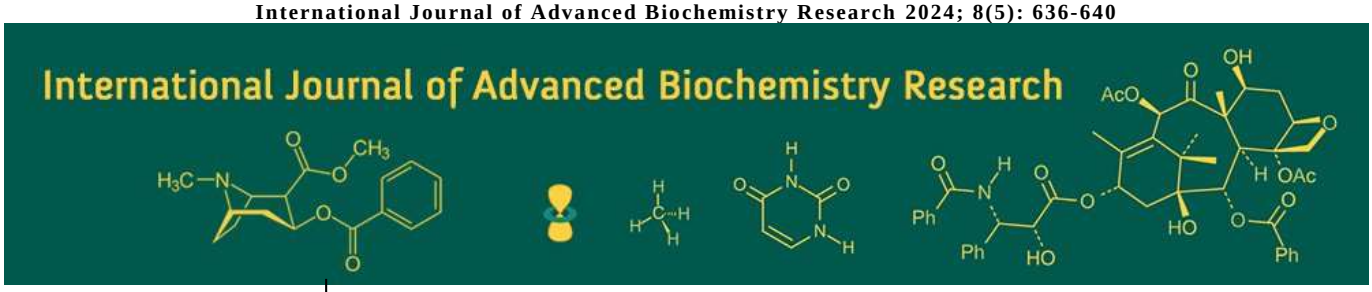

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(5): 636-640
www.biochemjournal.com
Received: 22-03-2024
Accepted: 26-04-2024

Devanshi Tiwari
M.Sc. (Ag.) Horticulture (Vegetable Science) Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India

Dr. Vijay Bahadur
Associate Professor of Horticulture, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India

Krishanveer Singh
M.Sc. (Ag.) Horticulture (Vegetable Science) Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Devanshi Tiwari
M.Sc. (Ag.) Horticulture (Vegetable Science) Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India

Evaluation of bottle gourd (*Lagenaria siceraria* L.) hybrids under Prayagraj agro climatic condition

Devanshi Tiwari, Dr. Vijay Bahadur and Krishanveer Singh

DOI: https://doi.org/10.33545/26174693.2024.v8.i5h.1171

Abstract
An experiment entitled "Varietal Evaluation of Bottle Gourd (*Lagenaria siceraria*) Hybrids" was conducted at Horticulture Research Farm, Department of Horticulture, Sam Higginbottom University of Technology and Sciences, Prayagraj, Uttar Pradesh during *Zaid* 2023. In which 10 hybrid varieties with three replication each of Bottle gourd *viz.* 2021/BOGHYB-1, 2021/BOGHYB-2, 2021/BOGHYB-3, 2021/BOGHYB-4, 2021/BOGHYB-5, 2021/BOGHYB-6, 2021/BOGHYB-7, SEMINIS(SHRADDHA), VNR (SARITA) and NEERAV were evaluated among each other's for quality, growth parameter and quantity parameters. In which among all the hybrids used in the experiment the best and most promising variety was found to be 2021/BOGHYB-3 in all the aspects *i.e.* Vine length (330.91 cm), Fruits per vine (8.66), fruit weight (0.98kg), Yield (24.89 t/h), Cost benefit ratio (6.69).

Keywords: Bottle gourd, cost benefit ratio, growth, hybrids, quality, yield, variation, yield

Introduction
The bottle gourd [*Lagenaria siceraria* L.], often known as Lauki or calabash gourd, is a diploid Cucurbitaceae plant with chromosomal number 2n-22. Due to its monoecious and andromonoecious nature, it is a highly cross-pollinated crop. The Latin terms "lagena" for bottle and "sicera" for drinking utensil are used to create the names "Lagenaria" and "siceraria." Cucurbitaceae is the most commercially important family, providing humanity with edible and healthy fruits. Although it is native to Africa, it has adapted successfully to India's widely diverse agroecosystems.

Bottle gourd is a vine grown for its fruit. It can be either harvested tender to be consumed as a vegetable, or harvested mature to be dried and used as a utensil, container, or a musical instrument. The fruits contain 0.2 percent protein, 2.9 percent carbohydrates, 0.5 percent fat, 0.5 percent minerals, 0.044 mg thiamine, 0.023 mg riboflavin, 0.33mg niacin and 12 mg vitamin C and 0.6 g fiber per 100 g fresh weight. Bottle gourd has a lot of medicinal properties. The fruit has a cooling effect. It is cardiotonic and diuretic in effect.

The bottle gourd has been included in the National Research Program on Vegetables, owing to its growing popularity as a health food. Because of its nutritional richness and ability to thrive in a wide range of climatic conditions, bottle gourd can be a useful instrument in research aimed at increasing the amount and quality of protective foods (vegetables).

The importance of the bottle gourd (also known as the poor man's vegetable) is supported by its qualities and the fact that it has a lot of variety in many economically essential traits. It is known for having a wide hemispheric dispersion and thus may be used to produce high-quality cultivars.

One of the most essential issues in cucurbits is sex expression, sex ratio, and fruit set. Most cucurbitaceous crops are monoecious, meaning they produce more male flowers and fewer female blossoms on the same plant. Only male flowers arise first in cucurbitaceous vegetables, and female flowers appear later, while their genetic makeup determines growth, flowering, and sex expression (Sharma and Sengupta, 2013) [21].

Inside the bottle gourd fruit are spongy flesh tissues, white pulp, and embedded seeds. There are a lot of bottle gourd seeds, and they're all covered in a protective layer called tests. The oil extracted from the seed is pure and pale yellow, and it can be used as a cooking and hair oil. The oil extracted from the seed is pure and pale yellow, and it is used as a cooking and hair oil.

Materials and Methods

Experimental Site and Location

The experiment was conducted in the Horticulture Research Field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj (U.P.), India during *Zaid* 2023. The experimental site is located in the sub–tropical region which is located at 250. 271 N latitude, 810. 561 E longitude and 98 m above the mean sea level. All the facilities necessary for cultivation including labor were made available in the department.

Climate Condition

Area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 ºC – 48 ºC and seldom falls as low as 4 ºC – 5 ºC. The relative humidity ranges between 20 to 94 %. The average rainfalls in this area are around 1013.4 mm annually.

Table 1: Details of Hybrid

S. No.	Hybrids	Symbols	Sources
1.	2021/BOGHYB-1	H_1	IIVR, VARANASI
2.	2021/BOGHYB-2	H_2	IIVR, VARANASI
3.	2021/BOGHYB-3	H_3	IIVR, VARANASI
4.	2021/BOGHYB-4	H_4	IIVR, VARANASI
5.	2021/BOGHYB-5	H_5	IIVR, VARANASI
6.	2021/BOGHYB-6	H_6	IIVR, VARANASI
7.	2021/BOGHYB-7	H_7	IIVR, VARANASI
8.	Seminis (Hybrid Bottlegourd) Shrada	H8	LOCAL
9.	Vnr (Sarita) F1 Hybrid	H_9	LOCAL
10.	Arise Seed (Neerav) F1 Hybrid	H_{10}	LOCAL

Statistical analysis the statistical analysis of the data was carried out using STATISTICA (7.0) software.

Results and Discussion

Growth parameters

The present investigation entitled "Varietal Evaluation in Bottle Gourd Hybrid" were carried out at Horticulture Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). in the year 2023. The results of the investigation, regarding the bottle Gourd on growth and yield have been presented in table and bar – diagrams wherever required. The result of the experiment has been presented under the following heading.

From the present investigation it is concluded that F1 Hybrid 2021/BOGHYB-3 performed best in H3 in terms of vine length (330.91 cm), Survival percentage (93%), Number of fruits per vine (8.66), Fruit length (38.66 cm), Fruit weight (980 g), Fruit diameter (10.50 cm) and Yield (24.89t/ha). Highest B:C was also found in hybrid H3 with 6.69.

Growth Parameters

Days to germination in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 2. Significantly the minimum number of days to gemination was recorded in the hybrids 2021/BOGHYB-3(7.4) followed by the genotype 2021/BOGHYB-6(7.66), 2021/BOGHYB-7(8), days which were on par with each other and maximum number of days to gemination (12.13) was recorded in the genotype ARISE SEED (NEERAV).

Days to 50% Germination in different hybrids of bottle gourd: Days to 50% germination in different hybrids of bottle gourd was recorded, statistically analyzed and presented in Table 2. Significantly the minimum number of days to 50% gemination was recorded in the hybrids 2021/BOGHYB-3(15.4) followed by the genotype 2021/BOGHYB-6(15.66), 2021/BOGHYB-7(16), days which were on par with each other and maximum number of days to 50% gemination (20) was recorded in the genotype ARISE SEED (NEERAV).

Survival % in different hybrids of bottle gourd

Survival % in different hybrids of bottle gourd was recorded, statistically analyzed and presented in Table 2. Significantly the minimum number of Survival % was recorded in the hybrids ARISE SEED (NEERAV) (72) followed by the genotype 2021/BOGHYB-2(75), 2021/BOGHYB-1(78), days which were on par with each other and maximum number of Survival % (93) was recorded in the genotype 2021/BOGHYB-2.

Days to first male flower appearance (DAS) in different genotypes of bottle gourd

Days to first male flower appearance in different hybrids of bottle gourd was recorded, statistically analyzed and presented in Table 2. Significantly the minimum number of days to first male flower appearance was recorded in the hybrids 2021/BOGHYB-3(34.10) followed by the hybrids 2021/BOGHYB-6(35.21), 2021/BOGHYB-7(35.66), days which were on par with each other and maximum number of days to first male flower appearance (40.99) was recorded in the genotype ARISE SEED (NEERAV).

Days to first female flower appearance (DAS) in different genotypes of bottle gourd

Days to first female flower appearance in different hybrids of bottle gourd was recorded, statistically analyses and presented in Table 2. Significantly the minimum number of days to first male flower appearance was recorded in the hybrids 2021/BOGHYB-3(45.21) followed by the hybrids 2021/BOGHYB-6(45.66), 2021/BOGHYB-7(46.10), days which were on par with each other and maximum number of days to first male flower appearance (50.21) was recorded in the hybrids ARISE SEED (NEERAV).

Node at First Male flower appearance in different genotypes of Bottle gourd

The Node at which first male flower appearance in different hybrids of bottle gourd was recorded, statistically analyzed and presented in Table 2. Significantly the minimum number of nodes to 1st male flower appearance (4.10) was recorded in the hybrids 2021/BOGHYB-3 followed by the hybrids 2021/BOGHYB-6(4.44), 2021/BOGHYB-7(4.66), which were on par with each other and maximum number of node (6.88) reported in the hybrids ARISE SEED (NEERAV).

Node at First Female flower appearance in different genotypes of Bottle gourd

The Node at which first female flower appearance in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 2. Significantly the minimum number of nodes to 1st male flower appearance (2.33) was recorded in the hybrids 2021/BOGHYB-3 followed by the hybrids 2021/BOGHYB-6(2.66), 2021/BOGHYB-7(3.21), which were on par with each other and maximum number of node (5.66) reported in the hybrids ARISE SEED (NEERAV).

Days to first fruit picking in different hybrids of Bottle gourd

The Days to first fruit picking in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 3. Significantly the minimum days to first fruit picking (60.55) was recorded in the hybrids 2021/BOGHYB-3 followed by the hybrids 2021/BOGHYB-6(62.22), 2021/BOGHYB-7(63.66), which were on par with each other and the maximum days to first fruit picking (68.55) reported in the hybrids ARISE SEED (NEERAV).

Vine length (cm) in different hybrids of Bottle gourd

The Vine length in different hybrids of bottle gourd was recorded, statistically analyzed and presented in Table 3. Significantly the minimum vine length (300.18) was recorded in the hybrids ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(302.43), 2021/BOGHYB-1(306.80), which were on par with each other and maximum vine length (330.91) reported in the hybrids 2021/BOGHYB-3.

Number of fruits per vine in different hybrids of Bottle gourd

The Number of fruits per vine in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 3. Significantly the minimum number of fruits per vine (4.55) was recorded in the hybrids ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(5.55), 2021/BOGHYB-1(5.88) which were on par with each other and the number of fruits per vine (8.66) reported in the hybrids 2021/BOGHYB-3.

Average fruit weight (kg) in different hybrids of Bottle gourd

The Average Fruit weight in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 3. Significantly the minimum average fruit weight (0.70) was recorded in the hybrids ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(0.74), 2021/BOGHYB-1(0.78) which were on par with each other and the maximum average fruit weight (1.04) reported in the hybrids 2021/BOGHYB-6.

Fruit length (cm) in different hybrids of Bottle gourd

The Fruit length in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 3. Significantly the minimum fruit length (28.94) was recorded in the hybrids hybrids ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(30.32), 2021/BOGHYB-1(32.02), which were on par with each other and the maximum fruit length (36.73) reported in the hybrids 2021/BOGHYB-6.

Fruit diameter (cm) in different hybrids of Bottle gourd

The Fruit diameter in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 3. Significantly the minimum fruit diameter (6.30) was recorded in the hybrids which were ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(6.64), 2021/BOGHYB-1(7.73), on par with each other and the maximum fruit diameter (12.30) reported in the hybrids 2021/BOGHYB-6.

Yield per plant(kg/plant) in different hybrids of Bottle gourd

The yield per plant in different hybrids of bottle gourd was recorded, statistically analyzed and presented in Table 3. Significantly the minimum yield per plant (2.53) was recorded in the were ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(2.85), 2021/BOGHYB-1(3.15), which were on par with each other and the yield per plant (4.85) reported in the hybrids 2021/BOGHYB-6.

TSS (O B) in different hybrids of Bottle gourd

The TSS (^{O} B) in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 4. Significantly the TSS (^{O} B) (1.23) was recorded in the hybrids ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(1.4), 2021/BOGHYB-1(1.43), which were on par with each other and the TSS (^{O} B) (3.03) reported in the hybrids 2021/BOGHYB-3.

Vitamin C (mg/100 g) in different hybrids of Bottle gourd

The Vitamin C (mg/100 g) in different hybrids of bottle gourd was recorded, statistically analysed and presented in Table 4. Significantly the minimum Vitamin C (mg/100 g) (24) was recorded in the hybrids ARISE SEED (NEERAV) followed by the hybrids 2021/BOGHYB-2(25.3), 2021/BOGHYB-1(26), which were on par with each other and the Vitamin C (mg/100 g) (31.7)reported in the hybrids 2021/BOGHYB-3.

Fruit colour in different hybrids of Bottle gourd

The Fruit colour in different hybrids of bottle gourd was noted and presented in Table 4. Significantly the fruit colour was noted in the hybrids SEMINIS (SHRADA), 2021/BOGHYB-2, 2021/BOGHYB-4, 2021/BOGHYB-5 and 2021/BOGHYB-6 were Light green, 2021/BOGHYB-3, 2021/BOGHYB-3, VNR (SARITA) and ARISE SEED (NEERAV) were Dark green 2021/BOGHYB-1were Grassy green.

Fruit Shape in different genotypes of Bottle gourd

The Fruit Shape in different hybrids of bottle gourd was noted and presented in Table

4. Significantly the fruit shape was noted in the hybrids 2021/BOGHYB-3, 2021/BOGHYB-5, SEMINIS (SHRADA), VNR (SARITA), ARISE SEED (NEERAV)were Long, 2021/BOGHYB-1, 2021/BOGHYB-2 were Round, 2021/BOGHYB-4, 2021/BOGHYB-6, 2021/BOGHYB-7 were oval shape.

Table 2: Growth Parameters

HYBRIDS	Days to Germination	Days to 50% Germination	Survival %	Vine length (At Last Harvest)	No of days to first male flower appearance	No of days to first female flower appearance	Node to which first female flower appears	Node to which first male flower appears
2021/BOGHYB-1	10	18.46	78	306.80	38.10	48.66	6.33	4.77
2021/BOGHYB-2	10.4	19.66	75	302.43	38.33	49.88	6.66	5.33
2021/BOGHYB-3	7.4	15.4	93	330.91	34.10	45.21	4.10	2.33
2021/BOGHYB-4	9.46	17.8	82	315.23	37.33	47.77	5.77	3.88
2021/BOGHYB-5	8.13	16.46	86	320.56	36.44	46.99	5.21	3.44
2021/BOGHYB-6	7.66	15.66	92	326.80	35.21	45.66	4.44	2.66
2021/BOGHYB-7	8	16	90	322.18	35.66	46.10	4.66	3.21
Seminis (Shrada)	9.8	18.13	80	310.22	37.77	48.33	5.33	4.21
Vnr (Sarita)	8.53	17.53	85	317.83	36.88	47.44	5.99	3.66
Arise Seed (Neerav)	12.13	20	72	300.18	40.99	50.21	6.88	5.66
F Test	S	S	S	S	S	S	S	S
S.E (d) (±)	0.37	0.15	2.69	0.38	0.83	0.76	0.82	0.79

Table 3: Yield Parameters

HYBRIDS	No of days to first picking	No of fruits per vine	Average fruit length (cm)	Average fruit diameter (cm)	Average fruit weight (g)	Fruit yield per plant (kg)	Yield per hectare (q/ha)
2021/BOGHYB-1	66.11	5.88	32.02	7.73	0.78	3.15	14.5
2021/BOGHYB-2	68.22	5.55	30.32	6.64	0.74	2.85	13.8
2021/BOGHYB-3	60.55	8.66	38.66	10.50	0.98	5.22	24.89
2021/BOGHYB-4	65.10	6.33	33.02	10.30	0.85	3.45	16.36
2021/BOGHYB-5	64.55	7.10	35.65	8.95	0.88	4.33	18.18
2021/BOGHYB-6	62.22	8.33	36.73	12.30	1.04	4.85	21.31
2021/BOGHYB-7	63.66	7.21	36.18	9.85	0.92	4.62	20.65
SEMINIS (SHRADA)	65.77	6.10	33.94	7.99	0.80	3.23	15.20
VNR (SARITA)	64.88	6.77	34.78	8.08	0.86	3.73	17.80
ARISE SEED (NEERAV)	68.55	4.55	28.94	6.30	0.70	2.53	13.1
F test	S	S	S	S	S	S	S
S.E (d) (±)	0.29	0.84	0.27	0.20	0.04	0.02	0.034

Table 4: Quality Parameters

HYBRIDS	TSS (O B)	Vitamin C (mg/100 g)	Fruit color	Fruit shape
2021/BOGHYB-1	1.43	26	GRASSY GREEN	ROUND
2021/BOGHYB-2	1.4	25.3	LIGHT GREEN	ROUND
2021/BOGHYB-3	3.03	31.7	DARK GREEN	LONG
2021/BOGHYB-4	1.8	27.3	LIGHT GREEN	OVAL
2021/BOGHYB-5	2.4	28	LIGHT GREEN	LONG
2021/BOGHYB-6	2.8	29.7	LIGHT GREEN	OVAL
2021/BOGHYB-7	2.6	28.7	DARK GREEN	OVAL
SEMINIS (SHRADA)	1.53	26.7	LIGHT GREEN	LONG
VNR (SARITA)	2.23	27.7	DARK GREEN	LONG
ARISE SEED (NEERAV)	1.23	24	DARK GREEN	LONG
F test	S	S		
S.E (d) (±)	0.47	0.72		

Conclusion

In conclusion, the comprehensive evaluation of various hybrids of bottle gourd revealed significant variations in growth parameters and yield attributes. The F1 Hybrid 2021/BOGHYB-3 demonstrated superior performance across multiple parameters, including vine length, survival percentage, fruit characteristics, and yield, highlighting its potential for cultivation in similar agro-climatic conditions. Additionally, this hybrid exhibited early flowering and fruiting, contributing to its overall suitability for commercial cultivation. However, it's noteworthy that genotype ARISE SEED (NEERAV) displayed delayed germination, reduced survival percentage, and inferior fruit quality attributes compared to other hybrids evaluated. These findings underscore the importance of selecting appropriate hybrids tailored to specific growing conditions to maximize yield and quality in bottle gourd cultivation. Further research focusing on agronomic practices and post-harvest management techniques can enhance the productivity and profitability of bottle gourd cultivation systems.

References

1. Abhishek V, Rajput JK, Saurabh T. Evaluation of bottle gourd genotypes (*Lagenaria siceraria*) for various yield and maturity characters. Department of Horticulture, CSAUAT, Kanpur. 2021;20:530-2.
2. Sohi A, Prasad VM, Bahadur V, Topno SE. Hybrids Evaluation of Bottle Gourd [*Lagenaria siceraria* (Molina) Standl.] for Fruit Growth Yield Quality and Morphological Traits in Prayagraj Agro-Climatic Conditions. Biological Forum – An International Journal. 2021;13(2):477-80.
3. Bhardwaj DR, Singh A, Singh U. Genetic variability of bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] by multivariate analysis. In: Proc. of National Symposium on Abiotic and Biotic Stress Management in Vegetable Crops. India: Society Vegetable Science; c2013. p. 370.
4. Chandrashekhar TM, Vijaya P, Joshi SV, Pandravada SR. Genetic variability, heritability and genetic advance for yield and yield attributes in bottle gourd (*Lagenaria siceraria* (mol) Standl.). Journal of Pharmacognosy and Phytochemistry. 2018;7(6):2085-8.
5. Dasha AS, Prasad VM, Wamiq M. Evaluation of sponge gourd (*Luffa cylindrica* L.) for fruit yield in Prayagraj Agro-climatic conditions. Journal of Pharmacognosy and Phytochemistry. 2020;9(6):1954-6.
6. Deepthi B, Reddy PSS, Kumar AS, Reddy AR. Character association and path coefficient analysis in bottle gourd (*Lagenaria siceraria* Mol.) genotypes.
7. Dubey SK, Maurya IB. Combining ability for characters related to yield and earliness in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. Indian Journal of Agronomy. 2007;42(3):535-9.
8. Harika M, Gasti VD, Shantappa T, Mulge R, Shirol AM, Mastiholi AB, *et al*. Evaluation of bottle gourd genotypes [*Lagenaria siceraria* (Mol.) Standl.] for various horticultural characters. Karnataka Journal of Agricultural Sciences. 2012;25(2):241-4.
9. Husna A, Mahmud F, Islam MR, Mahmud MA. Genetic Variability, Correlation and Path Co-Efficient Analysis in Bottle Gourd (*Lagenaria siceraria* L.). Advances in Biological Research. 2011;5(6):323-7.
10. Iopichino G, Gentile A, Continella G. Response of bottle gourd ecotypes [*Lagenaria siceraria* (Mol.) Standl.] growing in Sicily. Italus Hortus. 2009;13[2(11)]:720-3.
11. Kamal N, Verma S, Agrawal S, Rao SS. Genetic variability and correlation studies in bottle gourd grown as intercrop in coconut garden. Plant Archives. 2012;12(1):85-8.
12. Kumar R, Prasad VM. Hybrid evaluation trial in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. Environment and Ecology. 2011;29(1):74-7.
13. Chandra LN, Devi S. Evaluation trial on bottle gourd [*Lagenaria siceraria*] under Prayagraj agro-climatic conditions. International Journal of Agriculture, Environment and Biotechnology. 2021;25:517-20.
14. Venkatraman M, Anbarasi D, Haripriya K. Evaluation of genetic variability, heritability and genetic advance in thirty-five bottle gourd (*Lagenaria siceraria*) varieties for yield and yield related traits. Plant Archives. 2024;24(1):1203-10.
15. Mahato B, Pandit MK, Sarkar A. Evaluation of some indigenous bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] genotypes in the new alluvial zone of West Bengal. Journal of Interacademicia. 2010;14(4):440-3.
16. Milind P, Satbir K. Is bottle gourd a natural guard. International Research Journal of Pharmacy. 2011;2(6):13-7.
17. Narayan K. Genetic diversity and correlation studies in bottle gourd germplasm under Baster condition. XI Chhattisgarh young scientist congress. Journal of Agricultural Science. 2013;1(5):15.
18. Prathyusha, Devi S. Varietal Evaluation Studies in Cucumber under Prayagraj Agro-Climatic Condition (*Cucumis sativus* L.). International Journal of Current Microbiology and Applied Sciences. 2020;9(11):454-62.
19. Rathore JS, Collis JP, Singh G, Rajawat KS, Jat BL. Studies on Genetic Variability in Ridge Gourd (*Luffa acutangula* L (Roxb.)) Genotypes in Allahabad Agro-Climate Condition. International Journal of Current Microbiology and Applied Sciences. 2017;6(2):317-38.
20. Sahu B, Sarvanan S, Rangare SB, Sinha S, Sao P. Varietal Evaluation of Bottle Gourd under Allahabad Agro Climatic Condition [*Lagenaria siceraria* (Molina) Standl.]. Trends in Biosciences. 2014;7(1):7-8.
21. Thakur P, Sharma D, Visen VK, Dash SP. Evaluation of bottle gourd [*Lagenaria siceraria* (Molina) Standl.] genotypes. Plant Archives. 2013;15(2):1037-40.
22. Wani KP, Ahmed N, Hussain K. Gene action studies in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. Indian Journal of Agricultural Sciences. 2008;78(3):258-60.