

GROWTH, YIELD AND QUALITY OF *KAEMPFERIA GALANGAL*. AS INFLUENCED BY PLANTING TIME AND TYPE OF SEED MATERIAL*

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Kaempferia galanga L known as *kacholam* is an important medicinal crop of Kerala. The economic part is the underground rhizome, used traditionally as a wormicide. The active ingredient of the rhizome is an essential oil.

Kacholam is propagated vegetatively, using rhizome. The plant produces both mother and finger rhizomes. Works carried out on related crops like turmeric and ginger have shown significant difference in yield for the type of seed material used (Aiyadurai, 1966; Randhawa *et al.*, 1972; Randhawa and Misra, 1974; Patil and Borse, 1981; Chatterjee, 1983). In these crops, planting time had significant influence for growth, yield and quality constituents as revealed by Patil and Borse (1981) and Chatterjee (1983). In view of these findings the present investigation was undertaken to standardise the planting time and type of seed material in Kacholam.

Materials and Methods

The experiment was conducted at the College of Horticulture, Vellanikkara during the period from May 1982 to June 1983. The soil type of the area was laterite with clay loam texture. Weather data during the period are given in Table 1.

The seed materials were collected from cultivators of Thodupuzha, Kerala. Uniformly sized mother rhizomes (4-5 g) and finger rhizomes (1-2 g) were sorted out. The experiment was laid out in split plot design with three planting time, viz., third week of May, first week of June and second week of June in the main plot and two types of seed materials, viz., mother rhizome and finger rhizome in the sub-plot. The sub-plots had a gross area of 3.6 x 1.6 m and a net area of 3 x 1 m. A spacing of 20 x 15 cm was adopted for planting. The cultivation was undertaken as per the package of practices recommended for ginger by Kerala Agricultural University (KAU, 1981).

Ten plants per plot were selected for recording various growth parameters, viz., number of leaves, leaf length, leaf width and leaf area during the sixth month after planting. The yield of green rhizome per plot was recorded by taking the weight of the entire produce harvested from each plot. From the plot yield, the yield of green *kacholam* per hectare was computed. Samples consisting of 500 g green *kacholam* were dried in the sun and the drying per cent was worked out. The yield of dry rhizome per hectare was computed. The essential oil and oleoresin were estimated as per the methods of the American Spice Trades Association (ASTA, 1960). The per hectare essential oil and oleoresin yield were found out by multiplying the yield of dry rhizome per hectare with the per cent recovery of essential oil and oleoresin respectively.

Part of M.Sc. (Hort) thesis submitted by the senior author to the Kerala Agricultural University, 1983.

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Results and Discussion

7. Growth characters

Planting time had significant influence on the number of leaves, leaf width and total leaf area. Crop planted during the third week of May was significantly superior to other plantings (Table 2). Type of seed material did not show significant impact on the morphological characters.

2. Yield characters

Data relating to the fresh rhizome yield per plot, dry rhizome yield per plot, drying per cent, projected fresh and dry rhizome yield per hectare are presented in Table 3. All the yield characters were significantly influenced by planting time. Crop planted during the third week of May was significantly superior to other planting time with respect to fresh and dry rhizome yields. With regard to drying per cent, crop planted during the second week of June was significantly superior to the crop planted during the third week of May but it was on par with the crop planting during first week of June. Among the seed materials used, mother rhizome showed superiority over finger rhizome with respect to all the yield characters.

3. Qualitative characters

Planting time and the type of seed material did not influence the essential oil content significantly (Table 4). The essential oil yield per hectare, oleoresin content and oleoresin yield per hectare were significantly influenced by planting time; the third week of May planting being superior to others.

With regard to the type of seed material, mother rhizome showed significant influence for oleoresin yield per hectare. Other qualitative characters were not influenced by the type of seed material.

Crop planted during the third week of May established well before the monsoon got strengthened by middle of June. Heavy rainfall during June might have retarded the vegetative growth in late planted crops (Table 1). Hari *et al.* (1978) found 10th May as the best planting time for turmeric for good vegetative growth.

With respect to yield characters, early planted crop was significantly superior to mid and late planted crops. The results are in line with the findings of Randhawa and Misra (1974) and Chatterjee (1983) in turmeric.

Among the qualitative characters studied, the oleoresin content was significantly influenced by planting time; the third week of May being superior to other plantings. This difference might be as a result of photoperiodism. Photoperiods show significant influence on the mobilisation of photosynthates and allied products to the sink and on enzymatic action for the interconversion of food materials (Leopold and Kriedemann, 1975). Favourable photoperiod could be attributed to the increased oleoresin content in the early planted rhizome. In turmeric, Chatterjee (1983) obtained high oleoresin yield from the mid-May planting.



Fig. 1 Growth habit of
Kaempferia galanga

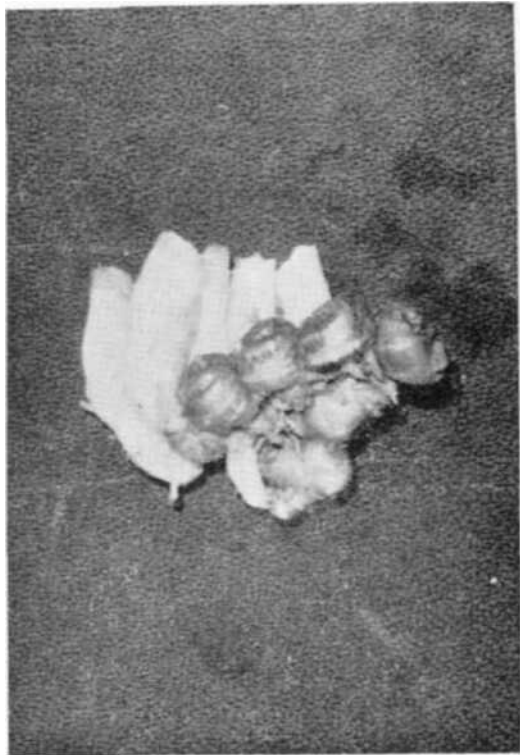


Fig. 2 Rhizomes of
Kaempferia galanga

Table 1
Weather data during 1982-'83

Month	Temperature (°C)		Mean relative humidity (%)	Total rainfall (mm)
	Mean maximum	Mean minimum		
May	33.8	24.5	79.9	173.6
June	30.6	23.1	79.8	657.6
July	29.1	22.9	87.5	600.9
August	28.9	24.3	85.0	575.4
September	30.9	24.0	78.8	67.4
October	32.0	23.1	77.0	277.8
November	31.4	23.9	71.8	98.4
December	31.9	23.1	58.4	5.2
January	33.2	21.6	51.3	0.0
February	34.5	22.7	64.0	0.0
March	36.1	23.7	65.0	0.0

Table 2
Effect of planting time and type of seed material on growth characters

Treatment	Number of leaves	Leaf length (cm)	Leaf width (cm)	Mean leaf area (cm ²)	Total leaf area (cm ²)
Planting time					
P1	30.25	12.78	4.54	52.22	1578.1
P2	29.67	11.26	4.17	42.25	1253.6
P3	20.21	12.23	4.13	45.43	914.5
C.D. (0.05)	3.34	NS	0.46	NS	304.2
Type of seed material					
m1	26.67	12.21	4.28	47.04	1244.9
m2	26.71	11.96	4.27	46.19	1252.5
C.D. (0.05)	NS	NS	NS	NS	NS

NS not significant

P1 third week of May

P2 first week of June

P3 second week of June

m1 mother rhizome

m2 finger rhizome

Table 3
Effect of planting time and type of seeds material on yield characters

Treatment	Fresh rhizome	Dry rhizome	Drying per cent	Projected gross yield	
	yield per plot (kg)	yield per plot (kg)		Fresh yield (q/ha)	Dry yield (q/ha)
Plantingtime					
P1	2.64	0.659	25.06	45.83	11.45
P2	2.25	0.605	26.87	38.98	10.50
P3	1.79	0.489	27.42	31.19	8.49
C.D. (0.05)	0.31	0.080	0.97	6.34	1.79
Type of seed material					
m1	2.39	0.637	26.96	41.45	11.06
m2	2.07	0.532	25.94	35.88	9.23
C.D. (0.05)	0.19	0.060	0.99	4.17	1.26
NS	not significant		P3	second week of June	
P1	third week of May		m1	mother rhizome	
P2	first week of June		m2	finger rhizome	

Table 4
Effect of planting time and type of seed material on qualitative characters

Treatment	Essential* oil content (%)	Essential oil yield (kg/ha)	Oleoresin* content (%)	Oleoresin yield (kg/ha)
Planting time				
P1	1.68 (7.45)	19.13	4.91 (12.79)	56.31
P2	1.74 (7.58)	18.16	4.10 (11.68)	43.06
P3	1.69 (7.47)	13.98	3.37 (10.63)	28.47
C.D. (0.05)	NS	3.70	0.89	9.09
Type of seed material				
m1	1.66 (7.49)	18.19	4.18 (11.83)	46.87
m2	1.74 (7.58)	15.98	4.07 (11.68)	38.36
C.D. (0.05)	NS	INS	NS	7.52
NS	not significant		P3	second week of June
P1	third week of May		m1	mother rhizome
P2	first week of June		m2	finger rhizome

* Values given in brackets are the angular transformed values.

Season and seed material for *Kaempferia galanga*

Table 5

Economics of cultivation of *kacholam* (for one hectare)

1	Cost of seed material (960 kg @ Rs 4.00/kg)	: Rs.	3,840.00
2	Land preparation, planting, manuring and harvesting etc.	: Rs.	3,856.00
3	Total cost of cultivation (1 + 2)	: Rs,	7,696.00
4	Yield of dry rhizome		1092 kg
5	Total income Rs. 11.00/kg of dry rhizome	: Rs,	12,012.00
6,	Net income (5-3)	: Rs.	4,316.00

Of the type of seed materials, mother rhizome showed superiority over finger rhizome in terms of yield and qualitative characters under discussion. Increased rhizome yield as a result of increase in the weight of planting material could be attributed to the 'carrier effect'. Compared to light weight planting materials, heavy planting materials contain more nutrients which result in better growth of plants. Several workers have reported higher yields using heavier planting materials in ginger (Randhawa *et al.*, 1972), in turmeric (Randhawa and Misra, 1974; Chatterjee, 1983) and in *Costus* sp. (Sharma *et al.*, 1980; Joseph, 1983).

4. Economics of cultivation

In the light of the results obtained, the treatment combination consisting of mother rhizome planted on third week of May was found to be the best. The produce is marketed after drying and making into chips and the economics was worked out based on the prevailing market price of Rs. 11.00 per kg (Mathrubhumi, 1983). It may be seen from Table 5 that a net income of Rs. 4316.00 could be obtained per hectare. A higher net income could be expected if processing industries come forward for the manufacture of oil and oleoresin which may find diversified uses in medicine and perfumery.

Summary

Asplit plot experiment was conducted at the College of Horticulture, Vellanikkara during 1982-83 with a view to find out the best planting time and type of seed material in *Kaempferia galanga* L. The treatments included were three planting time, viz., 3rd week of May, 1st week of June and 2nd week of June and two types of seed materials, viz., mother and finger rhizomes. Planting time had significant influence on the number of leaves per plant, leaf width, total leaf area and rhizome yields. Mother rhizome planted during the third week of May was significantly superior to other treatments with respect to rhizome and oleoresin yields. A net income of Rs. 4,316.00 per hectare could be obtained from the crop planted on 3rd week of May using mother rhizomes.

സംഗ്രഹം

കേരള കാർഷിക സർവകലാശാലയുടെ കീഴിലുള്ള വെള്ളാനിക്കര ഹോർട്ടിക്കൾച്ചറൽ കോളേജിൽ വെച്ച് 1982-83 ൽ കച്ചോലം എന്ന മരണയ സസ്യത്തിന്റെ നടുന്നതിനുള്ള സമയം, നടീൽ വസ്തു എന്നിവയെക്കുറിച്ച് ഒരു പരീക്ഷണം നടത്തുകയുണ്ടായി. ഓരോ ചെടിയിലുള്ള ഇലകളുടെ എണ്ണം, ഇലകളുടെ വീതി, ഇലകളുടെ വിസ്തീർണ്ണം, കിഴങ്ങിന്റെ ഉൽപ്പാദനം എന്നിവയെ നടുന്നതിനുള്ള സമയം പ്രകടമായി ബാധിക്കുന്നതായി കണ്ടു. മേയ് മൂന്നാമത്തെ ആഴ്ചയിൽ മാതൃകിഴങ്ങ് ഉപയോഗിച്ച് കൃഷി ചെയ്ത വിളയിൽനിന്ന് ഏറ്റവും കൂടുതൽ കിഴങ്ങും ഓളിയോറെസിനും ലഭിച്ചു. കൃഷിചെയ്ത വിളയിൽനിന്നും ഒരു ഹെക്ടർ കൃഷിക്ക് 4,316 രൂപ അറ്റാദായം ലഭിക്കുന്നതായി കണ്ടു.

Acknowledgements

The authors express their gratefulness to Dr, S. Ramachandan Nair, Professor (Horticulture), Dr. A. I. Jose, Professor (Agrl. Chemistry) and Sri. P. V. Prabhakaran, Associate Professor (Agrl. Statistics) for the help rendered during the investigation. The Junior Fellowship awarded to the senior author by Indian Council of Agricultural Research is gratefully acknowledged.

References

Aiyadurai, S. G. 1966. *A Review of Research on Spices and Cashewnut in India.* I.C.A.R., New Delhi, 145

ASTA 1960. *Official Analytical Methods of the American Spices Trade Association.* ASTA New York, 41-42

Chatterjee, R, K. 1983. Effect of planting date, weight of rhizome and spacing on the growth, yield and quality constituents on turmeric (*Curcuma longa* L.) M. Sc. (Hort) thesis, Kerala Agricultural University, 67-69

Hari, O. M. Verma, V, K. and Srivastava, R. P. 1978. Influence of the time of planting on the growth and yield of turmeric. *Indian J. Hort* 35 (21): 127-129

Joseph, E. J. 1983. Effect of spacing, rhizome weight and time of harvest on the yield and quality constituents in *Costus speciosus*, M.Sc. (Hort) thesis, Kerala Agricultural University, 62-64

KAU 1981. *Package of Practices Recommendations.* Kerala Agricultural University, Vellanikkara, 102-104

- Leopold, A. C. and Kriedemann, P. E. 1975. *Plant Growth and Development*. 2nd ed. Tata McGraw-Hill Publishing Company Ltd., New Delhi, 337-345
- Patil, R. B. and Borse, C. D. 1981. Effect of planting material and transplanting of seedlings of different age on the yield of turmeric, *Indian Cocoa Arecanut Spices J.* 4 (1): 3-5
- flandhawa, K. S. and Misra, K. A. 1974. Effect of sowing dates, seed size and spacing on the growth and yield of turmeric. *Punjab Hort. J.* 14 53-55
- Randhawa, K. S., Nandpuri, K. S. and Bajwa, M. S. 1972. Studies on the comparative efficacy of different size of seed and spacing on the yield of ginger (*Zingiberofficinale* Rosc). *J. Res.* 9 (2): 239-44
- Sharma, S. N., Singh, A. and Tripathi, R. S. 1980. Studies on *Costus speciosus* in relation to weight and source of planting material. *Indian J. Pharm Sci.* 42 (5): 151-153