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Performance of ridge gourd (*Luffa acutangula* L.) hybrid genotypes in Prayagraj agro-climatic conditions

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Abstract
An Experiment on ridge gourd was conducted during February to May 2021, in horticulture Research field, 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 17 hybrids of Ridge gourd *i.e.* RIGHYB-1, RIGHYB-2, RIGHYB-3, RIGHYB-4, RIGHYB-5, RIGHYB-6, RIGHYB-7, RIGHYB-8, RIGHYB-9, RIGHYB-10, RIGHYB-11, RIGHYB-12, RIGHYB-13, RIGHYB-14, RIGHYB-15 obtained from source of IIVR VARANASI and NEHA, DEEPIKA obtained from different sources to find out the best performance in terms of growth and yield in prayagraj agro climatic conditions. The experiment was conducted in Randomized Block design, were each hybrid replicated thrice the results from the present investigation concluded that Ridge gourd Hybrid genotype AVT-I 2019/RIGHYB-5 was recorded with maximum no of fruits (16.8 fruits), average fruit weight (162.93 g), average fruit yield (2.74 Kg/plant), average fruit yield (243.17 q/ha) and with maximum Benefit cost ratio 3.0.

Keywords: Ridge gourd, hybrid, agro-climatic conditions

Introduction
Ridge gourd [*Luffa acutangula* L.] popularly known as kalitori and called as 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 is an annual, monoecious cross pollinating, running vine plants consisting of long taproot system, simple, sharply angled 5-lobed leaves and the fruits are dark green vegetable having white pulp with white seeds embedded in spongy flesh.

It is a very important Indian vegetable crop and it can be grown throughout the year. The Ridge gourd vegetable in green stage and leaves with stem are used as vegetable. fruits become more fibrous if fruit pickings are delayed and become unfit for culinary purposes. It is very famous vegetable in south and east India. It is an important member of the family Cucurbitaceae grown is a fast-growing vine that often requires some support to facilitate its spread. It is a climbing annual grown primarily for its immature fruits which are eaten raw, pickled. The genus derives its name from the product 'loofah', which is used in bathing sponges, scrubber pads, doormats, pillows, and mattresses and also for cleaning utensils. The species contain a gelatinous compound called luffein. In south, southeast, and East Asia, the tender fruits are eaten fresh or more commonly cooked and consumed as a vegetable. Sometimes, the tender leaves and growing shoots are also used as pot herbs.

Fruits vary in size and may be oblong or club-shaped. Cultivated species of ridge gourd are monoecious in Nature with different sex forms *viz.*, androecious, gynoecious, gynomonoecious, andromonoecious and hermaphrodite plants are also reported. It is rich in vitamin A, C and Fe. The present production and productivity of ridge gourd is not sufficient enough to meet the nutritional requirement of increasing population. The productivity of ridge gourd varies from season to season and region to region. Thus, there is a need to identify stable varieties which is suitable for particular season and location. The expression of yield is the outcome of interaction of several characters.

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Materials and Methods

An Experiment on ridge gourd was conducted during February to May 2021, in horticulture Research field, 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 17 hybrids of Ridge gourd *i.e*., RIGHYB-1, RIGHYB-2, RIGHYB-3, RIGHYB-4, RIGHYB-5, RIGHYB-6, RIGHYB-7, RIGHYB-8, RIGHYB-9, RIGHYB-10, RIGHYB-11, RIGHYB-12, RIGHYB-13, RIGHYB-14, RIGHYB-15 obtained from source of IIVR VARANASI and NEHA, DEEPIKA obtained from different sources to find out the best performance in terms of growth and yield in prayagraj agro climatic conditions. The experiment was conducted in Randomized Block design, were each hybrid replicated thrice. The mean (maximum and minimum) temperature was 37.98ºC and 24.21ºC respectively, mean (maximum and minimum) relative humidity was 82.16 percent and 45.26 percent during the crop growing season. The experimental soil was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.318%), medium in available N (70 Kg/ha), medium available P (12.50 Kg/ha) and medium available K (216.10 Kg/ha). Fertilizers were applied in the form of urea, single super phosphate and murate of potash, respectively. The field beds were prepared and the seeds have been directly sown with respective spacing and covered by soil. The observation regarding yield were recorded after harvesting of crop.

Statistical analysis

The data recorded during the course of investigation were subjected to statistical analysis as per method of analysis of variance Fisher (1950). 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.

Chemical analysis of soil

Composite soil samples are collected randomly before the layout of experiment was laid so as to determine the soil properties initially. The soil samples are collected from 0-15 cm depth and were dried under shade, then powdered with the help of a wooden pestle and mortar then sieved through a 2 mm sieve and was then subjected to further analysis. The physical properties of soil were evaluated by using the Bouyoucos hydrometer method outlined by Bouyoucos (1927) and for organic carbon by Wet method Walkely and Black (1956) [27]. Available nitrogen was estimated by alkaline permanganate method by Subbiah and Asia (1956), available phosphorus by Clasen's Calorimeter method by Jackson (1967), available potassium was determined by use of Flame Photometric method (Perur *et al*., 1973) [25].

Results and Discussions

Growth parameters

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

Table 1: Performance of various genotypes of Ridge gourd in terms of Germination, first true leaf, first male, female flower, sex ratio, days to first picking and average vine length (m).

Genotypes	Days to Germination	Days to 1st leaf emergence	Days to 1st male flower emergence	Days to 1st female flower emergence	Nodes at 1st male flower emergence	Nodes at 1st female flower emergence	sex ratio	Days to 1st picking	Average vine length (m)
RIGHYB-1	8.47	16.87	47.4	52.53	3.33	9.73	24.6	64.8	2.25
RIGHYB-2	7.93	17.2	44.67	49.67	3.8	9.8	27.7	62.07	2.83
RIGHYB-3	8.4	18.8	44.13	49.4	4.03	11.2	25.33	61.8	1.83
RIGHYB-4	11.6	19.93	51.07	56	4.07	10.13	24	68.4	2.84
RIGHYB-5	10.47	19.47	47.33	52.2	5.53	8.47	25.6	64.53	2.26
RIGHYB-6	8.27	18.13	43.2	47.87	4.47	9.93	23.2	60.33	2.19
RIGHYB-7	8.6	18.27	42.93	47.93	4.4	9.13	20.73	60.4	1.92
RIGHYB-8	8.93	18.8	45.8	51.07	6.07	9.33	24.53	63.6	2.55
RIGHYB-9	9.53	18.27	45.93	50.2	5.07	9.33	25.73	62.4	3.09
RIGHYB-10	9.67	18.27	46.8	50.87	4.8	9.27	25.27	63.33	2.33
RIGHYB-11	9.6	18.13	45.67	49.73	3.93	8.6	24.2	62	2.11
RIGHYB-12	8.87	18.53	43.27	48.47	3.4	7.53	26.33	60.8	2.91
RIGHYB-13	8.27	17.47	44.6	49.8	3.67	7.6	25.8	61.33	2.29
RIGHYB-14	8	17.53	45.13	48.8	5.33	10.67	22.13	65.13	2.86
RIGHYB-15	8.67	18.13	45.07	49.87	4.87	10.4	22.27	61.8	2.77
NEHA	8.13	17.33	44.07	54.93	4.53	8.8	23.2	64.6	2.75
DEEPIKA	9.47	17	44.93	54.2	3.73	10.13	20.13	64.2	2.78
F test	S	S	S	S	S	S	S	S	S
S. Ed (±)	0.7	0.78	1.48	1.68	0.52	0.93	1.1	1.69	0.22
C.V.	9.6	5.3	4	4.04	14.44	12.15	5.55	3.28	10.72
C.D at 5%	1.44	1.6	3.02	3.42	1.06	1.9	2.23	3.44	0.45

Days to germination

The minimum number of days to germination (7.93) was recorded in the genotype RIGHYB-2 followed by the genotype RIGHYB-14 (8), NEHA (8.13), RIGHYB-6 (8.27), RIGHYB-13 (8.27 days), RIGHYB-3 (8.40 days), RIGHYB-1 (8.47), RIGHYB-7 (8.60), RIGHYB-15 (8.67), RIGHYB-12 (8.87), RIGHYB-8 (8.93), which were on par with each other and maximum number of days to germination (11.6) was recorded in the genotype RIGHYB-4. The number of days to germination is an important character. which indicate earliness or lateness of the crop in general. Better 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.

Days to first leaf emergence

The minimum number of days to 1st true leaf emergence (16.86) recorded in the genotype RIGHYB-1 followed by the genotype DEEPIKA (17), RIGHYB-2 (17.2), NEHA (17.33), RIGHYB-13 (17.46), RIGHYB-14 (17.53), RIGHYB-6 (18.13), RIGHYB-11(8.13), RIGHYB-7 (18.27), RIGHYB-9 (18.27), RIGHYB-10 (18.27), which were on par with each other and maximum number of days to 1st true leaf appearance (19.93) was reported in the genotype RIGHYB-4. Because of the capacity of genotype to intake more water and ability of the genotype to grow fast in the conditions like sunlight moisture and temperature and the number of days to first true leaf emergence indicates earliness or lateness of flower.

Days to First Male flower emergence

The minimum number of days to first male flower emergence was recorded in the genotype RIGHYB-7 (42.93) followed by the genotype RIGHYB-6 (43.2), RIGHYB-12 (43.27), NEHA (44.07), RIGHYB-3 (44.13), RIGHYB-13 (44.6), RIGHYB-2 (44.67), DEEPIKA (44.93), RIGHYB-15 (45.07), RIGHYB-14 (45.13), RIGHYB-11 (45.67), RIGHYB-8 (45.8), RIGHY B-9 (45.93) which were on par with each other and maximum number of days to male flower emergence (51.07) recorded in the genotype RIGHYB-4.The Days to First male flower emergence play an important role in deciding the earliness or lateness of crop in general. The variation in the first female flower emergence might have been due to internodal length, number of inter nodal and vigour of the crop.

Days to appearance of First Female Flower Emergence

The minimum number of days to 1st female flower emergence was recorded in the genotype RIGHYB-6 (47.87) followed by the genotype RIGHYB-7 (47.93), RIGHYB-12 (48.47), RIGHYB-14 (48.8), RIGHYB-3 (49.4), RIGHYB-2 (49.67), RIGHYB-11 (49.73), RIGHYB-13 (49.8), RIGHYB-15 (49.87), RIGHYB-9 (50.2), RIGHYB-10 (50.87), RIGHYB -8 (51.07) which were on par with each other and maximum number of days (54.93) reported in the genotype NEHA. The Days to First Female flower emergence play an important role in deciding the earliness or lateness of crop in general. The variation in the first female flower emergence might have been due to internodal length, number of inter nodal and vigour of the crop.

Node at First Male flower Emergence

The minimum number of nodes to 1st male flower emergence (3.33) was recorded in the genotype RIGHYB-1 followed by the genotype RIGHYB-12 (3.4), RIGHYB-13 (3.67), DEEPIKA (3.73), RIGHYB-2 (3.8), RIGHYB-11 (3.93), RIGHYB-3 (4.03), RIGHYB-4 (4.07) which were on par with each other and maximum number of node (6.07) reported in the genotype RIGHYB-8.

Nodes at First Female flower Emergence

The minimum number of nodes at 1st female flower emergence (7.53) was recorded in the genotype RIGHYB-12 followed by the genotype RIGHYB-13 (7.6), RIGHYB-5 (8.47), RIGHYB-11 (8.6), NEHA (8.8), RIGHYB-7 (9.13), RIGHYB-10 (9.27), RIGHYB-8 (9.33), RIGHYB-9 (9.33) which were on par with each other and the maximum number of node (11.2) reported in the genotype RIGHYB- 3.

Sex ratio

The maximum ratio of male: female flower (27.7) was recorded in RIGHYB-2 and followed by RIGHYB-12 (26.33), RIGHYB-13 (25.8), RIGHYB-9 (25.7), RIGHYB-5 (25.6) which were on par with each other and minimum male: female ratio was recorded (20.13) in DEEPIKA. The Male: Female ratio is an important character which indicates earliness or lateness of the crop in general. The variation in Male: Female ratio might have been due to number of vigor of crop.

Days to First picking

The minimum number of days for 1st picking (60.33) days was recorded in the genotype RIGHYB-6 followed by the genotype RIGHYB-7 (60.4), RIGHYB-12 (60.8), RIGHYB-13 (61.33), RIGHYB-3 (61.8), RIGHYB-15 (61.8), RIGHYB-11 (62), RIGHYB-2 (62.07), RIG HYB-9 (62.4), RIGHYB-10 (63.33), RIGHYB-8 (63.6), which were on par with each other and maximum number of days (68.4) in the genotype RIGHYB-4. It may be due to mobilization of food materials from source to sink in best treatment.

Average vine Length

The maximum vine length was (3.09m) at final harvest was recorded in the genotype RIGHYB-9 followed by the genotype RIGHYB-12 (2.91m), RIGHYB-14 (2.86m), RIGHYB-4 (2.84m), RIGHYB-2 (2.83m), DEEPIKA (2.78m), RIGHYB-15 (2.77m), NEHA (2.75m) which were on par with each other and minimum vine length (1.83m) reported in the genotype RIGHYB-3.The variation in plant height might be due to specific genetic makeup of different genotypes, inherent properties and vigour to crop.

Yield parameters

Data pertaining to yield parameters which are Average number of fruits/plants, Average Fruit weight (g), Average fruit length (cm), Average fruit diameter, Average fruit yield per plant (kg), Average fruit yield (q/ ha) were recorded and tabulated in Table-2.

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

Genotype	Average number of fruits per plant	Average fruit weight (g)	Average fruit length(cm)	Average fruit diameter (cm)	Average fruit yield (Kg/plant)	Average fruit yield q/ha
RIGHYB-1	14.73	156.6	33.67	5.4	2.3	204.51
RIGHYB-2	16.4	157	31.63	6	2.58	228.99
RIGHYB-3	14.53	139.13	29.05	5	2.01	178.83
RIGHYB-4	14.87	142.73	24.13	6.1	2.12	188.53
RIGHYB-5	15.8	143.87	28.88	4.7	2.27	201.98
RIGHYB-6	14.6	138.6	30.88	5.3	2.02	179.9
RIGHYB-7	12.73	161	27.24	5.1	2.05	181.9
RIGHYB-8	13.87	143.27	28.45	6.2	1.98	176.12
RIGHYB-9	15.67	148.57	31.15	6.1	2.32	206.5
RIGHYB-10	15.53	150.33	28.27	6.8	2.33	207.3
RIGHYB-11	14.07	156.07	27.48	7	2.2	195.37
RIGHYB-12	16.8	162.93	29.11	5.2	2.74	243.17
RIGHYB-13	14.93	155.87	28.77	6.6	2.33	207.11
RIGHYB-14	13.6	148.07	31.18	6	2.01	178.97
RIGHYB-15	10.6	130.4	25.9	5	1.38	122.79
NEHA	11.27	153.23	31.3	6.1	1.73	153.71
DEEPIKA	12.07	156.33	30.53	5.8	1.88	167.47
F-Test	S	S	S	S	S	S
S.Ed(±)	0.69	7.55	0.97	0.29	0.12	0.22
C.V.	5.89	6.18	4.06	6.07	7.14	7.14
C.D at 5%	1.4	15.37	1.98	0.59	0.25	22.53

Average number of fruits/plants

The maximum number of fruits/plant (16.8) was recorded in the genotype RIGHYB-12 followed by the genotype RIGHYB-2 (16.4), RIGHYB-5 (15.8), RIGHYB-9 (15.67), RIGHYB -10 (15.53) which were on par with each other and minimum vine length and minimum number of fruits (10.6) in the genotype RIGHYB-15. The Fruit per plant is one of the major factors for deciding the yield of the crop. The variation in fruit per plant have been to sex ratio and fruit set percentage.

Average Fruit weight (g)

The maximum average fruit weight (162.93 g) was recorded in the genotype RIGHYB-12 followed by the genotype RIGHYB-2 (161 g), RIGHYB-2(157 g), RIGHYB-1(156.6 g), DEEPIKA (156.33 g), RIGHYB-11 (156.07 g), RIGHYB-13 (155.87 g), NEHA (153.23 g) RIGHYB-10 (150.33 g), RIGHYB-9 (148.57 g), RIGHYB-14(148.07 g) which were on par with each other and the minimum average fruit weight (130.4 g) was recorded in the genotype RIGHYB-15. Increased fruit weight in different hybrids, might be due to enhanced photosynthesis accumulation of carbohydrates and Favourable effect on vegetative growth which increased the fruit variety besides increasing fruit size and weight.

Average fruit length (cm)

The maximum average fruit length was recorded in the genotype RIGHYB-1 (33.67 cm) followed by the genotype RIGHYB-2 (31.63 cm) and minimum fruit length (24.13 cm). in the genotype RIGHYB-4. Increased fruit size in different hybrids, might be due to enhanced photosynthesis accumulation of carbohydrates and Favourable effect on vegetative growth which increased the fruit variety besides increasing fruit size.

Average fruit diameter

The maximum fruit diameter (7 cm) was recorded in the genotype RIGHYB-11 followed by the genotype RIGHYB-10 (6.8 cm), RIGHYB-13 (6.6 cm) which were on par with each other and minimum in the genotype RIGHYB-5 (4.7 cm). 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 size.

Average fruit yield per plant (kg)

The maximum Average fruit yield kg/plant (2.74 kg) was recorded in the genotype RIGHYB-12 followed by the genotype RIGHYB-2 (2.58 kg), and minimum in the genotype RIGHYB-15 (1.38 kg). Significant variation might be due to fruit set percentage and number of fruits per plant, fruit weight and fruit diameter and 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.

Average fruit yield (q/ ha)

The maximum Average fruit yield (243.17 q/ha) was recorded in the genotype RIGHYB-12 followed by the genotype RIGHYB-2 (228.99 q/ha) and minimum in the genotype RIGHYB-15 (122.79 q/ha). The Significant variation might be due to fruit set percentage and number of fruits per plant, fruit weight and fruit diameter and the increase in yield and

yield attributes to enhanced photosynthesis, accumulation of carbohydrates, development of cell wall and cell differentiations

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Economics

In terms of Economics maximum Benefit cost ratio, Rs 3.0 was recorded in hybrid RIGHYB-12 followed by RIGHYB-2 with Benefit cost ratio 2.83 and respectively and minimum Benefit cost ratio 1.52. was recorded in hybrid RIGHYB-15.

Summary and Conclusion

The results from the present investigation concluded that Ridge gourd Hybrid genotype RIGHYB-12 was recorded with maximum no of fruits (16.8 fruits), average fruit weight (162.93 g), average fruit yield (2.74 Kg/plant), average fruit yield (243.17 q/ha) and with cost Benefit Ratio of 3.0.

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