

## IISR Mahima and IISR Rejatha – two high yielding and high quality ginger (*Zingiber officinale* Rosc.) varieties

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### Abstract

IISR Mahima (Acc. 117) and IISR Rejatha (Acc. 35), developed through selection from germplasm at the Indian Institute of Spices Research, Calicut are good quality, high yielding ginger varieties. Maturing in 200 days, IISR Mahima has given an average yield of 23.2 t ha<sup>-1</sup> (fresh) with a dry recovery of 23%, essential oil 1.72%, oleoresin 4.48% and fibre content 3.26%. Rhizomes of Mahima are bold and this variety is resistant to root-knot nematode also. IISR Rejatha is a medium duration, bold variety with an average yield of 22.4 t ha<sup>-1</sup> (fresh), dry recovery 19%, essential oil 2.36%, oleoresin 6.34% and fibre content 4.0%.

**Key words:** crop quality, ginger, new variety, pest resistance, root knot nematode, *Zingiber officinale*

### Introduction

Ginger (*Zingiber officinale* Rosc.) is an important rhizomatous spice produced and exported from India. Rhizomes of ginger are valued as a spice besides its use in alternative systems of medicine. India produces about 2,63,170 t of ginger annually from an area of 77610 ha (1999-2000) (Source: Directorate of Economics and Statistics, New Delhi). The productivity of ginger in India is low (3391 kg ha<sup>-1</sup>) as compared to other producing countries like Philippines, Bangladesh, Sri Lanka etc. One of the reasons for low productivity of ginger in the country is the lack of sufficient number of high yielding varieties and their spread. Apart from the 5 improved varieties viz. Varada, Suprabha, Suruchi, Suravi and Hingiri, all other existing ginger cultivars are land races or introductions. This has also necessitated the development of new varieties having better adaptability and acceptability.

Further, varietal diversity is also important in any crop, especially in a crop like ginger, to avoid uniform spread of diseases.

### Materials and Methods

Systematic evaluation of ginger germplasm is being carried out at Indian Institute of Spices Research (IISR), Kozhikode for yield, quality and resistance to stresses. Selection for bold rhizomes coupled with high yield during the year 1994-1995 resulted in short listing 14 ginger accessions (Acc. 15, 27, 35, 49, 71, 116, 117, 142, 179, 204, 244, 294, 415 & 3573). These accessions along with the control (Varada) were evaluated in replicated trials from 1995-96 to 1998-99 at different locations in Kerala viz. Peruvannamuzhi (Kozhikode District), Muvattupuzha (Ernakulam District) and Kumarakom (Kottayam District). The experiments were laid in RBD having 3 replications with a plot size of 3 m<sup>2</sup>. Based on the lead obtained from

\*RARS, Kerala Agricultural University, Kumarakom, Kottayam

**Table 1.** Yield of bold rhizome selections of ginger and control.

Acc. No.	Mean yield/ 3m <sup>2</sup> bed (kg, fresh)									Pooled mean yield bed <sup>-1</sup> (kg, fresh)	
	Peruvannamuzhi				Kumarakom			Muvattupuzha			
	1995-96	1996-97	1997-98	1998-99	1996-97	1997-98	1998-99	1996-97	1997-98		1998-99
117	6.80	13.50	9.90	11.00	25.90	6.30	9.88	10.00	12.33	10.67	11.63
35	6.30	14.67	11.63	13.00	20.16	6.29	7.87	12.20	10.00	10.40	11.25
49	5.30	12.33	10.33	9.33	-	3.90	7.54	10.00	9.33	10.16	8.69
27	2.83	10.00	11.30	11.83	-	9.32	7.96	14.16	14.33	11.00	10.64
3573	7.00	5.03	9.63	7.00	23.88	7.91	6.19	9.79	9.33	7.17	9.30
142	6.63	7.83	6.89	12.67	20.79	3.51	5.63	5.85	7.50	11.67	8.89
15	6.86	9.60	13.10	9.67	-	4.87	6.24	11.20	11.70	11.00	9.36
415	8.43	10.33	11.42	10.88	24.79	6.24	6.93	10.00	9.83	8.16	10.67
116	6.00	7.33	10.65	8.16	21.81	6.37	7.85	9.50	10.83	9.17	9.77
204	7.58	10.40	10.93	8.33	28.01	10.58	13.05	9.60	8.00	8.83	10.20
179	7.10	13.03	10.10	11.67	22.11	7.49	7.30	9.00	10.33	10.33	10.85
71	5.63	8.50	7.40	10.33	15.87	7.26	6.25	8.50	9.17	10.00	8.89
244	5.83	13.03	9.93	10.67	-	5.47	6.76	8.88	9.17	11.00	8.97
294	6.42	12.23	10.48	9.83	24.68	6.34	6.76	10.67	9.65	10.00	10.71
Control (Varada)	-	13.17	11.20	12.50	-	11.34	13.18	11.67	11.00	11.67	11.99
CD (P=0.05)	0.60	1.13	1.86	NS	4.60	0.94	3.14	1.80	0.83	1.22	2.32
CV%	11.60	14.80	12.90	-	19.50	12.61	12.62	10.60	10.80	13.00	11.32

these trials two promising accessions viz, Acc. 117 and Acc. 35 along with control Varada were evaluated in large number of plots at IISR Experimental Farm, Peruvannamuzhi and in 9 different farmers' plots (Kelothvayal and Kodenchery in Kozhikode District; Kothamangalam in Ernakulam District; Vythiri in Wynad District; Kumarakom in Kottayam District; Sreekarayam in Thiruvananthapuram District) during 1998-99 to 2000-01.

Observations were recorded on fresh yield of rhizomes, dry recovery and quality traits such as crude fibre, oleoresin and essential oil content as per standard procedures. The crop was raised as per the recommended practices. The data were analyzed following the normal statistical procedure. Screening for nematode resistance was done by indexing the galling and egg mass production.

### Results and discussion

The fresh rhizome yield per plot was significantly different among the entries during all the years at 3 locations, except for the last year (1998-99) at Peruvannamuzhi (Table 1).

Pooled analysis of the yield data over locations and years also revealed significant differences among the entries (Table 2). Acc. 117 and Acc. 35, though at par with control

**Table 2.** Overall mean performance (seasons & locations) of ginger selections

Acc. No.	Dry recovery (%)	Oil (%)	Fibre (%)	Oleoresin (%)
117	21.12	1.72	3.26	4.48
35	20.81	2.36	4.00	6.34
49	18.67	2.22	3.34	6.04
27	21.15	1.68	3.06	2.96
3573	21.33	1.84	3.62	4.50
142	20.33	1.72	2.96	4.98
15	19.05	1.96	3.36	6.08
415	20.16	1.55	3.20	4.94
116	20.32	1.52	2.26	4.70
204	18.93	1.60	3.06	4.06
179	20.30	1.56	2.56	3.86
71	19.55	1.94	2.68	5.95
244	17.87	1.80	2.78	5.75
294	19.59	1.44	2.32	3.88
Control (Varada)	19.53	1.68	3.29	3.96

Varada ranked second and third, respectively for mean fresh yield  $\text{bed}^{-1}$ . However, the overall mean performance of these two accessions at all locations and seasons for dry recovery and quality traits such as essential oil, oleoresin and fibre content, indicated their superiority for one or more of the quality traits over the control (Table 2).

Thus, though these two accessions (Acc. 117 and Acc. 35) were at par with the control Varada for fresh yield  $\text{bed}^{-1}$ , they showed superiority over Varada for dry yield, yield of essential oil and oleoresin per ha (Table 2). At different farmers' plots and in large number of plot trials also, these lines were either superior or at par with the control Varada in terms of yield and quality (Tables 3, 4 & 5). Quality analysis of the samples from different farmers' plots revealed some amount of variation with respect to the locations (Table 5). Year to year fluctuation was also noticed for yield and quality traits (data not shown) at different locations for all the accessions and control.

Screening for root-knot nematode (*Meloidogyne incognita*) resistance indicated resistant nature (egg mass index <2) of Acc. 117 (Table 6). The nematode reproduction factor (R) was also less than one for Acc. 117. Based on the superiority in dry yield, oil and oleoresin per ha and results obtained in farmers' plots and large number of plots, Acc. 117 and Acc. 35 are released (by State Variety Release Committee) as 'IISR Mahima' and 'IISR Rejatha,' respectively. The salient features of these new varieties are given in Table 6. The new varieties are characterized by plumpy rhizomes (Fig. 1).

Mohanty and Sarma (1979) pointed out the effectiveness of straight selection in improving yield and quality of ginger. Good variability for rhizome yield and quality attributes in ginger germplasm maintained at IISR, Kozhikode was already reported (Sasikumar *et al.* 1992). IISR Varada was developed from the germplasm collection maintained at Indian Institute of Spices Research, Kozhikode (Sasikumar *et al.* 1996), through selection.

**Table 3.** Multiplication rate and dry recovery of new ginger lines at different farmers' plots

Farmer/ planter	Acc. 35	Acc. 117	Varada
Mr. T.A Scaria, Thadathil House, Keloth Vayal, Kozhikode, Kerala	1:8.0	1:19.0	1:18.0
Mr. I.C. Wills, Illiparambil House, Kavalangad P.O. Kothamangalam, Ernakulam (Dist), Kerala	1:8.0	1:10.4	1:13.0
M/s Rajalakshmi Estate, Vythiri, Wynad (C/o Mr. Vasudevan., Vasantham, Anoth Pozhuthana, Wayanad, Kerala)	1:8.0	1:10.0	1:16.5
Mr. Jose Austin, Onamthuruthil, Santhinagar P.O., Kodenchery, Kozhikode, Kerala	1:9.0	1:7.0	1:9.0
Mean of four farmers plot trial, Kottayam (Dist), C/o. RARS, Kumarakom, Kerala	-	1:6.0	1:5.5
Farmer's Plot, Trivandum Dist., C/o IVLP, CTCRI, Thiruvananthapurma, Kerala	1:6.0	1:8.5	1:6.6

**Table 4.** Multiplication rate and dry recovery of promising ginger lines in large number of plots at IISR Farm, Peruvannamuzhi

	1999-2000			2000-01		
	No. of beds (3m <sup>2</sup> )	Multiplication rate	Dry recovery (%)	No. of beds (3m <sup>2</sup> )	Multiplication rate	Dry recovery (%)
Acc.117	21	1:10.2	21.10	55	1:11	22.50
Acc.35	21	1:10.8	19.10	58	1:9.5	20.10
Control (Varada)	40	1:10.7	18.60	28	1:9.3	20.00

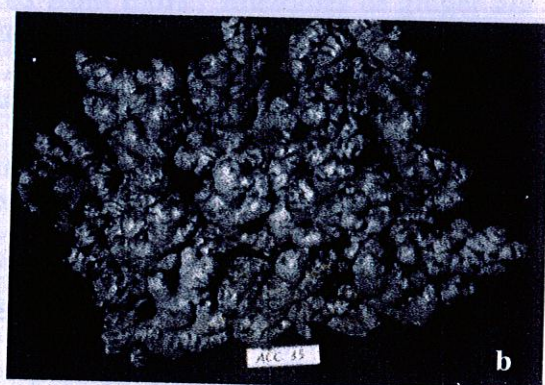
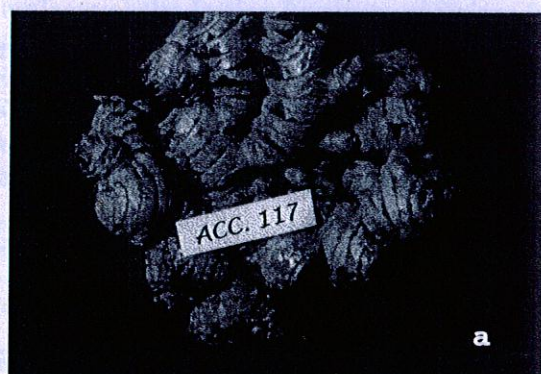
**Table 5.** Effect of locations on quality of promising ginger lines

Location	Acc. 117			Acc. 35			Varada		
	Fibre (%)	Oil (%)	Oleoresin (%)	Fibre (%)	Oil (%)	Oleoresin (%)	Fibre (%)	Oil (%)	Oleoresin (%)
Kothamangalam, Kerala	4.73	1.60	3.50	-	-	-	3.65	1.40	3.04
Satara, Maharashtra	3.83	1.60	4.78	3.50	2.20	5.43	-	-	-
Coorg, Karnataka	4.60	1.40	3.23	3.30	1.60	3.70	2.73	1.80	4.67

**Table 6.** Agronomic, yield and quality traits of promising ginger varieties and control

Line	Plant height (cm)	No. of leaves main shoot <sup>-1</sup>	No. of tillers plant <sup>-1</sup>	No. of leaves tiller <sup>-1</sup>	Leaf length (cm)	Leaf width (cm)	Clump shape	Yield (fresh t ha <sup>-1</sup> )	Dry (yield t ha <sup>-1</sup> )	Oil (L ha <sup>-1</sup> )	Oleoresin (L ha <sup>-1</sup> )	Reaction to root knot nematode*
Acc. 117	67.63	19.43	8.26	13.65	23.65	3.01	Three layered, compact	23.20	5.30	91.16	237.40	1.90
Acc. 35	65.30	20.12	12.80	12.50	23.88	2.92	Loose	22.40	4.35	102.0	275.90	3.33
Control (Varada)	69.33	24.90	6.27	12.80	24.35	2.75	Two-three layered, compact	23.98	4.69	78.70	185.70	2.33

NB: Leaves were green in all 3 cultivars and were of semi-erect habit. \* Egg mass index



**Fig. 1.** Rhizomes of two promising ginger lines a. IISR Mahima; b. IISR Rejatha

These two new varieties will help the ginger farmers to have a better varietal choice without sacrificing clonal purity and it will also mitigate to some extent the acute seed rhizome shortage of Varada.

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