

CULTURAL EXPERIMENTS WITH TURMERIC
(*CUCURMA DOMESTICA* VAL.)

III. THE INFLUENCE OF TYPE OF SEED, MULCHING,
PLANTING DEPTH AND SHADE ON YIELD

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SUMMARY

THE results of an experiment set down in the 1941-42 season, at the Experiment Station, Nugawela, for the purpose of investigating the effect of type of seed, frequency of mulching, depth of planting and shade on the yield of two varieties of turmeric (*Cucurma domestica* Val.) are reported.

Shade produced a large and significant reduction in the yield of uncured rhizomes.

Plants derived from "fingers" significantly outyielded those derived from mother setts. The superior performance of "fingers" appears to be largely due to the higher seed rate used with this type of planting material.

INTRODUCTION

In smallholdings in the wet zone, turmeric is usually grown in mixture with a variety of crops, and is, under these conditions, often subjected to heavy shade. Shade is a factor on which divergent opinions have been expressed, and its effect on the turmeric crop has not hitherto been the subject of experiment.

Although the depth of planting of setts is not considered a factor of much importance by the grower, accurate information on this point is desired in view of its bearing on planting costs.

In experiments recorded in previous numbers of this series (Paul & Fernando, 1941*a* & 1941*b*), a single rice-straw mulch at planting time increased yields considerably. The possibility of securing further increase in yield by more frequent mulching warranted investigation.

The examination, in previous experiments (Paul & Fernando, 1941*a* & 1941*b*), of the suitability of various kinds of planting material proved inconclusive. A study of the effect of seed type was accordingly included in the experiment presented herein.

TREATMENTS

There were 32 treatments consisting of the following in all combinations :—

- (V) Variety : Local (V_0) or Guntur (V_1).
- (T) Type of seed : “ Fingers ” (T_0) or quadrisectioned mother setts (T_1).
- (M) Mulching : Mulched once (M_0) or twice (M_1).
- (D) Depth of Planting : Seed planted one inch (D_0) or four inches (D_1) deep.
- (S) Shade : Unshaded (S_0) or shaded (S_1).

A single replication of 32 plots was distributed over four blocks of eight plots. The plots measured 4 ft. by 16 ft. (1/681 acre). Appendix 1 provides details of the design.

MATERIAL AND METHODS

The experiment was carried out at the Experiment Station, Nugawela, in the 1941-42 season. The soil of the experimental area was a moderately fertile, lateritic loam with a relatively low pH value. The land was mamotied, and received an application of 10 tons compost per acre on the day previous to planting. The rhizomes were planted at a spacing of 1 ft. by 1 ft. on April 23, 1941. The seed rates were as follows :— V_0T_0 —12 cwt. per acre ; V_0T_1 —6 cwt. per acre ; V_1T_0 —27 cwt. per acre ; V_1T_1 —9 cwt. per acre. The seed rates were higher for the Guntur than for the local variety, and much higher for the “ fingers ” than for the mother setts. On the date of planting, all plots were mulched at the rate of 12 tons rice straw per acre. The M_1 plots received a further mulch of 12 tons rice straw per acre on October 20.

A light cadjan shade was erected at a height of 18 inches over the S_1 plots on the day following the planting. The shade was progressively raised as the plants increased in height—it was raised to three feet on May 23, and to five feet on August 19. The overhead shade was observed to be ineffective against the early morning and the late afternoon sun, and was accordingly supplemented on June 4, by lateral cadjan tats.

The sprouts were first observed above ground on May 13, Mother setts tended to sprout earlier than “ fingers ”. Records of germination in plots subjected to the various treatments are given in Appendix 3. Sprouting was not evident in some of the hills even after nine weeks. On June 2, the dormant seed in these hills was replaced by sprouted seed from adjacent nurseries.

The plots received one weeding on September 23.

The pyralid caterpillar, *Dichocrocis punctiferalis* Guen., made its first appearance on August 5. This stem-boring caterpillar is the only troublesome pest of the turmeric crop in this country. The damage was severer in the shaded plots. The infestation was checked by the removal of the borer from invaded stems by the use of a wire hook. In the early stages the plants under shade made more rapid growth. Marked dwarfing effects were, however, evident later in the S_1 plots. On October 1, shaded plants were observed to be shorter and smaller leaved.

By the middle of December, the plants had begun to yellow and die down. Shaded plants showed earlier senescence. The crop was lifted on February 6 and 7, 1942.

Rainfall data for the experimental season are given in Appendix 2.

RESULTS

The analysis of variance of weights of uncured rhizomes produced by plots subjected to the various treatments is given in Appendix 4. The variance ratios for the seed type and shade treatments are significant at the one per cent. point.

The total yields of uncured rhizomes in shaded and unshaded plots in the two seed types are given below :—

Table I.—Yields of Uncured Rhizomes in Pounds

	Shaded.	Unshaded.	Total.
“ Fingers ” ..	78	517	595
Mother Setts ..	64	436	500
Total ..	142	953	1095

DISCUSSION

The most striking feature of the results is the demonstration of marked depressant effects of shade on the yield of turmeric. The degree of shade to which the experimental plants were subjected was not more intense than that which turmeric crops grown in small holdings in mixture with jak, arecanut, breadfruit, &c., often receive. An investigation of the extent to which other crops like ginger, *Colocasia* spp., *Xanthosoma* spp. and sweet potatoes, that compose the ground vegetation in these smallholdings, are adversely affected by a overhead canopy would be of considerable interest. The effects would find an obvious explanation in the slow rate of photosynthesis under conditions of poor illumination.

Plants derived from “ fingers ” gave yields significantly higher than those derived from mother setts. The higher seed rate used with the former type of planting material would have contributed to its superiority. The results obtained in previous experiments (Paul & Fernando, 1941a & 1941b) must be interpreted with caution as the seed rates for different varieties and seed types are not comparable.

The heavy initial mulch of 12 tons of rice straw per acre explains the absence of response to a second application.

Shallow planting is not inferior to deep planting and should be preferred in view of the lower cost.

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REFERENCES

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The Tropical Agriculturist, XCVI., 265-268.
2. Paul, W. R. C. & Fernando, Cultural Experiments with Turmeric (*Cucurma domestica* M., 1941b Val.)—II.
Ibid. XCVII., 10-13.
3. Yates, F., 1937 .. The Design and Analysis of Factorial Experiments. *Imp. Bur. Soil Sc., Tech. Comm., No. 35.*

APPENDIX I. (Design of the Experiment)

A factorial design by Yates (1937) of the form 2⁵ was adopted. The 32 treatments (five factors each at two levels) were arranged in the following manner :

BLOCK 1	BLOCK 2	BLOCK 3	BLOCK 4
1 1 1 1 1*	1 1 1 0 1	1 1 1 0 0	1 1 1 1 0
1 1 0 1 0	1 1 0 0 0	1 1 0 0 1	1 1 0 1 1
1 0 1 0 1	1 0 1 1 1	1 0 0 1 1	1 0 1 0 0
1 0 0 0 0	1 0 0 1 0	1 0 1 1 0	1 0 0 0 1
0 1 1 0 0	0 1 1 1 0	0 1 1 1 1	0 1 1 0 1
0 1 0 0 1	0 1 0 1 1	0 1 0 1 0	0 1 0 0 0
0 0 1 1 0	0 0 1 0 0	0 0 1 0 1	0 0 1 1 1
0 0 0 1 1	0 0 0 0 1	0 0 0 0 0	0 0 0 1 0

The three interactions V.T.D., V.M.S., and T.M.D.S. were confounded with the four blocks. For further details of the design, reference may be made to Yates (1937).

*The levels of the five factors in each treatment combination are given in succession, e.g., 11010 indicates $V_1T_1M_0D_1S_0$.

APPENDIX 2. (Rainfall Records for the Period April 1941–February 1942.)

Month.	Total Rainfall in Inches.	Number of Rainy Days.
April, 1941 ..	8.18	9
May ..	11.16	19
June ..	6.37	22
July ..	3.96	16
August ..	6.61	27
September ..	3.87	19
October ..	14.99	22
November ..	19.77	26
December ..	7.94	13
January, 1942 ..	2.42	9
February ..	1.00	4

APPENDIX 3.

Treatment.	Numbers of Sprouted Setts Observed on						
	13·5·41	20·5·41	27·5·41	4·6·41	11·6·41	18·6·41	25·6·41
1 0 0 0 1* ..	—	1	16	32	44	56	60
0 0 0 0 0 ..	—	7	39	45	62	63	63
0 1 0 0 0 ..	—	15	42	45	49	49	50
1 1 0 0 1 ..	1	5	35	48	59	59	59
0 1 1 0 1 ..	—	12	38	47	52	50	50
0 0 1 1 1 ..	—	5	38	49	64	64	64
0 1 1 1 1 ..	—	3	35	47	56	56	56
0 0 1 0 1 ..	—	10	33	54	64	64	64
0 1 0 1 0 ..	—	8	37	45	45	46	46
1 1 1 0 0 ..	—	6	31	51	55	59	59
0 0 0 1 0 ..	—	3	30	48	60	61	63
1 0 1 0 0 ..	—	—	11	31	47	56	58
1 0 1 1 0 ..	—	—	6	39	50	57	59
1 1 0 1 1 ..	—	3	37	42	56	57	58
1 0 0 1 1 ..	—	—	7	27	35	52	59
1 1 1 1 0 ..	—	3	34	52	53	56	56
0 0 1 0 0 ..	1	6	41	52	58	62	64
0 1 1 1 0 ..	1	3	36	45	45	47	48
0 0 0 0 1 ..	—	8	30	48	58	61	63
1 0 0 0 0 ..	—	1	9	39	54	59	61
1 0 1 0 1 ..	—	1	8	28	46	56	57
1 0 0 1 0 ..	—	—	6	26	43	51	54
1 0 1 1 1 ..	—	1	8	28	40	54	57
1 1 0 1 0 ..	1	6	25	38	56	56	57
0 1 0 0 1 ..	—	9	31	47	50	53	55
1 1 1 1 1 ..	—	1	22	45	48	56	56
0 1 1 0 0 ..	1	11	45	49	51	52	54
0 1 0 1 1 ..	—	13	24	39	41	47	47
0 0 0 1 1 ..	—	2	24	45	60	61	62
1 1 0 0 0 ..	—	3	34	51	58	59	60
0 0 1 1 0 ..	—	2	28	61	62	63	64
1 1 1 0 1 ..	—	3	25	48	52	56	56

* The levels of the five factors in each treatment combination are given in succession, e.g., 10001 indicates $V_1T_0M_0D_0S_1$.

APPENDIX 4. (Analysis of Variance of Weights of Uncured Rhizomes)

Main Effects :	D.F.	S.S.	M.S.
V ..	1	1·53	1·53
T ..	1	282·03	282·03
M ..	1	63·28	63·28
D ..	1	42·78	42·78
I ..	1	20,553·78	20,553·78
Two-Factor Interactions :			
VT ..	1	0·03	0·03
VM ..	1	569·53	569·53
VD ..	1	16·53	16·53
VS ..	1	16·53	16·53
TM ..	1	87·78	87·78
TD ..	1	7·03	7·03
TS ..	1	140·28	140·28
MD ..	1	13·78	13·78
MS ..	1	75·03	75·03
DS ..	1	34·03	34·03
Main Effects and Two-Factor Interactions	15	960·55	64·04
Blocks	3	—	—
Remainder	13	234·40	18·03
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