

Research Articles

SEEDLING PROPAGATION IN TURMERIC (*CURCUMA AROMATICA* SALISB)*

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ABSTRACT

Flowering behaviour, seed set, germination of seeds, growth and behaviour of seedlings and rhizome yield of seedlings were studied in *C. aromatica*. Fruit set was not observed in *C. longa*. Seedling progenies of 58 lines of *C. aromatica* showed remarkable uniformity in morphological characters as well as in chromosome numbers.

INTRODUCTION

Curcuma, a genus of about 70 species of rhizomatous herbs comes under the family Zingiberaceae. *Curcuma longa* Linn. (Syn. *C. domestica* Val.) and *C. aromatica* Salisb. are the two economically important species under the genus *Curcuma* Linn. Earlier reports indicate that turmeric is a sterile triploid which flowers but fails to set seed (Burkill, 1935; Purseglove, 1972). Valenton (1918) observed flowering in all the cultivars in Java but fruit set was observed only in two.

In the present study, viable seeds were obtained from *C. aromatica*. The information on the germination, growth characteristics and rhizome yield of seedling progenies are reported in this paper.

MATERIALS AND METHODS

Eleven cultivars of *C. aromatica* and six of *C. longa* were used for the

present investigation. Number of days taken for flowering in *C. longa* and *C. aromatica* and number of days taken for maturity of seeds, number of days taken for germination and percentage of germination and rhizome yield of seedling progenies in *C. aromatica* were studied. The seeds collected from individual plants in *C. aromatica* were washed in water and treated with Bavistin (0.1%) solution for 30 minutes to avoid fungal and bacterial growth. Seeds collected from individual plants from nine cultivars were sown separately to study the variation within or between progenies, if any. At the end of the first season, when the aerial parts started withering, the plants were uprooted and examined. After recording observations, the small rhizomes were transplanted to bigger polythene bags containing potting mixture. Chromosome number were recorded for five seedlings selected at random from each parental line.

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Somatic chromosome counts were taken from root tip squashes. The hydrolysis was carried out in 1N HCl at 60°C for 12 minutes and bulk stained in basic fuchsin. Slides were prepared in 1 per cent acetocarmine.

RESULTS AND DISCUSSION

In *C. aromatica*, the flowering period was July–September and in *C. longa* it was September to December. Opening of the flowers takes place in the morning hours between 6 AM and 7 AM at Kasaragod. The mature capsules (Fig.1) were observed in October–November.

The number of days taken for flowering from the time of sowing, maturity of seeds and germination particulars are given in Table I.

The data showed that the number of days taken for flowering in *C. longa* varies from 118 to 143 days whereas in the case of *C. aromatica* it varies from 95 to 104 days. Patnaik, Patra and Mohapatra (1960) noted that the first flush in a spike generally completed within 5–12 days and second series of flowers open after the first flush reaches nearly half way upto the spike. The time taken for maturity of seeds from

FIG. 1. TURMERIC INFLORESCENCE WITH MATURE SEEDS



Table I. *Details of flowering and seed set in turmeric*

Name of species/ cultivars	Number of days taken for flowering	Number of days taken for maturity of seeds	Number of days taken for germination (Mean)	Percentage of germination (Mean)
<i>C. aromatica</i>				
50 Kasturi	104	26	14	37.2
51 Kasturi tanuka	103	29	13	49.9
52 Ca 66 GL Puram	104	25	15	35.9
53 Ca 67 Jobedi	104	24	16	43.9
54 Ca 68 Dahgi	103	25	11	60.3
56 Ca 70 Katergia	102	23	16	39.5
57 Ca 72 Udayagiri	101	27	18	35.8
58 Ca 73 Amalapuram	95	26	11	62.5
60 Ca Chayapasupu	104	27	10	30.5
55 Ca 69 Dindigam	102	27	-	-
59 GL Puram I	100	29	-	-
<i>C. longa</i>				
8C Kuchipudi	133	-	-	-
13C Nandyal type	134	-	-	-
24D No. 24	118	-	-	-
18A T. Sunder	128	-	-	-
16A Wynad Local	135	-	-	-
21A Alleppey	143	-	-	-

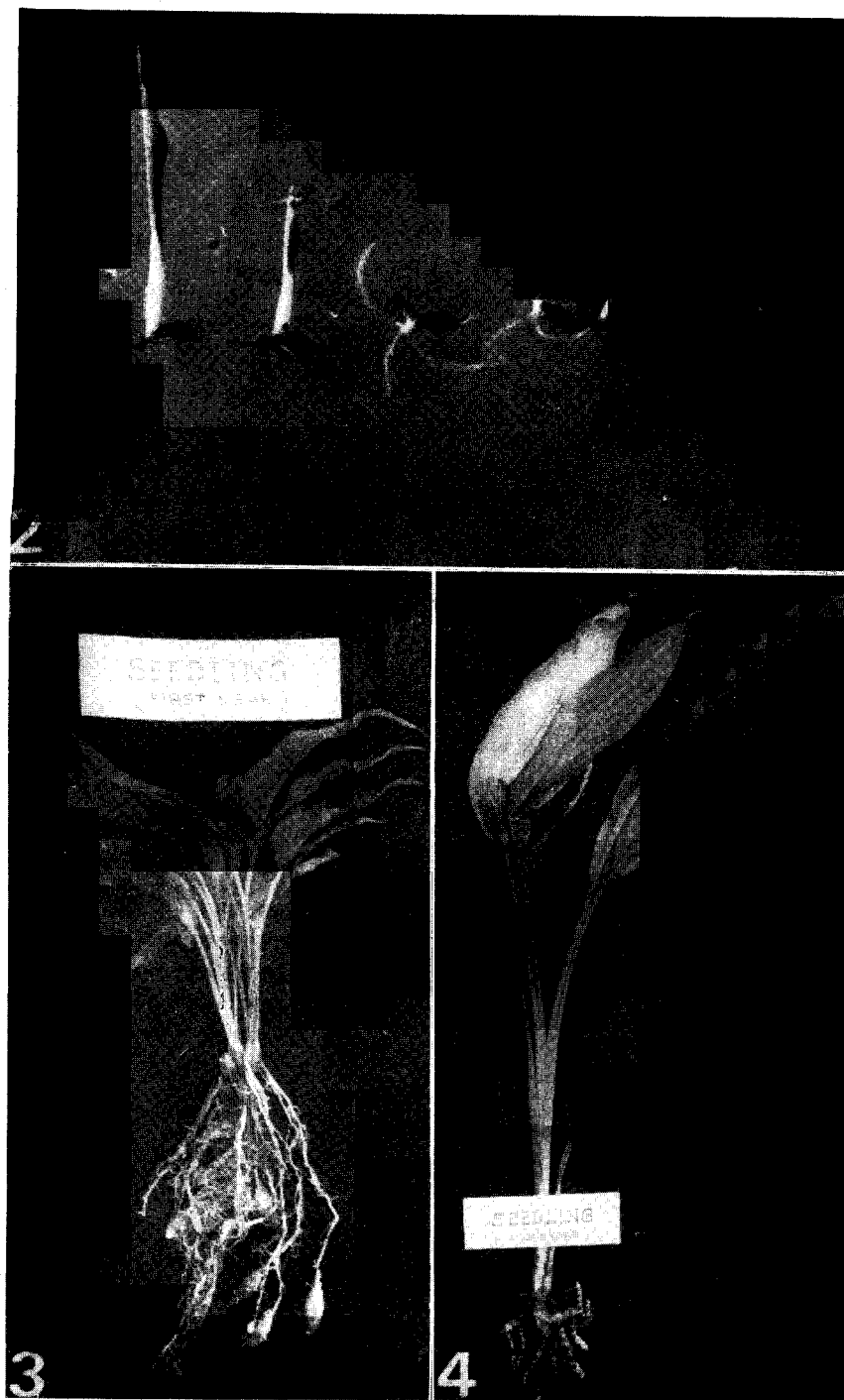
flowering ranges from 23 to 29 days. Seed set was not observed in any of the *C. longa* cultivars flowered. Sastrapradja and Aminah (1970) compared the embryo sac development and meiosis in *C. aurantiaca*, a fruit producing species with those of *C. lorzengii* a non-fruit producing species and found that the fruitlessness in the latter is due to pollen abortion. *C. longa*, which is a triploid showed high degree of irregularities in microsprogenesis. The pollen stainability in acetocarmine varied from 45-48 per cent in *C. longa* and 68-74 per cent in *C. aromatica* (Table II).

Two distinct types of seeds, dark heavy and light brown were extracted

Table II. *Pollen fertility in C. longa and C. aromatica as determined by stainability in acetocarmine*

Name of species/ cultivars	Pollen fertility (%)
<i>C. longa</i>	
8c Kuchipudi	45.74
13a Nandyal type	46.45
24d Number 24	48.48
<i>C. aromatica</i>	
50 Kasturi	74.49
57 Udayagiri	69.84
56 Katergia	73.58
54 Dahgi	68.56
58 Amalapuram	70.01

FIG. 2. GERMINATING TURMERIC SEEDS. FIG. 3. RHIZOME DEVELOPMENT DURING FIRST YEAR. FIG. 4. NORMAL RHIZOME DEVELOPMENT DURING SECOND YEAR



from mature capsules of *C. aromatica*. The seeds have a white aril, smooth surface and an apical micropylar ring with a wavy outline.

Percentage of germination varied from cultivar to cultivar and even plant to plant. Seventy to ninety per cent germination was recorded in 8–20 days after sowing. There was practically no germination after the 20th day. At the time of germination, the seeds absorb moisture and become enlarged before the emergence of the plumule. The plumule is about 4–5 cm long with two protuberances at the base, which later develop into the first primary roots (Fig. 2). The seedlings at two-leaf stage were transplanted to polythene bags. The seedlings raised from seeds of individual plants had remarkable morphological similarities to the parental clones. Like the parental

clones all the progenies had the somatic chromosome number *i. e.*, $2n=84$.

The seedling progenies produced mainly roots and root tubers in the first year of their growth. The rhizomes were very small (Fig. 3). Normal rhizome development occurred during the second year (Fig. 4).

Being a tetraploid semi-wild species (Nambiar, 1979) *C. aromatica* produces viable seeds, the seed production seems to be mainly controlled by environmental factors. In the cultivars of *C. longa* two distinct types are noticed—the flowering and the non-flowering. Seed production is not observed in any of the plants in the flowering group. They are completely sterile and have greater vegetative vigour and ability to spread by rhizomes compared to *C. aromatica*.

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