R. P. F. III

FINAL REPORT

1. Institute Code No: **Stat.1(813)**

2. I. C. A. R. Code No: **P1-76/14-ICI-410/2200**

3. Name and Address of Research Institute/Centre: **Central Plantation Crops Research Institute, Kasaragod-670124, Kerala, India.**

4. Project Title: **Evaluation of shade trees for optimum growth and yield of cardamom.**

5. Name and Designation of Project Leader **MV George**
Scientist S2(Agrl. Statistics)

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.	MV George, Scientist S-2(Agrl.Stat)	15 man months	Laying out the trial Recording of observations, collection of yield data.
2.	AA Mohammed Sayed, Scientist S-2(Genetics)	6 "	Analysis of data & Reporting, Maintenance of the crop, Recording of observations, collection of yield data.
3.	VS Korikanthimath, Scientist S1-(Agronomy)	4 "	

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

CPCRI Research Centre, Appangala, Heravanad-571 201 Coorg District, Karnataka.

CPCRI Kasaragod-670124, Kerala.

8. Date of start

1976

9. Date of termination

1980

10. (a) Objectives (Not more than 150 words)

Cardamom is generally cultivated in the existing forest areas where all kinds of trees grown there, are maintained as shade trees, with proper thinning and regulating of shade. The heterogeneity in the species and characteristic of the shade trees one the main handicaps in conducting any sensitive scientific experiment. Trees that give uniform shade will enable the experimenter for the economic utilisation of the experimental results. The main object of this study is to find out the best shade available in the farm which will be most beneficial for the optimum growth and yield of cardamom.

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

Cardamom is one of the most important foreign exchange earning spices of India, producing about 4500 M.T. annually from an area of 92,700 ha. It is a perennial plant grown under the natural warm humid condition of the tropics with A temperature range of 10° - 35° C, under the canopy of evergreen forests of western ghats. Cardamom is highly sensitive to wind and exposure to sunlight. Although cardamom is a shade loving plant it is generally true that excess of shade is also detrimental to the growth and yield of cardamom. Cardamom being a very important commercial crop, identification and popularisation of best shade trees is all the more important so as to enable the growers in modernising the plantations with scientific planting; economic manuring etc. The proposed study is very useful for identifying and popularising the best available tree in the region for optimum growth and yield of cardamom.

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

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

a) Research papers

Studies on some shade trees of cardamom
By MV George, AA Mohamed Sayed and VS Karikanthimath

b) Popular articles

c) Reports

Annual reports of CRCRI 1976,1977,1978,1979 & 1980

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

NIL

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

NIL

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

1. One Lab. note book recording the yield of cardamom for individual pickings and total for the plants from 4 directions N, E, S and W.
2. Both the note books are kept with the Project Leader.

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

As cardamom is generally cultivated in the existing forest areas the type/species of trees maintained as shade trees vary from region to region. It is worthwhile to take up extensive studies in other regions and later to conduct a well laid-out trial with the selected species repeated in several locations. None of the trials conducted on the existing trees as such can be very sensitive as it will be impossible to get an experiment site with shade trees of the same species.

17. Signatures with name of Project Leader and Associates:

MV George

AA Mohammed Sayed

VS Korikanthimath

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

(David Mallin).

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

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

KASARAGOD-670 124, KERALA

RPF III

Project No. Stat I(813)

11. Technical Programme: Date of Start: 1976

A preliminary study will be carried out at CPCRI Research Centre, Appangala, Karnataka during the four year period from 1975-76 to 1978-79. Among the available and existing shade trees from each of the four important species of shade trees viz. Karimaram (Diospirus ebenum); Elangi (Mimusops elangi), Naddi (Lagerstroemia lanceolata) and Jack (Arte carpus integrifolia) will be selected. General observations like height of trees, spread and height of canopy and branching (using Haga altimetre), incidence of pest/diseases etc will be recorded. Sixteen cardamom plants beneath each shade tree (four plants each from four directions; North, West, South and East) will be selected and marked for taking observations on growth characters. The yield data for each plant will be recorded for all the pickings for the four years of study. The observations on the growth characters like numbers of tillers, height of plants, length and breadth of the longest leaf, number of panicles per plant and length of panicle will be recorded for the final year 1978-79 for each of the plant. The light intensity will also be studied for one season. The light measurements will be taken 6 times a day at two hours interval starting from 7 AM. 12 measurements will be taken from 4 directions at a distance of 1m, 2m and 3m radius from the base of the tree. These observations will be taken for 3 days from the trees each from the 4 species selected. The study on light intensity need be continued for the next seasons if found useful.

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

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12. Final Report 19 81 —19 Date of Start: 1976

A preliminary study was carried out at CPCRI Research Centre, Appangala, Karnataka during the four year period 1975-76 to 1978-79. Among the available and existing shade trees twenty trees each from four important species of shade trees were selected. General observations like the height of trees, spread and height of canopy and branching, etc. were recorded. Sixteen cardamom plants beneath each shade tree were selected and marked for taking observations. The yield data for all the sixteen plants from 4 directions beneath all the 80 shade trees were collected for individual pickings for four years; and compiled the plant wise annual yield.

Analysis of growth characters of cardamom plants grown under different shade trees(table 1) revealed that cardamom plants grown under Karimaram(D. ebenum) produced panicles significantly more in number and longer in size than from those grown under other shade trees viz. Elangi(M. elengi), Nandi(L. lanceolata) and Jack(A. integrifolia). No significant difference between species was observed with regard to the other characters studied namely number of tillers produced, height of plants and size of the leaves. However, the plants grown under Karimaram was found to be taller(181 cm) than the plants grown under other species of shade trees(163-171 cms) and the leaves were found to be bigger in size(52.2 x 8.4cm ^{2}) against 50.3 x 7.7 to 50.1 x 8.0 cm^2).

Pooled analysis of yield of cardamom for the four year period showed significant differences between treatments(table 2). Karimaram was found to be the best shade tree for higher yield(121g) of cardamom per plant which worked out to be 40 to 50 per cent more than the average yield(79 to 89 g) of the cardamom plants grown under other species of shade trees.

Nandi, with no branching upto the average height of 15m,(table 3) were found to provide ideal growth conditions like wider canopy(138 m^2) more height(28.4m) but it sheds leaves during March/April exposing the cardamom plants beneath it to direct sunlight which is detrimental to the plants.

Karimaram has reasonably good height(26m) and spread of canopy(106 m^2). Branches are seen at a height of about 13.4 m from the ground with an average canopy height of 12m. Karimaram also does not shed its leaves during a particular season and hence has an edge over Nandi. Elangi is also a good shade tree with an average height of 23m, branching at a height of 12m and wider canopy(126 m^2). The disadvantages of this shade tree are the thick canopy which prevents the diffused sunlight and its flowering and shedding of flowers during the flowering phase of cardamom. Though jack tree also have almost all the characteristics of good shade trees, it's bulk ripe fruits, fall down damaging the cardamom plants. Ripened fruits, in addition, attract squirrels, rodents and insects which may cause direct or indirect damage to cardamom. But the additional income from these edible fruits to the grower, cannot be ignored. The remedy lies in harvesting them at the correct time to avoid damage to the cardamom plants. It is seen from these discussions that Karimaram has almost all the desirable qualities of an ideal shade tree and the plants grown under it has better growth and produce more cardamom than those grown under other shade trees evaluated. Hence Karimaram can be recommended as a shade tree suitable for the northern region of western ghats.

Table 1. Growth characters of cardamom plants grown under different shade trees for the year 1978-79 (Mean per plant).

Species	No.of tillers	Height (cm)	Length of leaf (cm)	Breadth of leaf (cm)	Number of panicles	Length of panicles (cm)
Karimaram	15.0	181.3	52.2	8.4	26.2	45.5
Elengi	13.0	162.9	50.3	7.7	14.7	36.5
Jack	16.8	163.6	50.1	7.9	20.5	36.7
Nandi	15.0	170.8	50.1	8.0	20.4	37.9
G. Mean	15.0	169.6	50.7	8.0	20.5	39.2
C.V.(%)	38.6	20.8	11.6	14.9	44.3	23.5
C.D.(P=0.05)	-	-	-	-	5.6.	5.8

Table 2. Mean yield of cardamom per plant(g) under different shade trees.

Species/years	1975-76	1976-77	1977-78	1978-79	Mean
Karimaram	112	81	81	207	121
Elengi	82	62	46	126	79
Jack	66	65	52	135	79
Nandi	109	65	42	135	89
Mean	92	68	55	151	92

S.E. for species = 57.5
S.E. for years = 49.4
C.D. for any two years for any species = 31
C.D. for any two species for any year = 32
C.D.(P = 0.05) = 18
C.D. (P=0.05) = 15

Table 3. General characters of shade trees(Means)

Species	Height (m)	Branching Height (m)	Canopy height(m)	Spread of canopy(m^2)
Karimaram	26.25	13.40	12.45	105.9
Elengi	22.75	13.35	10.65	126.4
Jack	21.80	12.00	10.58	90.9
Nandi	28.35	14.85	15.20	138.0