

FINAL REPORT

1. Institute Code No. :

Gen.II.(231).

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

3. Name & Address of Research Institute/Centre:

Central Plantation ~~Crops~~ Research Institute
Kudlu P.O. Kasaragod
Kerala

4. Project Title:

Floral Biology - Study of pollination and fertilisation.

5. Name & Designation of Principal Investigator:

G.Vijaya Kumar
Scientist S1

6. Name (s) and Designation (s) of Associate (s) and Establishment (s) on which borne:

C.K.Sukumaran CPCRI
Scientist S1 Kasaragod

(a) ~~Whole time~~

J.Antony
Jr.Parasitologist CPCRI (RS)

(b) Part time

[Indicate proportion of time to be devoted and other area (s)]:

C.P.Dubey

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

Division of Genetics
CPCRI Kasaragod
Kerala

8. Date of start:

July 1970

9. Date of termination:

December 1976

10. (a) Objectives

(Not more than 150 words)

To have a clear understanding ^{of} the process of pollination and fertilisation with special reference to identifying insects, one of the agents ~~which~~ which facilitate these processes, and their special role, if any, in enhancing the yield of coconut.

To collect fundamental information regarding ⁿ the commencement, duration and overlapping, if any, on the floral phases so that the information can be made use of in designing breeding programmes.

(b) Practical utility
(Not more than 100 words)

Identifying insect pollinators ~~and~~ and their peak time of visit helps in designing and programming assisted pollination programmes.

Methodology developed in quantifying floral-phase-overlapping helps in selection of parent palms for breeding programmes.

// proves

Results from the study// that keeping bee-hives in coconut garden brings about a minimum increase of TWO nuts per palm.

11. Technical Programme:

(Indicate briefly plan of procedure, techniques, instruments and special materials, organism, special environments etc.)

Collection and identification of insects visiting coconut crown.

Study of the flight range of bees with radio labelling.

Estimating the ~~flight range~~ increase in yield, if any when bee-hives are kept in the garden

Collection of fundamental data on the floral phases and evolution of a method to quantify them.

12. Final Report on the Project:

(A summary of results not exceeding 5 typed pages, precisely and concisely stating the fundamental and/or practical significance thereof).

Separate sheet attached.

Column No. 12. Final report on the project

The results obtained from this project can be elucidated under three topics, i) regarding the insect visitors on coconut crown and their potential as effective pollinators, ii) regarding the increase in yield of nuts when honey bees are used as intensive pollinators in coconut garden, and iii) regarding the quantification of overlapping of floral phases.

Insects visiting coconut crown were collected and examined for the presence/absence of coconut pollen on their body. Of the 13 species caught, 8 were identified with the help from CPCRI (RS) Kayamkulam. Of these, Sarcophaga fuscicanda was found to frequent the crown more often than others. However Apis dorsata visits the palm during female phases with maximum pollen. The details are given in Table.1. The peak hour of visit of these insects, as given in Table.2., was between 10 AM and 12 Noon.

To study the effect of bees in enhancing the yield of coconuts, when they are used as pollinators, 12 bee hives were kept in a compact design in one of the blocks of CPCRI Kasaragod campus. ^{palms} both Tall and Dwarf are present. Analysis of the data for two years showed a mean increase of TWO nuts per palm. However this was not significant statistically. This result was obtained by comparing the yield of the experimental palms with the mean yield (farm average) of 250 palms. This result, though statistically not significant, certainly advocates the practice of keeping bee hives in coconut gardens.

Observations on the commencement, duration and overlapping of the floral ^{phases} ~~phases~~ were recorded. Two sets of observations were recorded during the course of the Project. Observations recorded on 5 Dwarfs along with the local Tall are given in Table 3. The following inferences are made from this. a) In Chowghat Dwarf Green self pollination is prevalent due to an ^t overlapping of phases. So also is the case with Kulasekharam Dwarf Orange and Kulasekharam Dwarf Yellow. b) in Chowghat Dwarf Orange the partial crossing noted is due to the partial overlapping of phases. c) in Kulasekharam Dwarf Green and West Coast Tall, the absence of overlapping may result in complete cross pollination.

Another set of similar observations recorded in 4 cultivars viz. West Coast Tall, Chowghat Dwarf Orange, Laccadive Ordinary and Philippines Ordinary are given in

Tables 4, ~~and~~ 5 and 6. It can be seen, from Table 4, that in Chowghat Dwarf Orange, there is cent percent overlapping of phases in all the bunches. This is because both inter and intra spadix pollination is prevalent in Chowghat Dwarf Orange, as can be seen in the subsequent Tables. Overlapping of phases is noted in all the cultivars studied, though in varying degrees.

From the data collected for two years a set of 4 formulae were computed to calculate and quantify overlapping. Any two/three of the 8 parameters recorded during the observation is sufficient to calculate overlapping. The different formulae and ~~xx~~ the resultants of each, when used for estimating overlapping, are given in Table 5. It can be seen that the values obtained do not show any significant difference. A linear relationship is noticeable between the number of female flowers and the duration of female phase. When intra spadix overlapping is the major reason for the high degree (46%) of total overlapping in Dwarf, inter spadix overlapping plays a similar role in the other cultivars.

Using one of the formulae viz. $\frac{\text{Total number of overlapping days}}{\text{Total duration of female phase}}$ the overlapping was again estimated from the 1973 data and the '73/'74 pooled data to test the fitness of the formula. As already seen, Chowghat Dwarf Orange showed the highest degree of overlapping, followed by Philippines, West Coast Tall and Taccadive Ordinary.

An attempt was made to find out whether any correlation exists between climatological parameters and overlapping. It was seen that there was no significant correlation between relative humidity* and overlapping. However multiple correlation between overlapping and maximum temperature, minimum temperature and temperature range, indicated significance.

While the studies on insect pollinators are helpful in designing programmes of assisted pollination, the fundamental studies on the floral phases is of much use in breeding programmes. Besides, the formulae developed can be made use of in other crops with similar floral characteristics.

Table.1.. Details of insect visit on coconut crown

Name of insect	%visit	MALE PHASE		FEMALE PHASE	
		with pollen	without pollen	with pollen	without pollen
Apis indica	12.30	55.55	44.45	85.71	14.29
A.dorsata	16.00	66.67	33.33	95.83	4.17
A.florea	2.50	57.14	42.86	87.50	12.50
Blue bottle flies	27.20	51.85	48.15	76.67	23.33
Ceratinid bees	3.90	100.00	0.00	100.00	0.00
Dipteran flies	1.30	20.00	80.00	100.00	0.00
Eumenes Sp.	6.90	58.67	41.33	100.00	0.00
Sarcophaga fuscicanda	27.50	42.11	57.89	77.05	22.95

Table.2. Percentage of visit of insects in different hours

07.30	08.30	10.00	11.00	13.30	14.30	15.30
to	to	to	to	to	to	to
08.30	09.30	11.00	12.00	14.30	15.30	16.30
14.28	15.56	19.38	21.42	12.24	10.20	8.16

Table.3. Assessment of Male and Female phases

Cultivar	Number of palms	Number of inflorescence	Mode of pollination % of inflorescence with		
			Total (overlapping)	Partial	Nil
Chowghat dwarf orange	10	73	10.9	87.7	1.4
Chowghat dwarf green	10	112	100.0	0.0	0.0
Kulasekharam dwarf green	10	103	0.0	38.2	61.8
Kulasekharam dwarf yellow yellow	10	77	87.0	73.0	0.0
Kulasekharam dwarf orange	10	94	86.2	13.8	0.0
West coast tall	10	147	0.0	0.0	100.0

Table.4. Assessment of Male and Female phases

Cultivar	Overlapping bunches		Overlapping flowers	
	Mean	range	Mean	range
West coast Tall	26	0-66	27	9-44
Chowghat Dwarf orange	100	-	74	64-100
Laccadive Ordinary	27	0-66	31	0-45
Philippines Ordinary	24	0-66	24	10-53

Table 5. Intensity of overlapping of floral phases

Cultivar	Number of palms	Mean intensity of overlapping*					
		Inter spadix	Intra spadix	T O T A L			
				1	2	3	4
Chowghat Dwarf Orange	9	0.117	0.353	0.470	0.474	0.467	0.475
West Coast Tall	10	0.128	0.087	0.215	0.199	0.198	0.214
Laccadive xxx Ordinary	10	0.128	0.087	0.215	0.199	0.198	0.214
Philippines Ordinary	10	0.308	0.094	0.402	0.392	0.362	0.352

*Mean intensity of overlapping:

1. Total number of overlapping female flowers
Total number of female flowers

2. Total number of overlapping days

3. $1/n$ sigma Overlapping days for each bunch
Duration of female phases for
the overlapping bunch

4. $1/n$ sigma Overlapping female flowers for each bunch
No. female flowers in the corresponding bunch

n= Total number of bunches

Table 6. Mean intensity of overlapping

Cultivar	Mean intensity of selfing					
	Total		Interspadix		Intraspadix	
	1973	1973-'74	1973	1973-'74	'73	'73-'74
Chowghat Dwarf Orange	47.4	58.4	11.7	26.4	35.3	32.1
West Coast Tall	19.9	17.5	12.8	5.7	8.7	11.8
Laccadive Ordinary	19.5	21.1	10.3	16.1	7.8	5.0
Philippines Ordinary	39.2	39.3	30.8	30.9	9.4	8.4

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13. Progress of work in relation to the time targeted for completion of work and reasons for non-achievement of targets, if any.

Studies on the flight range of bees with radio labelling techniques could not be carried out, since the radio laboratory at Kayamkulam could not be commissioned within the project period.

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14. Publications: (Proposed) Some observation on the floral biology of coconut.

(a) Research papers

(b) Popular articles

(c) Reports.

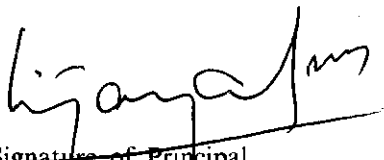
} Two copies each to be
supplied with this proforma.

CPCRI Annual report 1971 to '76

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

Experimental log book for Gen.V(231)
Dn.Genetics
CPCRI Kasaragod.

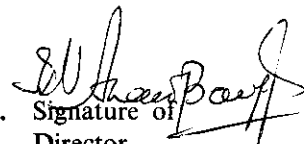
16. Signature of Principal Investigator.



17. Signature of Head of Division/Section/Station.



18. Signature of Director.



GUIDELINES FOR PREPARATION OF FINAL REPORT OF THE RESEARCH PROJECT

1. Institute Code No. : Enter the same Code No. as was given in the approved research project proposal.
2. ICAR Code No. : To be filled by the I. C. A. R.
3. Name and address of the Research Institute/
Centre : Write the name and address of the Research Institute responsible for the research activity.
4. Project title : This should be the same as was given in the approved research project proposal.
5. Name and designation of the Principal Investigator : He is the person immediate incharge of the Project and serving as a point of contact.
6. Name (s) and Designation (s) of associate (s) and
establishment on which borne : Give name (s) and designation (s) of the scientific personnel connected with this project and the establishment on which they were borne. It may also be mentioned whether they are whole-time or part-time workers. If part-time, please indicate the proportion of time to be devoted in this project and in other areas.
7. Location : Show actual place with complete address where the work has been conducted/proposed to be conducted.
8. & 9. Date of start and date of termination/com-
pletion : Give actual start of the project and the date of completion.
10. (a) Objectives : It is a complete and logically arranged statement of the objectives of the study specifying briefly the aims and goals of the project.
- (b) Practical utility : The importance of the investigation indicating the economic implications, way in which the farmer community will be benefited or scientific knowledge advanced.
11. Technical programme : This statement provides the methodology/experimentation to be employed to accomplish specific objectives. It should be an informative statement which will indicate essential phases/items of contemplated work giving details of the experiments/methodology involved.
12. Final Report of the project : A summary of results not exceeding 5 pages precisely and concisely stating the fundamental and/or practical significance thereof.
13. Progress of work in relation to time-targeted for
completion of work : Progress of work should be reported under brief headings strictly in the order of items of the approved programme of work. If work on any item could not be undertaken, the fact should be mentioned under it. It is necessary to substantiate the results by quantitative data and other details, wherever possible.
14. Publications : List publications resulting from this research, give the title, author (s), Journal where published under separate headings, namely, (i) papers actually published, (ii) manuscripts submitted for publication, (iii) manuscripts under preparation and (iv) patents applications.
15. Details (Nos. etc.) of field/Laboratory and their
final location : List total number of field/Laboratory/Note Books used under this project and their final location.
- 16, 17 & 18. Signatures : The final report may be prepared and signed by Principal Investigator and countersigned by the Head of the Division/Section/Station and the Director.