiment was laid out on 15.6.1974 using uniform suckers. The plants were given a manurial dosage of 16 cm N, 4 gm P_2O_5 and 12 gm K_2O per plant in two split applications, first dose in June 1974 and second dose in September, 1974. In June 1975, i.e. 12 months after planting, when the plants were at 35-39 leaf stage, growth regulator (Ethrel) at 100 ppm dosage was applied in the first two replications to induce uniform flowering. But, no flowering could be noticed till September, 1975. The application was repeated in September, 1975 but no flowering could be noticed till November 1975. The indication is that 100 ppm Ethrel is not effective in inducing flowering in pineapple under Kerala conditions. The experiment was converted into an observational trial, the results of which are furnished below:

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Observational trial:

500 ppm Ethrel was applied on 5.11.1975 i.e. 17 months after planting on 400 plants on replication III and 20 plants each were selected for spray treatment with Planofix. Spraying of Planofix was done on the following dates in different treatments

S.No.	Treatment	Date of spraying of Planofix
1.	100 ppm Planofix - one month after flowering	21.1.1976
2.	200 ppm ,,	21.1.1976
3.	300 ppm ,,	21.1.1976
4.	100 ppm Planofix - two months after flowering	21.2.1976
5.	200 ppm ,,	21.2.1976
6.	300 ppm ,,	21.2.1976
7.	100 ppm Planofix - three months after flowering	20.3.1976
8.	200 ppm ,,	20.3.1976
9.	300 ppm ,,	20.3.1976

Just prior to spraying of Planofix, the length and circumference of individual fruits were recorded. The same observations were continued at weekly intervals after spraying also. The crop is yet to be harvested and the results will be furnished in the next report.

Project No.3.2.4 Standardisation of time of application of growth regulator (Ethrel) for materials raised from suckers and crowns.

The experiment was laid out on 13.7.1974 using uniform suckers and crowns. Manuring was done at the rate of 16 gm N, 4 gm P₂O₅ and 12 gm K₂O per plant per year, in two split applications in the first year. The application of Ethrel at 100 ppm was done on 19.9.1975 on suckers of 14 months old (treatment-1) No flowering could be induced. In other trials also, no inducement of flowering could be achieved by the application 100 ppm Ethrel. Taking advantage of the observation that 500 ppm Ethrel could induce flowering, an observational trial on crown suckers only was taken up to find out the optimum age at which the crown suckers could be induced to flower by using 500 ppm Ethrel.

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First year (1974-75):

1. Survey of weed flora
2. Observations on the varieties and types of weeds found in different treated plots to assess the extent of efficacy of the herbicides on them.
3. Collection of weeds from an area of one square metre, counting the weeds and recording their dry weight at intervals of two, five and eight months after the application of herbicides
4. Deleterious effects if any, produced on pineapple plants by the herbicides and
5. Economics of weed control with herbicides.

During the second year (1975-76) under report, the herbicides were sprayed at full dose as post emergence sprays in May, 1975. No second spraying was done.

To induce uniform flowering in plants, Ethrel at 1000 ppm was applied on 24.10.1975, when the plants were about 16½ months old. The following observations were recorded during the second year of study.

Second year (1975-76):

1. Collection of weeds from an area of one square metre, counting the weeds and recording their dry weight at intervals of two, four and six months after spraying herbicides.
2. Data on the vegetative growth of plants viz. number of leaves, length and width of "D" leaves and leaf area, at the time of application of growth regulator and
3. Extent of flowering in different treatments consequent on the application of growth regulator "Ethrel".

The data recorded pertaining to the following observations are presented in tables XVIII, XIX and XX.

1. Count of weeds and dry weight of weeds per square metre area - 1974-75 season (first year)
2. Count of weeds and dry weight of weeds per square metre area 1975-76 season (second year)
3. Data on vegetative growth of plants viz. mean number of leaves and leaf area at the time of application of growth regulator and extent of flowering in different treatments. The data reveal the following:

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1974 season - first year:

There was considerable reduction in weed growth in all the plots sprayed with herbicides compared to control plots two months after the first pre-emergence spraying. Among the treatments, diuron 1.5 kg and 3.0 kg, bromacil 2.5 kg and combination of diuron 1.5 kg + Bromacil 2 kg and diuron 2 kg + bromacil 1.5 kg accounted for least weed growth. The effectiveness of the herbicides in keeping the weeds under check continued for about 4 months and thereafter there was renewed growth activities of weeds. However, further growth of weeds could be checked by giving a second spray at half the first dose six months after the first spray as is evident from the weed count taken after 3 months.

In respect of dry weight of weeds per square metre area, diuron 3 kg recorded the least weed growth 2 months after spraying followed by bromacil 2.5 kg and combination of diuron 1.5 kg + bromacil 2 kg. Eventhough there was an increase in dry weight of weeds at 5 months in all the treatments, further increase in dry weight was arrested by the second spraying.

Among the different dosages, diuron 3 kg per hectare is more effective especially in the initial stages. In respect of bromacil, 2.5 kg per hectare is effective.

1975-76 season - second year:

In the second year also, it has been found that there was a general reduction in weed growth in almost all the plots sprayed with herbicides compared to control plots two months after the post emergence spraying. Among the treatments, diuron 3 kg per hectare, bromacil 3 kg per hectare and combination of diuron 2 kg + bromacil 1.5 kg per hectare accounted for least weed growth. In respect of dry weight of weeds per square metre area also, diuron 3 kg per hectare was more effective.

Thus, in both the years, the best treatment in controlling the weeds in pineapple plantation under Trichur conditions was found to be diuron 3 kg per hectare. It was also found that a minimum of three weeding is absolutely essential to keep the weeds in check in hand weeded control plots.

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No. of leaves and leaf area:

In respect of mean number of leaves produced per plant and leaf area, the data are in general favourable to diuron 3 kg per hectare eventhough it is only second best to combination treatment diuron 2 kg + bromacil 2 kg per hectare. The treatment 'Hand weeded control' is also superior. The treatment 'unweeded control' is the worst.

Extent of flowering:

Application of Ethrel at 1000 ppm has helped to induce good flowering in all the treatments from 89 to 100 percent. The percentage of flowering was minimum in the unweeded control plots.

Harvest of the crop is in progress.

Project No.3.2.6 Adaptive trial for the induction of flowering in 'kew' pineapple

The experiment was laid out on 6.6.1974 using uniform suckers. The plants were given the manurial dosage of 16 gm N, 4 gm P₂O₅ and 12 gm K₂O per plant in two split applications viz. pre-monsoon and post N.E monsoon. The application of growth regulators at the prescribed doses were done on 12.5.1975 when the plants were of 35-39 leaf stage (12 months old). Except stray flowering in the treatment "Ethrel 25 ppm + 2% Urea + 0.04% Caco₃", no flowering was noticed upto 140 days in other treatments. Therefore, the application of growth regulators was repeated on 19.9.1975, when the plants were 16 months old. Data on the extent of flowering were recorded in different treatments at intervals of 47, 104 and 133 days after application. The data are furnished in the table XXI.

The data show that among the different treatments tried, treatment-2 i.e. "25 ppm Ethrel + 2% Urea + 0.04% Caco₃", was early to flower showing 50.7% flowering within a period of 47 days. But, in 133 days after application, flowering was almost uniform in all the treatments including control. The maximum flowering was noticed during the period 104-133 days in all treatments except treatment 2. The maximum flowering in Tr-2 was during the first 47 days. However since the growth regulators failed to induce flowering when applied at 35-39 leaf stage (12 months) and the extent of flowering was low within a period of 47 days when applied at 16 months after planting, it is presumed that the growth regulators at the concentrations tried are not effective in the induction of early and uniform flowering under Trichur conditions.

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Observational trials to find out the optimum concentration of growth regulator "Ethrel" to induce flowering in pineapple under Trichur conditions.

As it was found that 100 ppm Ethrel was not effective in induction of flowering in Pineapple under Trichur conditions preliminary observational trials were conducted in suckers of different age groups using the following concentrations of Ethrel.

Age groups:

Suckers of 14, 15, 16, 17 and 18 months old

Concentrations:

1000 ppm, 250 ppm, 100 ppm and control.

No. of plants under each treatment - 20

Date of application of growth regulators - November 1975.

The extent of flowering recorded in various treatments at intervals of 40, 65 and 90 days after the application of Ethrel at different concentrations are presented in table XXII.

The data indicate that:

1. (1). of the four dosages tried, 1000 ppm and 500 ppm are the best in inducing flowering in pineapple under Trichur conditions when applied in the month of November
- (2). The best stage of application appears to be when the plants are 14½ to 16 month old i.e. above 35 leaves.
- (3). Ethrel is more effective on plants of good vigour and size
- (4). The performance of growth regulator on 17 month old plants was not satisfactory. The reason for the same needs to be investigated by conducting further comprehensive trials.

Detailed trials to investigate various aspects of growth regulator applications are proposed to be conducted during the next year.

/ III OTHER DETAILS /

S E C T I O N - D .

Development of initiative and leadership among senior/junior Research Officers:

.....contd.

The scheme is operated in two centres i.e. Banana Research Station, Kannara for banana and University Main Campus, Vellanikkara, Mannuthy for pineapple. The overall charge of the two schemes is vested with the Horticulturist and the supporting technical staff are one Junior Horticulturist, one Plant Pathologist, one Plant Physiologist, one Junior Plant Breeder and one Junior Entomologist. There was no Junior Research Officer in position during the year. The research staff attend to the work of their respective disciplines. A number of new research projects both on banana and pineapple have been drawn up and these projects will be implemented next year after getting approval from the Project Co-ordinator.

S E C T I O N - E.

Remarks of the scientific committee and action taken.

No remarks were offered during the period.

S E C T I O N - F.

Technical summary.

2.1 Banana (Improvement of fruits through selection)

2.1.1 (a) Varietal collection in banana.

Five more clones were added to the varietal collection bringing the total to 144. The existing varieties were genotypically classified, based on taxonomic scoring. Twenty eight promising varieties were chosen for multiplication based on their growth, duration, yield and fruit quality.

(b) Varietal testing:

Among the four medium tall dessert varieties tested under irrigated condition, Monsmarie and Giant governor were found to be superior in bunch weight over the other two varieties Robusta and Peddapacha. This is in conformity with the previous year's findings.

2.2.2 Nutritional requirement of banana.

The data for 1973-74 and 1974-75 showed a reduction in yield with the increasing levels of nitrogen above 100 gr. N. The effects of P and K were positively significant on bunch weight.

2.2.3 Trace element studies.

The experimental results showed that application of micronutrients enhances yield. Boron @ 12.5 kg/ha was found to be the most effective micronutrient in this respect.

....contd.

2.2.5 Control of weeds in banana with the aid of herbicides

The experimental results showed that post emergence spraying with 1.5 litre Gramoxone + 3 kg Diuron per hectare was effective in controlling weeds of banana.

2.3.1 Experiment No.1 To inspect banana growing areas to account for the extent of disease and losses

From the survey undertaken it was found that Nendran variety followed by Red banana, Poovan, Palayankodan and Robusta exhibited maximum percentage of infection of bunchy top disease under natural conditions. The variety Kodappanilla Kunnan showed the least infection.

2.3.1 Experiment No.3 To screen all cultivated varieties of banana for their disease resistance (bunchy top)

From the two sets of screening trials conducted using 10 varieties under each trial the varieties Pisang awak and Bodles altafort showed tolerance against the disease.

2.3.1 Experiment No.5 To control the spread of bunchy top disease in banana by use of insecticides.

Statistical analysis of the data showed that all the treatments except treatment 7 were significantly superior to control

2.3.2 Experiment No.2 To search for suitable control measures using different fungicides against leaf spot disease of banana

The statistical analysis of the data showed that there was no significant difference in yield between treatments.

2.3.5 Studies on the nematode parasites of banana

From the counts of nematode population in the soil and root samples it was observed that there was a reduction in the number of the parasites as a result of application of nematicides. But on statistical analysis of the data no significant differences were noticed between treatments.

3.2 P I N E A P P L E

3.2.1 Population density trial (variety 'Kew')

The experiment was planted on 20.9.1974. Data on the vegetative growth of the plants showed that spacing 25 cm x 60 cm x 90 cm in three row method accomodating 57,143 suckers per hectare and two row method accomodating 53,333 suckers per hectare were superior to all other spacings. Collection of yield data is in progress.

....contd.

3.2.2 Nutritional studies in Pineapple (variety 'Kew'):

The experiment was planted on 8.7.1974. In respect of vegetative growth N₂M₄ treatment (16 gr of N per plant applied full in soil) was found to be the best. Flowering is in progress and the yield data will be available only next year.

3.2.3 Effect of plant growth regulators on fruit size and maturity of pineapple 'Kew' variety.

The experiment was planted on 15.6.1974. It was observed that 100 ppm "Ethrel" was not effective in the induction of flowering. In an observational trial it was found that 500 ppm Ethrel induces flowering in pineapple. So the plants were made to flower using 500 ppm Ethrel and planofix at different concentrations was applied one, two and three months after flowering. The effect of planofix on fruit size and quality is under study.

3.2.4 Standardisation of time of application of growth regulators (Ethrel) for materials raised from suckers and crowns.

The experiment was planted on 13.7.1974. 100 ppm Ethrel did not induce flowering both in suckers and crowns. Since it was found from observations that 500 ppm "Ethrel" is effective in induction of flowering an observational trial was conducted using 500 ppm "Ethrel" to find out the optimum age of crown suckers for maximum flowering. Good flowering was noticed in 17 and 18 month old crown suckers. The observation is in progress.

3.2.5 Control of weeds in pineapple with the aid of herbicides

Among the weedicides tried, Diuron 3 kg/ha. was found to be the best in controlling the weeds. This is also economical when compared to hand weeding.

3.2.6 Adaptive trial for the induction of flowering in 'Kew' pineapple.

The experiment was planted on 6.6.1974. The growth regulators tried at the proposed concentration failed to induce uniform flowering in the plants. The trial will have to be continued using higher concentrations.

/T A B L E-A/

Staff position of I.C.A.R. Scheme.

S.No.	Designation	Total No. of sanctioned posts	Name of personal working	From	To	Remarks
1.	Horticulturist	1	Sri K.Kannan	8.11.75	31.3.76	
2.	Jr. Horticulturist	1	Sri S.Balakrishnan	1.4.75	31.3.76	
3.	Junior Plant Pathologist	1	Sri P.C.Jose	1.4.75	31.3.76	
4.	Junior Plant Physiologist	1	Shri M.N.C.Nayar	15.11.75	31.3.76	
5.	Jr. Entomologist-cum-Nematologist	1	Sri D.Joseph	17.11.75	31.3.76	
6.	Junior Plant Breeder	1	Sri R.Gopimoney	10.11.75	31.3.76	
7.	Senior Research Assistants	5	All the five posts are vacant			
8.	Agri. Demonstrators	4	1.Sri N.Madhavan Nair	1.4.75	31.3.76	Two posts
			2.Sri A.Naziruddin	1.4.75	31.3.76	are vacant
9.	Clerk-cum-Typist	1	Sri Somasundaran	5.3.76	31.3.76	
10.	Oil Engine Driver	1	Sri K.K.Francis	13.1.75	31.3.76	
11.	Lab. Assistants	2	All posts vacant			
12.	Watchman	2				
13.	Mali	2				
14.	Messenger/Peon	2				

TABLE-II

Varietal testing in banana: Mean data on growth and yield

Treatment	Height (cm.)	Girth (cm)	No. of leaves	Duration of flowering (days)	No. of suckers per plant	No. of hands/ bunch	No. of fingers per bunch	Bunch weight (kg)	Total duration (days)
Monsmarie	218.0	56.5	12.5	250.9	3.1	7.3	103.2	12.5	331.7
Giant Governor	184.7	55.1	12.7	246.6	3.0	7.1	102.2	11.7	323.4
Peddapacha	204.6	52.0	12.0	264.6	2.8	6.5	89.6	9.9	333.6
Robusta	188.6	52.5	12.8	238.2	3.1	7.0	91.5	9.7	316.9
C.D.(0.05)	14.286	NS	NS	NS	NS	NS	NS	1.73	NS

TABLE III

Nutritional requirement of banana : Mean data on morphological and bunch characters.

Treatments	Height (cm.)	Girth (cm)	No. of leaves at flowering	Duration of flowering	Bunch weight (kg)	No. of hands/ bunch	No. of fingers per bunch	Remarks
L 100	172.3	50.04	13.32	250.3	10.8	7.0	94.4	
N 200	172.4	50.38	13.21	245.7	10.4	6.9	95.9	
R 300	173.2	49.14	13.06	250.6	10.3	6.7	92.5	
P 0	169.1	47.51	13.05	249.2	10.1	6.7	92.5	
P 40	172.5	50.42	13.44	247.7	10.5	6.9	95.3	
P 80	177.8	51.64	13.10	249.1	10.9	7.1	95.0	
K 0	164.6	48.59	13.32	247.2	9.8	6.8	90.4	
K 200	176.4	49.84	13.21	247.0	10.8	6.9	95.9	
K 400	176.9	51.14	13.42	250.8	10.9	6.9	96.4	

TABLE IV

Trace element studies : Mean data on morphological characters

Treatments	Height (cm)	Girth (cm)	No. of leaves	No. of suckers
1	208.1	64.0	10.6	2.2
2	288.6	67.0	11.1	2.8
3	233.6	63.0	10.3	2.6
4	218.1	64.7	10.6	2.6
5	216.5	61.8	11.3	2.4
6	228.8	62.9	11.1	2.2
7	223.4	56.6	10.9	2.4
8	220.5	63.7	10.7	2.2
9	227.5	64.8	11.8	2.8
10	222.7	65.2	11.5	2.5
11	212.4	64.1	10.5	2.2
12	230.6	67.1	11.8	2.6
13	211.2	62.3	11.4	2.3
14.	216.5	66.5	11.0	2.7
15	223.3	64.2	11.0	2.1
16	221.6	64.6	10.7	2.7
17	217.9	66.6	11.0	2.8
18	218.9	64.1	11.4	2.5
19	217.7	67.9	11.0	2.0
20	231.4	65.3	11.3	2.8

TABLE-V

Trace element studies - Mean data on bunch characters

Treatments	Bunch weight(kg)	No.of hands	No.of fingers
1	11.8	7.2	107.8
2	15.9	9.0	131.8
3	11.6	7.9	114.7
4	13.2	7.8	121.0
5	13.3	8.0	122.6
6	14.5	8.6	125.9
7	12.2	8.4	111.9
8	15.6	8.6	130.4
9	13.2	8.3	119.1
10	13.5	8.2	109.1
11	12.4	7.8	108.9
12	13.5	8.3	120.4
13	13.8	8.0	120.7
14	15.1	8.7	129.8
15	13.3	8.2	122.0
16	13.5	8.2	120.8
17	14.9	8.7	126.5
18	13.5	8.1	121.6
19	15.2	8.0	124.7
20	13.7	8.3	119.0

TABLE-VI

Control of weeds in banana with the aid of herbicides : Mean number and dry weight of weeds per square metre.

(a)

Treatment	No. of weeds per sq. metre		
	9.12.74	15.5.75	22.7.75
1	29.2	18.5	12.6
2	26.0	17.0	17.3
3	7.7	6.3	37.0
4	11.2	12.6	8.0
5	nil	3.3	6.6
6	14.3	6.6	9.0
7	32.6	3.4	37.3
8	9.6	12.0	20.6
9	nil	16.0	30.0
10	187.0	83.3	75.0

(b)

Treatment	Dry weight of weeds per sq. metre (gr)		
	9.12.74	15.5.75	22.7.75
1	16.5	9.6	8.0
2	15.0	13.7	8.5
3	0.5	3.7	23.0
4	0.5	11.0	4.6
5	nil	3.7	3.0
6	1.0	5.7	4.6
7	23.0	27.3	22.3
8	2.5	8.0	14.6
9	nil	10.7	26.0
10	223.0	67.3	58.0

TABLE - VII

Control of weeds in banana with the aid of herbicides: Mean data on the number of leaves and suckers produced and bunch characters:

Treatments	No. of leaves	No. of suckers	Weight of bunch(kg)	No. of hands	No. of fingers
1.	13.5	2.3	10.9	7.6	106
2	12.3	2.03	9.5	6.8	95.4
3	12.6	2.01	10.4	7.1	88.8
4	12.8	2.2	10.5	6.8	97.4
5	13.5	2.3	11.5	7.4	99.0
6	12.6	2.6	10.8	7.2	101.5
7	12.6	2.3	9.5	6.9	93.5
8	13.0	2.2	10.3	6.7	101.0
9	12.7	2.2	10.4	7.2	102.2
10	12.9	2.5	10.8	6.9	96.00

TABLE - X/

Control of spread of bunchy top disease by the use of different insecticides: Data on aphid count in different treatments

Treatments	Replication I	Replication II	Replication III	Replication IV	Mean
Roger 0.05%	2	25	6	33	11
Ekatox 0.02%	1	6	148	149	46.3
Metasystox 0.02%	4	12	8	24	8
Thimet 15 kg/ha	nil	nil	nil	nil	nil
Dimecron 0.05%	47	7	3	57	19
Metacid combi	9	6	10	25	8.3
Malathion 0.05%	84	387	56	527	175.6
Ekatin 0.02%	10	3	50	63	21
Thiodan 0.05%	0	8	5	13	4.3
Disyston 40 kg/ha	0	2	0	2	0.66
Sevin 0.2%	271	52	34	357	119
Anthic 0.05%	46	77	29	152	50.6
Control	791	66	64	921	307.0

/TABLE - XI/

Fungicidal trial against banana leaf spot disease : Data on bunch weight

TREATMENTS	REP.I	REP.II	REP.III	REP.IV	MEAN(KG)
Blitox	11.2	10.8	9.5	10.5	10.5
Difoltan	11.8	10.0	9.6	13.2	11.1
Bordeaux mixture	12.0	11.0	12.6	11.3	11.7
Dithane Z-78	12.4	10.9	10.2	9.3	10.7
Dithane ^{M-45} Z-48	12.1	11.2	10.1	9.8	10.8
Control	12.0	11.1	10.3	12.3	11.4

TABLE-XI

Studies on the nematode parasites of banana : Mean population of nematodes in the soil samples collected from the basins of banana plants

Treatments	Dasanit		Furadan		Themik		Thimet		Control	
	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne
at planting	310	116	480	110	250	120	146	23	110	nil
4 months after planting	65.2	16.25	nil	nil	16	40.5	121.75	40.75	24.25	16.25
8 months after planting	2.5	nil	1.5	nil	1.5	nil	5	nil	1.25	nil

TABLE - XIII

Studies on nematode parasites of banana : Mean population of nematodes in root samples collected from plants

Treatments	Dasanit		Furadan		Thamnik		Thimet		control	
	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne	Rado- pholus	Melido- gyne
4 months after planting	16.5	..	..	16.25	16	16	nil	nil	24	nil
8 months after planting	0.5	..	1.25	1.25	0.5		1.75	1.0	0.5	nil

TABLE-XIV

Studies on nematode parasites of banana: Mean bunch weight (Kg)

TREATMENTS	BUNCH WEIGHT (kg)
Dasanit	6.5
Furadan	5.6
Themik	6.6
Thimet	4.6
Control	5.4

TABLE XV

Population Density Trial: Data on vegetative growth of plants and percentage of flowering upto 31.3.1976

Treatment	Mean number of leaves produced per plant at intervals of			Leaf area in sq. cm. (L X W of "D" leaf) at intervals of			Percentage of flowering till 31.3.1976	Time taken for weeding plots at different periods of		
	6 months	12 months	18 months	6 months	12 months	18 months		6 months Hrs.mts	12 months Hrs.mts	18 months Hrs.mts.
P1 S1	13.34	20.73	27.77	216.63	229.59	254.19	3.70	2 11	4 18	
P1 S2	13.31	20.72	25.62	217.78	221.33	238.69	8.21	2 29	4 28	
P1 S3	13.24	21.23	26.09	209.20	218.76	233.69	7.55	2 31	3 48	
P1 S4	13.97	20.25	26.09	219.64	239.24	230.42	12.90	2 27	4 14	
P1 S5	13.44	20.20	26.15	226.39	231.33	242.64	7.74	2 21	4 18	
P1 S6	12.79	19.75	27.13	218.02	180.54	250.65	8.43	2 67	4 36	
P1 S7	13.33	21.13	24.19	232.56	239.64	237.21	10.00	3 01	4 16	
P2 S1	14.08	21.57	30.00	217.05	246.49	242.78	8.21	1 39	4 15	
P2 S2	15.85	23.79	30.41	231.94	269.54	263.57	15.34	2 43	4 15	
P2 S3	13.40	21.28	28.87	218.75	239.12	255.95	9.33	1 56	4 47	
P2 S4	12.74	20.04	26.32	173.88	217.54	222.55	4.06	1 36	4 43	
P2 S5	13.23	20.55	26.57	228.61	250.37	234.18	14.48	1 36	4 18	
P2 S6	12.78	20.71	26.24	215.73	242.73	233.36	8.01	2 00	4 15	
P2 S7	13.70	20.85	26.32	234.85	254.49	244.53	8.83	2 46	4 41	
P3 S1	13.80	23.10	28.32	176.59	233.91	235.04	7.38	1 77	3 51	
P3 S2	13.75	21.21	25.97	207.90	231.54	230.03	11.21	2 56	3 43	
P3 S3	12.42	19.71	25.34	168.91	208.78	204.70	4.82	2 26	4 23	
P3 S4	12.93	20.15	25.57	184.72	216.56	214.74	9.12	1 37	4 11	
P3 S5	13.49	21.27	26.35	211.79	231.35	235.81	8.04	2 04	4 14	
P3 S6	13.59	23.14	26.42	201.45	237.60	226.70	17.34	2 11	4 26	
P3 S7	13.72	21.16	24.95	198.63	241.81	225.60	11.84	2 19	4 25	

No weeding done

TABLE XVI

Nutritional studies in pineapple : Data on vegetative growth of plants and extend of flowering upto 31.3.1976

Treatment	Mean Number of leaves produced per plant at intervals of			Leaf area in sq. cms. (L x W of D leaves) at intervals of			Percentage of flowering till 31.3.1976	Extent of scorching of leaves in percentage (May, 1975)
	6 months	12 months	18 months	6 months	12 months	18 months		
N1 M1	22.23	32.14	30.60	236.46	252.32	320.39	38.00	7.40
N1 M2	23.41	33.70	31.71	215.11	24.32 310.43	310.43	50.67	8.60
N1 M3	19.29	25.73	26.50	152.15	245.05	301.73	14.50	29.03
N1 M4	23.63	31.80	31.36	238.99	282.12	334.25	34.82	2.50
N2 M1	21.83	29.44	30.16	228.85	244.09	320.65	37.50	7.27
N2 M2	22.24	29.50	29.24	190.15	235.40	308.73	33.21	2.04
N2 M3	21.29	26.56	26.24	180.46	201.35	281.89	23.44	34.00
N2 M4	22.87	31.60	30.84	231.87	260.95	316.61	38.40	2.80
N3 M1	24.17	31.84	32.26	235.52	232.22	316.22	46.43	8.32
N3 M2	21.99	29.12	29.30	218.00	199.00	300.88	20.31	22.36
N3 M3	18.73	24.30	24.70	160.82	180.19	268.91	9.60	39.50
N3 M4	24.30	37.40	33.90	267.67	274.25	358.98	44.42	2.86

TABLE XVII

Standardisation of time of application of growth regulator (Ethrel) on material raised from crowns
(observational trial)

Treatments	Total No. of plants	Date of application	Percentage of flowering noticed in a period of						Remarks
			15 days	40 days	60 days	90 days	115 days	145 days	
17 month old plants	280	18.12.1975	..	NR	72.14	88.57	95.71	..	500 ppm Ethrel
18 month old plants	270	22.1.1976	..	18.89	82.96	94.07	..	..	do.
19 month old plants	155	20.2.1976	0.55	10.96	63.87	(Flowering not completed as on 30.4.1976)		..	do.
20 month old plants	275	15.3.1976	14.91	44.00	(Flowering not completed as on 30.4.1976)		..	..	do.
Control(water)	112	20.11.1975	..	..	..	1.11	2.48	2.48	

(NE not recorded)

TABLE XVIII

Control of weeds in pineapple with the aid of herbicides: Data on number of weeds and dry weight of weeds per square metre area:

1974-75 season - First year

Treatment	Mean number of weeds per square metre area at intervals of			Mean dry weight of weeds per square metre area at intervals of (m gms)		
	2 months	5 months	8 months	2 months	5 months	8 months
Diuron 1.5 kg/ha	14.00	18.33	14.33	44.60	116.67	140.93
" 2.0 "	22.33	27.00	15.33	17.33	83.33	39.87
" 2.5 "	34.00	24.00	13.00	14.97	66.67	112.70
" 3.0 "	14.00	21.00	10.32	3.23	56.50	25.60
Bromacil 1.5 "	26.00	28.67	14.00	63.90	250.00	137.23
" 2.0 "	44.34	38.33	20.33	28.20	134.33	138.15
" 2.5 "	16.67	26.67	12.67	10.00	82.33	54.60
" 3.0 "	34.00	31.33	10.33	14.33	83.33	70.23
Diuron 1.5 kg + Bromacil 1.5 kg/ha	34.00	23.00	20.00	12.60	85.33	94.30
Diuron 1.5 kg + Bromacil 2.0 kg/ha	21.67	23.33	11.00	11.87	150.00	60.77
Diuron 2.0 kg + Bromacil 1.5 kg/ha	21.33	29.00	13.67	13.37	133.33	47.70
Diuron 2.0 kg + Bromacil 2.0 kg/ha	31.34	34.33	14.33	14.03	134.35	63.53
Hand weeded control	91.00	25.33	12.67	225.77	66.67	28.80
Unweeded control	82.34	53.67	29.33	208.87	283.33	254.60

TABLE XIX

Control of weeds in pineapple with the aid of herbicides: Data on number of weeds and dry weight of weeds per square metre area:

1975-76 Season - Second Year

Treatment		Mean number of weeds per square metre area at intervals of			Mean dry weight of weeds per square metre area at intervals of (in gms)		
		2 months	4 months	6 months	2 months	4 months	6 months
Diuron	1.5 kg/ha	27.00	31.33	9.70	9.99	123.33	32.70
"	2.0 "	19.00	18.67	10.00	8.72	56.57	46.33
"	2.5 "	9.00	19.33	11.70	4.47	28.33	46.70
"	3.0 "	7.60	14.33	6.66	3.93	20.33	27.70
Bromacil	1.5 "	20.30	18.00	20.03	26.84	83.00	133.70
"	2.0 "	30.00	23.67	20.03	30.00	99.17	152.33
"	2.5 "	18.70	16.67	15.70	21.01	31.33	87.00
"	3.0 "	9.30	19.00	16.33	4.35	26.67	48.70
Diuron 1.5 kg + Bromacil	1.5 kg/ha	19.40	20.70	15.33	3.88	71.83	70.00
"	1.5 kg + Bromacil						
"	2.0 kg/ha	13.40	10.33	7.33	3.06	12.50	64.70
"	2.0 kg + 1.5 kg/ha	8.40	9.34	9.40	5.98	32.23	94.00
"	2.0 kg + Bromacil	34.30	14.00	18.66	2.31	34.33	149.33
"	2.5 kg/ha						
Handweed control		45.00	21.67	9.33	15.23	138.33	28.70
Unweeded control		30.60	41.34	27.33	210.37	372.67	453.33

TABLE XX

Control of weeds in pineapple with the aid of herbicides: Data on mean number of leaves per plant, leaf area and extent of flowering in percentage consequent of application of 1000 ppm Ethrel.

Treatment	Mean No. of leaves per plant	Mean leaf area in sq.cms.	Percentage of flowering at intervals of			
			37 days	43 days	57 days	67 days
Diuron 1.5 kg/ha	37.93	285.13	31.90	59.05	89.05	90.00
„ 2.0 „	37.91	287.27	31.90	66.67	89.05	91.43
„ 2.5 „	37.87	283.14	32.29	71.43	95.24	97.61
„ 3.0 „	38.22	292.32	43.33	72.86	94.30	97.13
Bromacil 1.5 „	34.22	254.52	29.05	69.05	80.05	94.76
„ 2.0 „	31.31	273.15	22.86	57.14	85.24	89.05
„ 2.5 „	33.66	248.77	31.90	64.29	86.67	89.05
„ 3.0 „	35.84	261.03	35.24	78.09	99.52	100.00
Diuron 1.5 kg + Bromacil 1.5 kg/ha	33.63	261.03	36.19	65.24	93.33	96.19
„ 1.5 kg + Bromacil 2.0 kg/ha	35.53	287.54	42.86	72.38	95.71	95.71
„ 2.0 kg + Bromacil 1.5 kg/ha	36.02	300.29	41.90	91.90	95.24	95.71
„ 2.0 kg + Bromacil 2.0 kg/ha	38.88	298.98	34.76	63.81	89.05	90.95
Hand weeded control	37.88	289.84	21.43	50.00	90.00	94.29
Unweeded control	28.20	239.26	20.00	21.90	66.67	75.24

TABLE XXI

Project 3.2.6. Adaptive trial for the induction of flowering in 'Kew' Pineapple.

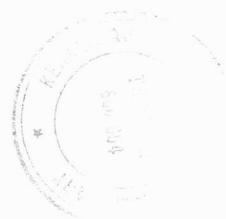
Extent of flowering at different periods:

Treatment	Percentage of flowering at a period of		
	47 days	104 days	133 days
Ethrel at 100 ppm	10.8	43.18	62.75
Ethrel 25 ppm + 2% urea + 0.04% CaCO_3	50.7	58.60	81.50
Planofix 1 ml in 4.5 litres of water	5.9	30.21	70.56
Control (water)	16.2	23.14	70.31

TABLE XXII

Data on the observational trial on the optimum concentration of "Ethrel" in inducing flowering in pineapple

Treatments	Age of suckers in months														
	14			15			16			17			18		
	40 days	65 days	90 days	40 days	65 days	90 days	40 days	65 days	90 days	40 days	65 days	90 days	40 days	65 days	90 days
Ethrel 1000 ppm	15.00	50.00	50.00	15.0	55.0	75.0	25.0	70.0	70.0	5.00	10.00	30.00	5.0	60.00	75.00
Ethrel 500 ppm	15.00	55.00	55.00	25.0	60.0	65.0	40.0	80.0	80.0	nil	15.00	20.00	nil	20.00	70.00
Ethrel 250 ppm	nil	40.00	45.00	10.0	35.0	45.0	20.0	55.0	65.0	nil	10.00	20.00	nil	nil	25.00
Ethrel 100 ppm	nil	nil	nil	nil	10.0	15.0	15.0	40.0	50.0	nil	nil	nil	nil	25.0	65.00
Control	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	10.00



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