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Study on Performance of Ridge Gourd (*Luffa acutangular*) Hybrid Genotype and Genetic Diversity

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

An experiment on ridge gourd was conducted from February to May 2022 in the horticulture research field at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, and Technology & Sciences Prayagraj (U.P.), India. The results of the investigation, regarding the performance of the 13 hybrids of Ridge gourd, i.e., 2022/RIGHYB-1,2022/RIGHYB-2,2022/RIGHYB-3,2022/RIGHYB-4,2022/RIGHYB-5,2022/RIGHYB-6,2022/ RIGHYB-7,2022/RIGHYB-8,2022/RIGHYB-9,2022/RIGHYB-10,2022/RIGHYB-11,2022/RIGHYB-12, were obtained from different sources to find out the best performance in terms of growth and yield quality. The experiment was conducted in a randomized block design, where each hybrid was replicated three times. The results of the present investigation concluded that Ridge gourd hybrid

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genotype 2022/RIGHYB-2 was recorded with a maximum day to germination (8.07 days), fruit length (22.21 cm), fruit weight (124.92), fruit yield (126.17 q/ha), and a maximum benefit-cost ratio of (5.93).

Keywords: Ridge gourd; hybrid; genotype.

1. INTRODUCTION

"Ridge gourd [*Luffa acutangula L.*], also known as kalitori, angled gourd, angled loofah, Chinese okra, silky gourd, and ribbed gourd. It belongs to genus Luffa of Cucurbitaceae and has chromosome number 2n = 26. It's a monoecious cross pollinating, annual crop having vine with a long taproot system, simple, sharply angled 5-lobed leaves, and dark green fruits with white pulp and white seeds embedded in spongy (flesh)" [1].

In traditional Indian medicine, ridge gourd is frequently used to treat leucoderma, anemia, Vata, Kapha, and splenic hypertrophy. The ridge gourd possesses various health advantages, such as its laxative properties and excellent blood purification properties [2,3,4]. Ridge gourd contains anti-inflammatory and antibacterial qualities, aids in weight loss, and is good for diabetics. It also has a very high dietary fiber content. Fresh leaf juice is applied topically to children's eyes to prevent granular conjunctivitis and to prevent excessive Meibomian discharge that causes the eyelids to cling together at night. For every 100g of tAhe edible part of the ridge gourd, there are 0.5g of fiber, 0.5 percent protein, 0.35 percent carbohydrate, 37 mg of carotene, 5.0 mg of vitamin C, 18 mg of calcium, and 0.5 mg of vitamin E.

As a warm-season vegetable crop, its capacity to withstand elevated temperatures guarantees its versatility for extensive cultivation across the tropical regions. A crop known by several names, including ribbed gourd, angled gourd, silky gourd, angled loofah, and vegetable gourd, ridge gourd is produced throughout tropical and subtropical (India).

It is a year-round crop that is highly significant to India's vegetable economy. The vegetable ridge gourd in its green stage, as well as its stem-containing leaves, are used. If fruit picking is postponed, it becomes more fibrous and unsuited for culinary use. In south and east India, this vegetable is highly well-known. It is a significant member of the Cucurbitaceae family and a fast-growing vine that frequently needs assistance to spread. It is an annual climber plant that is mostly grown for its immature fruits, which are pickled and consumed raw. The name of the genus comes from the product called "loofah," which is used to clean utensils and to make bath sponges, scrubbing pads, doormats, pillows, and mattresses. The species has a gelatinous substance in it known as luffein. The soft fruits are eaten either raw or, more frequently, cooked and served as a vegetable in South, Southeast, and East Asia. Sometimes delicate branches and leaves are utilized as herbal in pot.

The ridge gourd's present yield and output are insufficient to meet the dietary demands of the expanding population. The output of ridge gourds varies by place and by season. It is therefore necessary to identify stable cultivars that are suitable for a certain season and region. The expression of yield is the consequence of the interactions between different characters.

2. MATERIALS AND METHODS

In the horticulture research sector at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, and Technology & Sciences Prayagraj (U.P.) India, an experiment on ridge gourd was undertaken from February to May 2023. "The investigation's findings about the characteristics of the thirteen Ridge Gourd genotypes, i.e 2022/RIGHYB-1, 2022/RIGHYB-2, 2022 /RIGHYB-3, 2022/ RIGHYB-4, 2022 /RIGHYB-5, 2022/ RIGHYB-6, 2022/RIGHYB-7, 2022/ RIGHYB-8, 2022/RIGHYB-9, 2022/ RIGHYB-10, 2022/RIGHYB-11, 2022/RIGHYB-12, obtained from source of IIVR VARANASI and ALOK obtained from different sources to find out the best performance in terms of growth and yield in quality" [1]. The experiment was conducted in Randomized Block design, were each hybrid replicated thrice During the crop-growing season, the mean (maximum and minimum) relative humidity was 47.26 percent, while the mean (maximum and minimum) temperature was 38.98oC and 26.21oC, respectively. With a texture of sandy clay and a pH of 7.2, the experimental soil had low levels of

organic carbon (0.318%), medium levels of accessible N (70 kg/ha), medium levels of P (12.50 kg/ha), and medium levels of K (216.10 kg/ha). Fertilizers were applied as murate of potash, urea, and single super phosphate, in that order. After the field beds were ready, the seeds were immediately sowed, spaced appropriately, and covered with soil. Following crop harvesting Crop, yield observations were made and documented.

2.1 Statistical Analysis

"The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance Fisher (1950) [1]. The significance and non-significance of the treatment effect were judged with the help of 'f' value (variance ratio) was compared with the table value at 5% level of significance. If calculated value exceeded then the value, the effect of considered to be significant. The significant difference between the means was tested against the critical difference at 5% level of significance" [1].

2.2 Chemical Analysis of Soil

Prior to laying out the experiment, composite soil samples are randomly gathered in order to ascertain the initial qualities of the soil. Samples of soil were taken at a depth of 0 to 15 cm, dried in the shade, ground into a powder using a wooden pestle and mortar, and then passed through a 2 mm sieve before being examined further. The Bouyoucos hydrometer method, described by Bouyoucos [5], was used to assess the physical qualities of the soil, and the Walkely and Black [6] wet method was used to assess the organic carbon content of the soil. Jackson [7] used Clasen's Calorimeter to estimate available phosphorus, Subbiah and Asia [8] used the alkaline permanganate method to estimate available nitrogen, and Perur et al. [9] used the flame photometric method to measure available potassium.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

Data pertaining to growth parameters which are Days to germination, days to first male flower emergence, days to first female flower emergence, nodes at first male flower emergence, nodes at first female flower emergence, days to first picking, average vine length were recorded and tabulated in Table 1.

3.2 Days to Germination

The shortest time required for germination (5.33 days) was observed in 2022/RIGHYB-2, and the longest time (8.07 days) was noted in 2022/RIGHYB-9 (5.87 days), 2022/RIGHYB-4 (5.93 days), 2022/RIGHYB-7 (6.00 days), 2022/RIGHYB-6 (6.20 days), 2022/RIGHYB-10 (7.00 days), and 2022/RIGHYB-3 (7.20).The number of days to germination is a critical indicator of crop maturity, generally indicating how early or late the crop will be. Because of its genetic composition or the fact that its seed coat is more water-permeable, germination in this hybrid may be due to genetic potential or having the better permeability of seed coat to water and hence earlier initiation of germination.

3.3 Days to First Male Flower Emergence

The minimum number of days were recorded for first male flower emergence in 2022/RIGHYB-2 (39.60days) followed by ALOK (40.60 days). The maximum number of days (47.00 days) was found to first male flower emergence in 2022/RIGHYB-7.The number of days until the first male blossom emerges is a significant factor in determining how early or late a crop should be harvested overall. The length, quantity, and vigor of the internodal zones may have contributed to the difference in the initial female flower emergence [10-12].

3.4 Days to First Female Flower Emergence

The minimum number of days were recorded for first female flower emergence in 2022/RIGHYB-8 (46.00 days) followed by 2022/RIGHYB-2 (46.00 days), 2022/RIGHYB-3 (46.13), 2022/ RIGHYB-1 (46.20), 2022/RIGHYB-10 (46.67), 2022/ RIGHYB-5 (46.80), which were on par with each other and the maximum number (48.73 days) was found to first female flower emergence in ALOK. The Time Before First The appearance of female flowers is a significant factor in determining whether a crop is generally early or late. The crop's vigor, internodal length, and number may have contributed to the difference in the first female flower emergence.

Table 1. Performance of Hybrid genotypes of Ridge gourd in terms of Germination,first male, female flower,days to first picking and

Symbol	Genotype	Days to germination	Days to First Male flower emergence	Days to First Female Flower Emergence	Node at First Male flower Emergence	Nodes at First Female flower Emergence	Days to First picking
G1	2022/RIGHYB-1	6.73	40.93	46.20	7.67	16.20	66.51
G2	2022/RIGHYB-2	5.33	39.60	46.00	8.60	17.60	60.81
G3	2022/RIGHYB-3	7.20	41.00	46.13	7.27	18.67	62.37
G4	2022/RIGHYB-4	5.93	42.13	47.13	9.33	17.60	61.06
G5	2022/RIGHYB-5	6.13	41.80	46.80	8.67	18.20	61.70
G6	2022/RIGHYB-6	6.20	42.27	47.27	9.80	18.60	62.24
G7	2022/RIGHYB-7	6.00	42.13	47.13	9.53	17.13	65.87
G8	2022/RIGHYB-8	5.33	40.80	46.00	7.07	16.20	61.43
G9	2022/RIGHYB-9	5.87	42.27	47.27	9.33	17.67	62.19
G10	2022/RIGHYB-10	7.00	47.00	46.67	9.27	18.40	60.81
G11	2022/RIGHYB-11	6.27	43.13	48.53	8.53	18.33	60.93
G12	2022/RIGHYB-12	5.93	42.43	46.93	9.27	19.07	64.56
G13	ALOK	8.07	40.60	48.73	9.53	19.60	66.62
F-Test		S	S	S	S	S	S
S. Ed.		0.36	1.63	0.63	0.78	0.90	1.57
CD at 5%		0.74	3.36	1.23	1.61	1.85	4.39
CV%		6.91	4.75	1.54	10.89	6.05	3.05

Table 2. Performance of various genotypes of Ridge gourd in terms of yield parameters

Symbol	Genotype	No of fruit per Vine	fruit length (cm).	Fruit Diameter (cm).	Fruit weight (g)	Fruit yield per plant (kg)	fruit yield(q/ha)
G1	2022/RIGHYB-1	18.53	19.87	39.63	114.67	2.12	23.60
G2	2022/RIGHYB-2	19.00	21.66	42.93	89.84	2.37	26.38
G3	2022/RIGHYB-3	18.60	22.05	36.40	102.78	1.91	21.25
G4	2022/RIGHYB-4	18.87	18.87	38.93	80.67	1.54	16.91
G5	2022/RIGHYB-5	19.00	22.49	42.87	123.87	2.08	23.12
G6	2022/RIGHYB-6	18.67	22.15	39.67	82.22	1.53	17.05
G7	2022/RIGHYB-7	17.87	21.25	42.93	81.75	1.46	16.23
G8	2022/RIGHYB-8	17.47	21.07	41.47	90.79	1.58	17.62
G9	2022/RIGHYB-9	14.28	22.21	38.60	124.97	1.28	14.25
G10	2022/RIGHYB-10	18.13	19.95	42.40	85.39	1.54	17.20
G11	2022/RIGHYB-11	14.60	20.60	34.23	96.07	1.00	11.20
G12	2022/RIGHYB-12	18.07	21.11	42.63	110.81	2.00	22.24
G13	ALOK	7.47	20.29	40.70	91.13	0.68	7.56
F-Test		S	S	S	S	S	S
S. Ed.		1.46	1.54	3.53	12.54	1.46	34.34
CD at 5%		3.01	3.17	7.29	25.26	3.01	70.87
CV%		10.62	8.94	10.77	15.29	10.62	24.44

Node at first male flower emergence: The minimum node at which first male flower appears were recorded in 2022/RIGHYB-8(7.07 node), followed by 2022/RIGHYB-3(7.27 node), 2022/RIGHYB-1 (7,67 NODE), 2022/RIGHYB-11 (8.53 node), 2022/RIGHYB-2 (8.60node), 2022 /RIGHYB-2 (8.60 node), 2022/RIGHYB-5(8.67), which were on par with each other and the maximum (9.80node) at whichfirst male flower emergence found in 2022/ RIGHYB.

Nodes at first female flower emergence: The minimum node at which first Female flower appears were recorded in 2022/RIGHYB-8 (`16.20 node) followed by 2022/RIGHYB-27(17.13 node), which were on par with each other and the maximum node at which first female flower emerged (19.60 node) was noticed in ALOK.

Days to first picking: The minimum number of days to first harvesting from sowing in 2022/RIGHYB-10 (60.81 days) followed by 2022/RIGHYB-11 (60.93 days), 2022/RIGHYB-4 (61.06 days), (62.80 days), which were on par with each other and the maximum number of days (66.62 days) ALOK was found to first harvesting. It may be due to mobilization of food materials from source to sink in best treatment.

Yield parameters: Data pertaining to yield parameters which are no of fruit per vine, fruit length(cm) , fruit diameter (cm),Fruit weight (g), fruit yield per plant (kg), fruit yield (q/ ha) were recorded and tabulated in Table 2.

No of fruit per Vine: The maximum numbers of fruit per vine were found in genotypes 2022/RIGHYB-5 (19.00), followed by 2022/RIGHYB-6 (18.67), 2022/RIGHYB (18.60), which were on par with each other and the lower number of fruit (7.47) was recorded in ALOK. The reason might be due to continued supply of food materials and water in hybrid which gives highest number of fruits.

Fruit length (cm): The highest fruit length was recorded in 2022/RIGHYB-9(22.21 cm) followed by 2022/RIGHYB-5 (22.49 cm), RIGHYB-3 (22.05 cm), which were on par with each other and significantly shorter fruit length (18.87) was observed in the genotypes of 2022 /RIGHYB-4.

Increased fruit size in different genotypes, might be due to enhanced photosynthesis accumulation of carbohydrates and favorable effect on vegetative growth which increased the fruit variety besides increasing fruit size.

Fruit Diameter (cm): The maximum fruit diameter was found in 2022/RIGHYB-7(42.93 cm), followed by 2022/RIGHYB-5 (42.87 cm), ALOK(40.70), which were on par with each other and the minimum fruit diameter (34.23 cm) found in 2022/RIGHYB-11.Increased fruit size attributed in different hybrids might be due to enhanced photosynthesis, accumulation of carbohydrates and favorable effect on vegetative growth which increased the fruit variety besides increasing the fruit diameter.

Fruit weight (g): The maximum weight per fruit was found in 2022/RIGHYB-9 (124.97 gm) followed by 2022/RIGHYB-5(123.87 gm), 2022/RIGHYB-1 (114.67 gm), , which were on par with each other and The minimum fruit weight (80.67 gm) was noted in 2022/RIGHYB-4. Fruit variety increased in addition to size and weight, and higher fruit weight in different genotypes may be the result of improved photosynthetic accumulation of carbohydrates and favorable effect on vegetative growth.

Fruit yield per plant (kg): The maximum yield per plant was recorded in 2022/RIGHYB-2 (2.37 kg), followed by 2022/RIGHYB-2. (1.66 kg), 2022/RIGHYB-10 (1.54 kg), 2022/RIGHYB-9 (1.28 kg), 2022/RIGHYB-11 (1.00 kg), which were on par with each other and the lower yield (0.68 kg) was recorded in ALOK. “The increase in yield and yield attributes to enhanced photosynthesis, accumulation of carbohydrates, development of cell wall and cell differentiations as they boost up overall vegetative growth, biological activity of the plants and retention of more flowers and fruits which increased number of fruits and size of fruits besides increasing yield” [1].

fruit yield(q/ha): The maximum yield (q/ha) was recorded in 2022/RIGHYB-2 (26.68 q/ha), followed by 2022/RIGHYB-6 (17.05 q/ha), 2022/RIGHYB-7 (16.23 q/ha), 2022/RIGHYB-9 (14.25 q/ha), 2022/RIGHYB-11 (11.20q/ha), which were on par with each other and the significantly lowest yield (7.56 q/ha) was found in the case of ALOK. The increase in yield is attributed to improved photosynthesis, carbohydrate accumulation, cell wall development, and cell differentiations, all of which support the plants' overall vegetative growth, biological activity, and ability to retain more flowers and fruits, which in turn increases the quantity and size of fruits produced in addition to yield.

Economics: In terms of Economics Maximum Gross return, Net return and Benefit cost ratio,

Rs. 659557.29, Rs. 5641457.29 and 5.93was recorded in genotype 2022/RIGHYB-2 followed by 2022/RIGHYB-11 with Gross return Rs. 280114.42, Net return Rs. 185014.42and Benefit cost ratio 1.94respectively and minimum Gross return 189092.85, Net return Rs. 93992.85, and Benefit cost ratio (0.98). in genotype ALOK.

4. CONCLUSION

From the present investigation it is concluded that variety 2021RIGHYB-2 performed best in terms of germination, vine length, days to 1st flowering , days to 1st harvesting, number of fruit per vine , fruit length , diameter, weight, yield &with highest B:C Ratio (5.93).

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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