The Pharma Innovation Journal 2022; 11(6): 1048-1052

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 1048-1052

www.thepharmajournal.com
Received: 01-04-2022
Accepted: 10-05-2022

Chandrakant Kurre
M.Sc. Scholar, Department of Vegetable Science, SHUATS, Prayagraj, Uttar Pradesh, India

Vijay Bahadur
Associate Professor and Head, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh, India

Samir Ebson Topno
Assistant Professor, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh, India

Anita Kerketta
Assistant Professor, Department of Horticulture, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Chandrakant Kurre
M.Sc. Scholar, Department of Vegetable Science, SHUATS, Prayagraj, Uttar Pradesh, India

Performance of ridge gourd (*Luffa acutangula* L.) Genotypes in prayagraj agro-climatic conditions

Chandrakant Kurre, Vijay Bahadur, Samir Ebson Topno and Anita Kerketta

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 10 genotypes of Ridge gourd *i.e.* RIGVAR-1, RIGVAR-2, RIGVAR-3, RIGVAR-4, RIGVAR-5, RIGVAR-6, RIGVAR-7, KASHI SHIVANI obtained from source of IIVR VARANASI and FAIZABADI, JAIPURI LONG 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 genotype replicated thrice the results from the present investigation concluded that Ridge gourd genotype RIGVAR-5 was recorded with minimum sex ratio (21.12), average fruit weight (173.53 g), average fruit yield (1.68 kg/plant), average fruit yield (149.69 q/ha) and with maximum Benefit cost ratio of 1.9.

Keywords: Ridge gourd, genotypes, agro-climatic conditions

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.

In Indian traditional systems of medicines, ridge gourd is used widely in the treatment of Vata, Kapha, Anaemia, Leucoderma and in splenic enlargement. In health benefits of Ridge Gourd, it is an excellent blood purifier, possessing laxative properties, Beneficial for diabetes, Ridge gourd is extremely rich in dietary fiber, Aiding in weight loss, Anti-inflammatory and anti-biotic. The juice of the fresh leaves is dropped into the eyes of children against granular conjunctivitis and also to prevent the eye lids sticking together at nights due to excessive Meibomian secretion. Every 100g of the edible portion of ridge gourd contains 0.5g of fiber, 0.5 percent of protein, 0.35 percent of carbohydrate, 37 mg of carotene, 5.0 mg of vitamin c, 18 mg of calcium and 0.5 mg of Iron.

Being a warm season vegetable crop, it has the ability to tolerate high temperature which ensures its adaptability for widespread cultivation throughout the tropics. Ridge gourd, is grown throughout India in tropical and subtropical climate, both as spring-summer and rainy season crop known as ribbed gourd or angled gourd or silky gourd or angled loofah or vegetable gourd.

It is a very important Indian vegetable crop and it can be grown throughout the year.0The Ridge gourd vegetable in green stage and leaves with stem are used as vegetable.0fruits 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.

The current production and productivity of ridge gourd is insufficient to fulfill the growing population's nutritional needs. Ridge gourd productivity varies from season to season and region to region. As a result, stable cultivars that are good for a specific season and area must be identified. The interaction of various characters results in the expression of yield.

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 10 genotypes of Ridge gourd *i.e.* RIGVAR-1, RIGVAR-2, RIGVAR-3, RIGVAR-4, RIGVAR-5, RIGVAR-6, RIGVAR-7, KASHI SHIVANI obtained from source of IIVR VARANASI and FAIZABADI, JAIPURI LONG 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) [9]. 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) [4] 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) [15], 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 and female flower, sex ratio, days to first picking and average vine length

Genotypes	Days to Germination	Days to 1st leaf emergence	Days to 1st male flower emergence	Days to 1st female flower emergence	Node at 1st male flower emergence	Node at 1st female flower emergence	sex ratio	Days to 1st picking	Average0 vine length (m)
RIGVAR-1	10.68	17.46	45.75	48.75	2.90	5.36	27.83	64.47	2.55
RIGVAR-2	9.22	15.20	43.63	48.81	2.46	5.75	25.33	61.93	3.26
RIGVAR-3	8.92	14.22	42.69	49.02	2.32	5.92	25.60	62.80	2.89
RIGVAR-4	8.87	13.11	44.37	50.19	2.67	6.34	24.00	63.93	2.77
RIGVAR-5	8.77	13.18	44.71	46.63	3.42	8.63	21.12	61.47	3.13
RIGVAR-6	8.78	13.71	44.16	47.25	2.64	7.28	23.40	62.20	3.12
RIGVAR-7	8.37	14.68	43.62	51.06	2.70	6.89	25.27	64.00	3.17
FAIZABADI	9.32	13.83	44.03	48.40	2.53	6.42	24.60	62.60	2.25
JAIPURI LONG	10.01	15.37	45.90	51.07	2.43	7.87	24.53	60.73	2.52
KASHI SHIVANI	9.71	14.46	43.07	51.68	3.85	7.82	24.20	62.73	2.90
F test	S	S	S	S	S	S	S	S	S
S. Ed (±)	0.59	0.87	1.53	0.28	1.51	0.85	1.55	1.03	0.19
C.V.	7.78	7.74	4.24	12.11	3.76	15.27	7.71	2.01	8.05
C.D at 5%	1.24	1.83	3.22	0.58	3.18	1.79	3.25	2.17	0.39

Days to germination

The minimum number of days to germination was recorded in RIGVAR-7 (8.37) followed by RIGVAR-5 (8.77), RIGVAR-6 (8.78), RIGVAR-4 (8.87), RIGVAR-3 (8.92), RIGVAR-2 (9.22), FAIZABADI (9.32), which were on par with each other and the maximum day (10.68) to germination was noticed in RIGVAR-1. The number of days to germination is an important character. Which indicate earliness or lateness of the crop in general. Better germination in this genotype 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 first true leaf emergence

(13.11) was recorded in RIGVAR-4 followed by RIGVAR-5 (13.18), RIGVAR-6 (13.71), FAIZABADI (13.83), RIGVAR-3 (14.22), KASHI SHIVANI (14.46), RIGVAR-7 (14.68), which were on par with each other and the maximum day (17.46 days) to first true leaf was noticed in RIGVAR-1. 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 were recorded for first male flower emergence in RIGVAR-3 (42.69) followed by KASHI SHIVANI (43.07). The maximum number of days (45.90) was found to first male flower emergence in JAIPURI LONG. The days to first male flower emergence plays an important role in deciding the earliness or lateness or crop in general. The variation in first male flower emergence might have been due to intermodal length, number of intermodal and vigour of the crop.

Days to appearance of First Female Flower Emergence

The minimum number of days were recorded for first female flower emergence in RIGVAR-5 (46.63) followed by RIGVAR-6 (47.25), FAIZABADI (48.40), RIGVAR-1 (48.75), RIGVAR-2 (48.81), RIGVAR-3 (49.02), which were on par with each other and the maximum number (51.68) was found to first female flower emergence in KASHI SHIVANI. The days to first Female flower emergence plays an important role in deciding the earliness or lateness or crop in general. The variation in first Female flower emergence might have been due to intermodal length, number of intermodal and vigour of the crop

Node at First Male Flower Emergence

The minimum node at which first male flower appears were recorded in RIGVAR-3 (2.32), followed by JAIPURI LONG (2.43), RIGVAR-2 (2.46), FAIZABADI (2.53), RIGVAR-6 (2.64), RIGVAR-4 (2.67), RIGVAR-7 (2.70), which were on par with each other and the maximum (3.85) at which first male flower emergence found in KASHI SHIVANI.

Nodes at First Female Flower Emergence

The minimum node at which first Female flower appears were recorded in RIGVAR-1 (5.36) followed by RIGVAR-2 (5.75), RIGVAR-3 (5.92), RIGVAR-4 (6.34), FAIZABADI (6.42), RIGVAR-7 (6.89), which were on par with each other and the maximum node at which first female flower emerged (8.63) was noticed in RIGVAR-5.

Sex ratio

The minimum ratio of male: female flower (21.12) was recorded in RIGVAR-5 and followed by RIGVAR-6 (23.40), RIGVAR-4 (24.00), KASHI SHIVANI (24.20), which were on par with each other and maximum male female ratio (27.83) was noticed in RIGVAR-1. The male: female ratio is an important character which indicates earliness or lateness of the crop in general. The variation in male: female flower ratio might have been due to number of vigour of crop.

Days to First picking

The minimum number of days to first picking recorded in JAIPURI LONG (60.73) followed by RIGVAR-5 (61.47), RIGVAR-2 (61.93), RIGVAR-6 (62.20), FAIZABADI (62.60), KASHI SHIVANI (62.73), RIGVAR-3 (62.80), which were on par with each other and the maximum number of days (64.47) was found to first picking in RIGVAR-1. The days to first harvesting from sowing plays an important role in deciding the earliness and lateness of fruiting the different genotypes of ridge gourd. It may be due to mobilization of food materials from source to sink in best treatment.

Average vine Length

The maximum length of main vine (3.26 m) was recorded in RIGAVAR-2 followed by RIGVAR-7 (3.17 m), RIGVAR-5 (3.13 m), RIGVAR-6 (3.12 m), KASHI SHIVANI (2,90 m), RIGVAR-3 (2.89 m), which were on par with each other and the minimum (2.25 m) was noticed in FAIZABADI. 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)
RIGVAR-1	9.36	154.33	24.98	4.91	1.44	128.37
RIGVAR-2	9.87	167.73	20.51	5.03	1.65	146.90
RIGVAR-3	8.80	155.87	20.33	4.81	1.38	122.25
RIGVAR-4	10.34	159.60	20.57	4.39	1.53	136.28
RIGVAR-5	9.68	173.53	25.93	4.66	1.68	149.69
RIGVAR-6	10.44	159.27	24.48	4.96	1.66	147.80
RIGVAR-7	9.27	162.60	27.70	4.62	1.50	133.18
FAIZABADI	9.00	168.93	20.16	5.23	1.53	135.69
JAIPURI LONG	9.58	149.07	25.80	4.88	1.43	127.08
KASHI SHIVANI	10.14	157.00	24.77	4.88	1.59	141.36
F-Test	S	S	S	S	S	S
SE.d(±)	0.48	6.6	1.71	0.17	0.07	6.15
C.V.	6.12	5.03	8.9	4.35	5.51	5.51
C.D at 5%	1.01	13.86	3.59	0.36	0.15	12.93

Average number of fruits/plants

The maximum numbers of fruit per plant were recorded in genotype RIGVAR-6 (10.44), followed by RIGVAR-4 (10.34), KASHI SHIVANI (10.14), RIGVAR-2 (9.87), RIGVAR-5 (9.68), JAIPURI LONG (9.58), which were on par with each other and the lower number of fruit (8.80) was recorded in RIGVAR-3. 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)0

The maximum average weight per fruit was recorded in RIGVAR-5 (173.53 g) followed by FAIZABADI (168.93 g), RIGVAR-2 (167.73 g), RIGVAR-7 (162.60 g), which were on par with each other and The minimum fruit weight (154.33 g) was noted in RIGVAR-1. Increased fruit weight in different genotype, might be due to enhanced photosynthesis accumulation of carbohydrates and favorable effect on vegetative growth which increased the fruit variety besides increasing fruit size and weight.

Average fruit length (cm)

The highest fruit length was recorded in AVT-I 2019/RIGVAR-7 (27.10 cm) followed by RIGVAR-5 (25.93 cm), JAIPURI LONG (25.80 cm), RIGVAR-1 (24.98 cm), KASHI SHIVANI (24.77 cm), RIGVAR-6 (24.48 cm), which were on par with each other and significantly shorter fruit length (20.16 cm) was observed in the genotypes of FAIZABADI. Increased fruit size in different genotypes, 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 was found in FAIZABADI (5.23 cm), followed by RIGVAR-2 (5.03 cm), RIGVAR-6 (4.96), RIGVAR -1 (4.91), JAIPURI LONG (4.88), KASHI SHIVANI (4.88), which were on par with each other and the minimum fruit diameter (4.39 cm) found in RIGVAR-4. 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 yield per plant was recorded in RIGVAR-5 (1.68 kg), followed by RIGVAR-6. (1.66 kg), RIGVAR-2 (1.65 kg), KASHI SHIVANI (1.59 kg), FAIZABADI (1.53 kg), which were on par with each other and the lower yield (1.38 kg) was recorded in RIGVAR-3. 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 yield (q/ha) was recorded in RIGVAR-5 (149.69 q/ha), followed by RIGVAR-6 (147.80 q/ha), RIGVAR-2 (146.90 q/ha), KASHI SHIVANI (141.36 q/ha), FAIZABADI (135.69 q/ha), which were on par with each other and the significantly lowest yield (122.25 q/ha) was found in the case of RIGVAR-3. 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.

Economics

In terms of Economics Maximum Benefit cost ratio, 1.90 was recorded in hybrid RIGVAR-5 followed by RIGHYB-6 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 genotype RIGVAR-5 was recorded with minimum sex ratio (21.12), average fruit weight (173.53 g), average fruit yield (1.68 Kg/plant), average fruit yield (149.69 q/ha) and with cost Benefit Ratio of 1.9.

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