



Evaluation of Different Genotypes of Ridge Gourd for Better Growth, Yield and Quality under Prayagraj Agro-Climatic Conditions

Mandadi Mithila ^{a+++*}, V. M. Prasad ^{a#}, Vijay Bahadur ^{a†},
Samir E. Topno ^{a‡} and Yash Kumar Singh ^{a^}

^a Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, (U.P.), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Ridge gourd, scientifically known as *Luffa acutangula*, is a tropical vine that belongs to the Cucurbitaceae family. It is commonly grown for its young and tender fruits, which are used as a vegetable in cooking. It is known by various names, including Kalitori, angled gourd, angled loofah, silky gourd, and ribbed gourd. Ridge gourd has a chromosome number of $2n = 26$. This versatile vegetable can be incorporated into a wide range of dishes, such as stir-fries, curries, soups, and stews, thanks to its mild and slightly sweet flavor. In the *Kharif* season of 2022, a study was conducted at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom

⁺⁺ P. G. Scholar;

[#] Professor;

[†] Associate Professor;

[‡] Assistant Professor;

[^] Ph. D. Scholar;

*Corresponding author;

University of Agriculture Technology and Sciences in Prayagraj, Uttar Pradesh, to assess the performance of different ridge gourd genotypes under the local agro-climatic conditions. The experiment followed a Randomized Block Design and involved nine genotypes with three replications each. The genotypes included G1 (IET 2021/RIGHYB-1), G2 (IET 2021/RIGHYB-2), G3 (IET 2021/RIGHYB-3), G4 (IET 2021/RIGHYB-4), G5 (IET 2021/RIGHYB-5), G6 (IET 2021/RIGHYB-6), G7 (IET 2021/RIGHYB-7), G8 (Dharidar-8), and G9 (Jaipuri Long-9). Based on the results of the experiment, it was determined that the genotype IET 2021/RIGHYB-5 exhibited the best performance in terms of growth parameters, such as vine length (222.10 cm) and early maturity, with the first fruit ready for picking in 60.00 days. It also excelled in yield parameters, including fruit length (25.03 cm), fruit diameter (5.65 cm), and fruit yield per plant (1528.31 g/plant). Additionally, IET 2021/RIGHYB-7 demonstrated outstanding performance in quality parameters, including Total Soluble Solids (TSS) at 4.23°Brix and Vitamin C content at 2.05 mg/100g.

Keywords: Germplasm; T.S.S.; ridge gourd; genotypes.

1. INTRODUCTION

Ridge gourd is a creeping vine plant that produces elongated, typically cylindrical fruits used as vegetables. It's a diploid crop requiring cross-pollination and is cultivated throughout India. The gel-like substance found in ridge gourd is known as "Luffein." The ideal temperature range for ridge gourd growth is between 18°C and 28°C. Ridge gourd flowers are pale yellow and bloom in the morning. Botanically, ridge gourd is classified as *Luffa acutangula* Roxb. and belongs to the Cucurbitaceae family. It's a diploid species with a chromosome count of $2n=2x=26$. Ridge gourd is believed to have originated in India and the tropical regions of Asia. It's predominantly grown in countries like China, India, Turkey, Iran, and Southeast Asia. Its progenitor is "*Luffa graveolens*." In India, ridge gourd was grown on approximately 10.03 thousand hectares in the 2020-21 season, yielding 3.16 million tonnes [1]. Bihar led in both area and production of ridge gourd in that year, followed by Uttar Pradesh and Haryana. The components found in ridge gourd fruits consist of carbohydrates, carotene, fat, protein, phytin, flavonoids, saponin, and amino acids. In a study by Kandlakunta et al., [2] it was noted that ribbed gourd contains approximately 300 micrograms of beta-carotene and 1,000 micrograms of carotenoids per 100 grams of fresh fruit. Ridge gourd has demonstrated several medicinal properties, such as protecting the liver, managing diabetes, acting as an antioxidant, inducing abortion, and exhibiting antifungal effects [3]. Living organisms require a range of minerals, including both essential macronutrients like nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, sodium, and micronutrients like iron, zinc, manganese, copper, cobalt, boron, and molybdenum, to support various biological processes throughout

their life cycles. In many developing countries, a significant number of people experience micronutrient deficiency, often referred to as "hidden hunger." Ridge gourd fruits contain a substantial quantity of minerals and dietary fiber [4]. It's a warm-season crop that cannot tolerate frost and thrives in temperatures between 18°C and 28°C. Ridge gourd adapts well to soils with a pH ranging from 6.0 to 7.0, regardless of soil type, from sandy to heavy clay. It's typically grown as a sole crop during both the Kharif and Rabi seasons in India, suited to areas with annual rainfall between 65-85 cm. Given its adaptability and widespread cultivation in India, the study aimed to evaluate different ridge gourd varieties under Prayagraj's agro-climatic conditions, comparing hybrid varieties with local ones. Many high-performing ridge gourd varieties are available in the market, making it a promising crop for cultivation in Prayagraj.

2. MATERIALS AND METHODS

The current investigation aimed to assess the growth, fruit yield, and fruit quality of various ridge gourd genotypes. This study was conducted at the Horticultural Research Farm (HRF) within the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology, and Sciences (SHUATS), Prayagraj, during the *Kharif* season of 2022. The experiment was designed using a Randomized Block Design and involved nine different genotypes, each with three replications. The genotypes used in the study were as follows: G1 (IET 2021/RIGHYB-1), G2 (IET 2021/RIGHYB-2), G3 (IET 2021/RIGHYB-3), G4 (IET 2021/RIGHYB-4), G5 (IET 2021/RIGHYB-5), G6 (IET 2021/RIGHYB-6), G7 (IET 2021/RIGHYB-7), G8 (Dharidar-8), and G9 (Jaipuri Long-9). Throughout the growth cycle of ridge gourd, observations were recorded at

various stages, including measurements of vine length, the number of days until flower emergence, fruit length, fruit girth, yield per plot, and quality parameters such as Total Soluble Solids (TSS) and vitamin C content. The collected data were subjected to statistical analysis using the method recommended by Fisher and Yates in 1936.

2.1 Climatic Conditions of the Experimental Area

Prayagraj goes through three distinct seasons: A hot and dry summer, a cool and dry winter, and a

warm and humid monsoon. The summer season typically spans from April to June, during which maximum temperatures range between 40°C (104°F) and 45°C (113°F). The monsoon season begins in early July and continues until September. Winter sets in from December to February. The region receives an average annual rainfall of approximately 1013.4 mm, with the majority occurring from July to September, along with occasional scattered showers and drizzles during the winter months. The soil type at the experimental site was sandy loam, characterized by relatively low levels of organic carbon, nitrogen, and phosphorus.

2.2 Treatment Details

Table 1. Treatment Details

S. No.	Name of hybrid	Notation	Source
1.	IET 2021/RIGHYB-1	G1	IIVR VARANASI
2.	IET 2021/RIGHYB-2	G2	IIVR VARANASI
3.	IET 2021/RIGHYB-3	G3	IIVR VARANASI
4.	IET 2021/RIGHYB-4	G4	IIVR VARANASI
5.	IET 2021/RIGHYB-5	G5	IIVR VARANASI
6.	IET 2021/RIGHYB-6	G6	IIVR VARANASI
7.	IET 2021/RIGHYB-7	G7	IIVR VARANASI
8.	Dharidar-8	G8	Raj seeds Prayagraj
9.	Jaipuri Long-9	G9	Shulabh seeds pvt lt.

2.3 Characters Studied and Observations Recorded

2.3.1 Growth parameters

Days to germination

Vine length (cm)

2.3.2 Earliness parameters

Days to emergence of first male flower

Days to emergence of first female flower

Node number at which flower appears

Days to first fruit picking

2.3.3 Yield parameters

Number of fruits per plant

Average fruit weight (g)

Average fruit length (cm)

Average fruit diameter (cm)

Fruit yield per plot (g/plot)

Fruit yield per hectare (t/ha)

2.3.4 Quality parameters

T.S.S. (°Brix)

Vitamin C content (mg/100g of fruits pulp)

2.3.5 Economic parameters

Gross return (Rs/ha.)

Net Return (Rs/ha)

Benefit Cost Ratio

3. RESULTS AND DISCUSSION

3.1 Days to Germination

Among the different genotypes minimum days to germination (4.53 days) was observed with IET 2021/RIGHYB-5 followed Dharidar-8 with 4.63 days. Maximum days to germination (5.73 days) were observed in IET 2021/RIGHYB-7.

3.2 Vine Length (m)

Among the different genotypes maximum Vine length (222.10 cm) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 221.58 cm. Minimum Vine length (211.02 cm) was observed IET 2021/RIGHYB-7. Similar findings were reported in cucurbits by Rathore et al., [5]; Triveni et al., [6] in ridge gourd.

3.3 Days to Emergence of First Male Flower

Among the different genotypes minimum days to emergence of first male flower (40.00 days) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 41.00 days. Maximum days to emergence of first male flower (47.00 days) was observed IET 2021/RIGHYB-7. Similar findings were reported by Ramya et al., [7] in bitter gourd.

3.4 Days to Emergence of First Female Flower

Among the different genotypes minimum days to emergence of first female flower (47.00 days) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 48.00 days. Maximum

days to emergence of first female flower (56.00 days) was observed IET 2021/RIGHYB-7. The findings were reported similarly earlier in cucurbits by Ara et al., [8] in pointed gourd.

3.5 Node Number at which Flower Appears

Among the different genotypes, at harvest maximum node number at which flower appears (59.20 node) was observed with IET 2021/RIGHYB-7 followed IET 2021/RIGHYB-4 with 57.67 node. Minimum node number at which flower appear (46.57 node) was observed IET 2021/RIGHYB-1. Similar findings were reported by Ramya et al., [7] in bitter gourd.

3.6 Days to First Fruit Picking

Among the different genotypes minimum days to first fruit picking (60.00 days) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 61.00 days. Maximum days to first fruit picking (66.33 days) was observed IET 2021/RIGHYB-7. The findings were reported similarly earlier in cucurbits by Ara et al., [8] in pointed gourd.

3.7 Number Fruits per Plant

Among the different genotypes maximum number of fruits per plant (14.67 fruits) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 14.63 fruits. Minimum Number of fruits per plant (10.95 fruits) was observed IET 2021/RIGHYB-7. The findings were in accordance with earlier reports by Triveni et al., [6] in ridge gourd.

Table 2. Performance of different genotypes of ridge gourd for various growth and earliness parameters studied

Genotype Notation	Genotype details	Days to germination (DAS)	Vine length (cm)	Days to emergence of first male flower	Days to emergence of first female flower	Node number at which flower appears	Days to first fruit picking	Number of fruits per plant
G₁	IET 2021/RIGHYB-1	5.20	218.76	43.00	50.00	46.56	64.00	12.87
G₂	IET 2021/RIGHYB-2	5.30	216.72	45.00	53.00	56.00	62.00	11.73
G₃	IET 2021/RIGHYB-3	4.83	221.58	41.00	48.00	50.90	61.00	14.63
G₄	IET 2021/RIGHYB-4	5.67	217.36	44.00	50.00	57.66	66.00	12.77
G₅	IET 2021/RIGHYB-5	4.53	222.10	40.00	47.00	55.10	60.00	14.67
G₆	IET 2021/RIGHYB-6	5.07	216.80	45.00	51.33	52.43	62.00	12.23
G₇	IET 2021/RIGHYB-7	5.73	211.02	47.00	56.00	59.20	66.33	10.95
G₈	Dharidar-8	4.63	220.12	43.00	48.00	49.53	64.00	13.63
G₉	Jaipuri Long-9	4.87	212.56	46.00	55.00	51.90	65.00	11.46
'F' Test		S	S	S	S	S	S	S
SE (d)		0.23	0.49	0.94	0.31	0.87	0.31	0.26
C.D. at 5%		0.48	1.05	2.00	0.67	2.01	0.67	0.55
C. V.		5.48	0.28	2.64	0.76	2.01	0.61	2.49

Table 3. Performance of different genotypes of ridge gourd for various yield and quality parameters studied

Genotype Notation	Genotype details	Average fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Fruit yield per plot (g/plant)	TSS [°Brix]	Vitamin C content (mg/100g)
G₁	IET 2021/RIGHYB-1	95.53	22.35	5.29	95.53	1229.66	3.42	1.43
G₂	IET 2021/RIGHYB-2	91.33	19.78	4.90	91.33	1072.03	4.13	1.82
G₃	IET 2021/RIGHYB-3	98.58	24.62	5.45	98.58	1446.45	3.67	1.60
G₄	IET 2021/RIGHYB-4	93.50	21.51	5.17	93.50	1194.14	4.15	1.82
G₅	IET 2021/RIGHYB-5	104.22	25.03	5.65	104.22	1528.31	4.20	1.73
G₆	IET 2021/RIGHYB-6	93.69	20.62	5.09	93.69	1146.44	4.03	1.63
G₇	IET 2021/RIGHYB-7	90.29	18.59	4.56	90.29	988.67	4.24	2.05
G₈	Dharidar-8	98.53	24.21	5.37	98.53	1343.98	3.48	1.49
G₉	Jaipuri Long-9	90.78	19.78	4.73	90.78	1041.18	3.69	1.65
'F' Test		S	S	S	S	S	S	S
SE (d)		1.73	1.73	0.05	1.73	38.78	0.24	0.02
C.D. at 5%		3.67	0.30	0.11	3.67	82.21	0.50	0.05
C. V.		2.23	0.79	1.22	2.23	3.89	7.45	1.72

3.8 Average Fruit Weight (g)

Among the different genotypes maximum average fruit weight (104.22 g) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 98.58 g. Minimum average fruit weight (90.29 g) was observed IET 2021/RIGHYB-7. The findings were in accordance with earlier reports of cucurbits by Haque et al., [9] in snake gourd.

3.9 Average Fruit Length (cm)

Among the different genotypes maximum fruit length (25.03 cm) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 24.62 cm. Minimum fruit length (18.59 cm) was observed IET 2021/RIGHYB-7. The findings were in accordance with earlier reports by Triveni et al., [6] in ridge gourd.

3.10 Average Fruit Diameter (cm)

Among the different genotypes maximum fruit diameter (5.65 cm) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 5.45 cm. Minimum fruit diameter (4.56 cm) was observed IET 2021/RIGHYB-7. The findings were in accordance with earlier reports of cucurbits by Haque et al., [9] in snake gourd.

3.11 Fruit Yield per Plot (g/plant)

Among the different genotypes maximum average fruit yield per plant (1528.31 g/plant) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 1446.45 g/plant. Minimum average fruit yield per plant (988.67 g/plant) was observed IET 2021/RIGHYB-7. The findings were in accordance with earlier reports of cucurbits by Quamruzzaman et al., [10] in bottle gourd and Rathore et al., [5]; Triveni et al., [6] in ridge gourd.

3.12 Fruit Yield per Hectare (t/ha)

Among the different genotypes maximum average fruit yield per hectare (13.58 t/ha) was observed with IET 2021/RIGHYB-5 followed IET 2021/RIGHYB-3 with 12.83 t/ha. Minimum average fruit yield per hectare (8.79 t/ha) was observed IET 2021/RIGHYB-7. The findings were in accordance with earlier reports of Haque et al., [9] in snake gourd; Uddin et al., [11]; Quamruzzaman et al., [10] in bottle gourd and Rathore et al., [5]; Triveni et al., [6] in ridge

gourd; Ara et al., [8] in pointed gourd; Ramya et al., [7] Bitter gourd.

3.13 T.S.S. [°Brix]

Among the different genotypes maximum Total Soluble Solid (4.24°Brix) was observed with IET 2021/RIGHYB-7 followed IET 2021/RIGHYB-5 with 4.20°Brix. Minimum Total Soluble Solid (3.42 °Brix) was observed IET 2021/RIGHYB-1. The findings were in accordance with earlier reports of Haque et al., [9] in snake gourd; Uddin et al., [11]; Quamruzzaman et al., [10] in bottle gourd and Rathore et al., [5]; Triveni et al., [6] in ridge gourd; Ara et al., [8] in pointed gourd; Ramya et al., [7] Bitter gourd.

3.14 Vitamin C Content (mg/100g of fruits pulp)

Among the different genotypes maximum Vitamin C content (2.05 mg/100g) was observed with IET 2021/RIGHYB-7 followed IET 2021/RIGHYB-5 with 1.73 mg/100g. Minimum Vitamin C content (1.43 mg/100g) was observed IET 2021/RIGHYB-1. The findings were in accordance with earlier reports of Haque et al., [9] in snake gourd; Uddin et al., [11]; Quamruzzaman et al., [10] in bottle gourd and Rathore et al., [5]; Triveni et al., [6] in ridge gourd; Ara et al., [8] in pointed gourd; Ramya et al., [7] Bitter gourd.

3.15 Gross Return (Rs/ha.)

Maximum gross returns were recorded in genotype IET 2021/RIGHYB-5 with Rs.271699.28 followed by IET 2021/RIGHYB-3 with Rs.257145.88 and the minimum (Rs. 175763.63) was recorded in genotype IET 2021/RIGHYB-7.

3.16 Net Return (Rs/ha)

Maximum net returns were recorded in genotype IET 2021/RIGHYB-5 with Rs.149606.50 followed by IET 2021/RIGHYB-3 with Rs.135053.10 and the minimum (Rs. 53670.83) was recorded in genotype IET 2021/RIGHYB-7.

3.17 Benefit Cost Ratio

Maximum BC ratio were recorded in genotype IET 2021/RIGHYB-5 with 2.23 followed by IET 2021/RIGHYB-3 with 2.11 and the minimum 1.44 was recorded in genotype IET 2021/RIGHYB-7.

Table 4. Performance of different genotypes on BC Ratio of Ridge gourd under Prayagraj Agro-climatic condition

S.no	Genotypes	Fruit yield t/ha	Cost of Cultivation(INR/ha)	Gross Return (INR/ha)	Net Return (INR/ha)	BenefitCost Ratio
1	IET 2021/RIGHYB-1	10.93	1,22,092.8	218605.29	96512.49	1.79
2	IET 2021/RIGHYB-2	9.53	1,22,092.8	190582.33	68489.53	1.56
3	IET 2021/RIGHYB-3	12.86	1,22,092.8	257145.88	135053.1	2.12
4	IET 2021/RIGHYB-4	10.61	1,22,092.8	212291.7	90198.9	1.74
5	IET 2021/RIGHYB-5	13.58	1,22,092.8	271699.28	149606.5	2.23
6	IET 2021/RIGHYB-6	10.19	1,22,092.8	203810.76	81717.96	1.67
7	IET 2021/RIGHYB-7	8.79	1,22,092.8	175763.63	53670.83	1.44
8	Dharidar-8	11.95	1,22,092.8	238929.54	116836.7	1.96
9	Jaipuri Long	9.25	1,22,092.8	185099.25	63006.45	1.52

4. CONCLUSION

From the above experimental finding it was concluded that the genotype IET 2021/RIGHYB-5 performed best in terms of growth parameters like vine length (222.10 cm), earliness in maturity (60.00 days for first fruit picking) and yield parameters like fruit length (25.03 cm), fruit diameter (5.65 cm), and fruit yield per plant (1528.31 g/plant). IET 2021/RIGHYB-7 showed best performance for quality parameters also TSS (4.23°Brix) and Vitamin C content (2.05 mg/100g).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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