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GENETIC RESOURCES AND THEIR EVALUATION IN GINGER

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*Ginger (*Zingiber officinale *Rosc.) is believed to have originated in South-East Asia probably in India or China. It is grown in almost all the tropical countries of which China, Taiwan, Philippines, Sierra-Leone, Jamaica and Nigeria are important. India produces 1,35,000 tonnes of ginger annually from an estimated area of 53,600 hectares. Rio-de-Janeiro, China and Jamaica among the exotic group and UP, Maran, Karakkal, Ernad Chernad, Kurupamppadi, Nadia, Sleeva local, Narasapattam, Thingpuri, Vengera, Valluvanad, Mananttodi, Tura, Burdwan, Gurubathan, Tinladium, Wynad Kunnamengulam and local types among the indigenous group, are cultivated extensively. Suprabha (PGS-35) and Suruchi (PGS-19) were released for commercial cultivation and V_1K_1-3 is in pre release multiplication stage among the mutants. One hundred and forty accessions were collected under the auspices of All India Coordinated Spices Improvement Project, Pottangi. Out of these, 124 accessions were evaluated in a phased manner and useful accessions were identified.*

Ginger (*Zingiber officianale* Rosc.) belongs to family Zingiberaceae which comprises 47 genera and about 1,400 species. The ginger has probably originated in South-East Asia (Bailey, 1949). Ginger was brought to Mediterranean region from India by traders during 1st century (Burkill, 1966) and by Arabs to East Africa during thirteenth century. It was spread to West Africa by Portuguse for commercial cultivation. Presently, ginger is grown in almost all the tropical countries like India, China, Taiwan, Philippines, Sierra Leone, Jamaica and Nigeria on commercial scale. India produces about 1,35,000 tonnes of ginger annually from an estimated area of 53,600 hectares. Kerala is the leading state in area and production of ginger followed by Orissa, Meghalaya, Himachal Pradesh, Karnataka, Mizoram, Manipur, Tamil Nadu, Maharashtra, Bihar, Tripura, Gujarat, Uttar Pradesh, Nagaland, Rajasthan, Haryana, Assam and to some extent in Jammu and Kashmir, Sikkim and Arunachal Pradesh.

The National Bureau of Plant Genetic Resources initiated all India survey of ginger germplasm in collaboration with Central Plantation Crops Research Institute, Kasaragod and Himachal Pradesh Agricultural University, Palampur during the year, 1976-77 and considerable germplasm was collected (Thomas, 1980). Gene erosion was visible because an introduced exotic cultivar Rio-de-Janeiro had replaced the local landraces/cultivars in many areas. Thus collection and conservation of ginger germplasm on priority basis was essential. In the present paper, an attempt has been made to provide useful information on evaluation and classification of ginger germplasm collected from Eastern Ghat High Land Zone of Orissa.

MATERIALS AND METHODS

The All India Coordinated Spices Improvement Project, Pottangi has collected 140 accessions from different ginger growing centres (Table 1) in collaboration with the Central Plantation Crops Research Institute, Kasaragod; National Research Centre for Spices, Calicut; Kerala Agricultural University and different State Government Departments. These have been maintained at Pottangi situated in the Eastern Ghat High Land Zone of Orissa. Eight exotic and 116 indigenous types were grown in augmented block design and evaluated systematically during 1987-90 for 21 different morphological and economic characters.

Table 1. Source of ginger germplasm

Source of Collection/Introduction	Collections
EXOTIC GERMPLASM	8
Brazil, China, Jamaica	
INDIGENOUS GERMPLASM	
Kerala, Orissa, Meghalaya, Himachal Pradesh, West Bengal, Andhra Pradesh, Madhya Pradesh, Karantaka, Mizoram, Manipur, Tamil Nadu, Maharashtra, Bihar, Tripura, Gujarat, Uttar Pradesh, Nagaland, Rajasthan, Sikkim and Assam	132
Total	140

RESULTS AND DISCUSSION

The accessions were classified according to the source of collection and categories (Table 2). The landraces were named after the place of collection. The wild ginger collected from Eastern Ghats is shown under wild taxa. Mutants were isolated by mutagenesis with gamma rays, EMS, Sodium Azide and Colchicine (Mohanty, 1984). Out of the 14 mutants, V_1K_1-3 (UP irradiated with 1 kR gamma rays) and V_2E_5-2 (Rio-de-Janeiro treated with 1.0 per cent EMS) are in the coordinated multi-locational trial and the rest are under initial evaluation trials. Among the advanced cultivars, PGS-35 and PGS-19 developed by clonal selections from *Kunduli* local were released as *Suprabha* and *Suruchi* for commercial cultivation in Orissa.

Considerable variability was observed in plant height (29.0-61. 6cm), tillers per plant (6.0-13.8), leaves per tiller (6.7-14.1), leaf length (13.5-24.5 cm) and breadth (1.2-1.9 cm) of fully opened last leaf, dry straw yield (8.4-33.0 g), fresh rhizome yield (50-250 g), number of rhizome fingers per plant (17.6-38.7), length of rhizome (8.7-17.7 cm), thickness or rhizome (1.8-3.5 cm), number of adventitious roots (3.0-7.6), tuberous roots (4.5-25.9), root yield per plant (9.4-66.7 6), dry ginger recovery (13.5-29.7%), oleoresin content (4.9-10.8%), essential oil (0.6-2.4%), crude fibre (3.4-6.4%), incidence of scale insect (0.7-3.9 score value in 0 to 5 scale), soft rot (0.96%) and leaf spot 0-7.5 index value in 'O; nil to 5 scale) incidences. The promising accessions identified for specific traits are listed in Table 3.

Table 2. Classification of ginger germplasm

Type	Class	Accessions	Total No.
EXOTIC	Landrace	Rio-de-Jeneiro, China, Jamaica	3
	Mutant	V_2E_5-8, V_2E_4-5, V_2S_1-7, V_2E_5-2, V_2E_5-3	5
INDIGENOUS	Wild taxa	Wild type	1
	Landrace	Maran, Ernad Mangeri, Turia local-2, Kotagarh, Kurupamppadi, Wynad local, Anamika, Ernad Chernad, UP, Burdwan No. 1, Burdwan No. 2, Turia local, Zaheerabad, Chintapalli local, Singh-Jhara, Taffingiva, Sargiguda, Kurmaput local, K. Local, Vengara, Tura, Narasapattam, Laxmipur local, Junagarh, Thingpuri, Tinladium, Wynad Kunnumangulam, Bhitterkatta, H.P., Nadia, Karakkal, Gurubhathan, Vhaisay, Narag, Wynad Local, Rajgarh, Gendori, Nawarangpur, Kakriguma	43
	Advanced Cultivar	PGS-43, PGS-19, PGS-4, PGS-38, PGS-12, PGS-10, PGS-11, PGS-23, PGS-14, PGS-8, PGS-15, PGS-22, PGS-31, V.S., PGS-13, PGS-33, PGS-16, PGS-1, PGS-20, S-607, PGS-28, PGS-51, PGS-9, S-638, S-645, S-666, PGS-24, PGS-39, PGS-37, No. 21, No. 14, S-558, No. 15, No. 5, No. 18, PGS-17, PGS-29, PGS-26, PGS-7, PGS-44, S-62, S-641, S-557, No. 1, PGS-35, No. 20, PGS-3, S-646, No. 17, No. 8, No. 23, No. 6, No. 9, No. 19, No. 22, No. 3, Sikkim selection No. 1, SG-551, B-1, SG-212, SG-30, SG-547, SG-600, ZO-17, ZO-8, ZO-16, SO-1, ZO-18, ZO-36, ZO-14, ZO-13, ZO-2, ZO-9.	73
	Mutant	V_1S_1-8, V_1K_1-2, V_5E_5-4, V_1C-8, V_1E_4-5, V_1E_4-4, V_4E_4-1, V_1E_9-1, V_1E_8-2,, V_3S_1-8, V_1S_1-2, V_1S_1-4, V_1K_1-3, V_1K_1-1	14
		Total	140

Yield superiority of *Rio-de-Janeiro*, *Thingpuri*, *U.P.*, *Kerakkal*, *Maran*, *Suprabha* and *Jujigan* has been reported by several workers (Muralidharan and Sakunthala, 1974; Anonymous, 1978; Sreekumar *et al.*, 1980; Nybe and Nair, 1979 and Mohanty, 1984). Rhizomes of China, Taffingiva and SG-35 are bold and that of *Suruchi* and *Kunduli* local were slender (Anonymous, 1988 and Mohanty *et al.*, 1981). Further China, U.P., Nadia, Poona and Jamaica were less fibrous types (Nybe and Nair, 1979). High oleoresin content was observed in *Rio-de-Janeiro*, *Kurupamppadi*, *China*, *Ernad-Chernad*, *H.P.*, *Karakkal* and *Valluvanad* (Sreekumar *et al.*, 1980). Studies on reaction to soft rot, leaf spot and scale insect had been carried out by several workers (Mohanty, 1984;

Premanathan *et al.*, 1980 and Nybe and Nair, 1979). *Burdwan-1*, *Anamika*, *Poona*, *Maran* and *H.P.* were observed to be less susceptible to soft rot, while wild ginger, *Maran* and *Kunduli* local were less susceptible to *Phyllosticta* leaf spot as compared to other cultivars, Rhizomes were less susceptible to scale insects in wild ginger, *Anamika* and *Turia local-1*.

Table 3. Promising accessions of ginger for specific traits

Traits	Accessions
High yield	Rio-de-Janeiro, UP, Thingpuri, Karakkal, Maran, Suprabha, Jugijan
Bold rhizome	China, Taffingiya, SG-35
Slender rhizome	Suruchi, Kunduli local
High dry recovery	Turia local-2, Maran, Nadia, Karakkal, Suruchi, Tura, Thodpuzha
Less fibre content	China, UP, Nadia, Poona, Jamaica
High oleoresin content	Rio-de-Janeiro, Kurupamppadi, China, Ernad, Chernad, HP, Karakkal, Valluvanod
Less susceptibility to soft rot	Burdwan-1, Anamika, Poona, H.P.
Less susceptibility to leaf spot	Wild ginger, Maran, Kunduli Local
Less susceptibility to scale insect	Wild ginger, Anamika, Turia Local-1

The salient features of the advanced cultivars and parents and Mutants are presented in Table 4. *Suprabha* (PGS-35) and *Suruchi* (PGS-19) were developed from *Kunduli* local. *Kunduli* local has slender rhizomes with a maximum yield of (18.5 t/ha) and an average yield of 8.5 t/ha with 229 days duration. *Suprabha*, developed from *Kunduli* local, possessed unaltered maturity period with yield potential up to 22.8 t/ha. The variety has got characteristic feature of plumpy rhizome having 20.5 per cent of dry recovery; oleoresin, 8.9 per cent; essential oil, 1.9 per cent and crude fibre, 4.4 per cent. *Suruchu*, a clonal selection of *Kunduli*, recorded a maximum of 21.80 t/ha rhizome yield which is 74.4 per cent higher than its parent. Suruchi matures in 218 days with an average yield of 11.57 t/ha, having dry recovery of 23.5 per cent; oleoresin, 10.0 per cent and essential oil, 2.0 per cent. Both *Suprabha* and *Suruchi* have been released in Orissa for commercial cultivation. V_1K_1-3 a mutant of *U.P.* matures within 225 days and has the maximum yield potential of 24.23 t/ha with dry recovery of 23.0 per cent; oleoresin content, 10.2 per cent and essential oil, 2.1 per cent. In respect of yield, oleoresin content and essential oil, this mutant appears to have an edge over the released varieties.

Table 4. Description of parents, advanced cultivars and mutants

Cultivar	Duration (days)	Yield (t/ha) Av.	Yield (t/ha) Max.	Dry recovery (%)	Oleoresin (%)	Oil (%)	Crude fibre (%)
Kunduli	229	8.57	12.50	18.5	8.0	1.6	3.9
U.P.	238	9.16	14.20	20.4	7.2	1.3	4.4
Suruchi	218	11.57	21.80	23.5	10.0	2.0	3.9
Suprabha	229	16.55	22.80	20.5	8.9	1.9	4.4
V_1K_1-3	225	16.67	24.23	23.0	10.2	2.1	4.0

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