Journal of Genetics, Genomics & Plant Breeding 6(4) 111-116 (October, 2022)
ISSN (Online): 2581-3293

RESEARCH ARTICLE

Varietal trial of okra (*Abelmoschus esculentus* L.) for evaluation of yield and yield parameters

D. K. Mehata, I. Kattel, S. P. S. Yadav, S. Bhujel, S. Bhattarai, P. Yadav, P. Sapkota, S. Timsina, V. Lahutiya

Girija Prasad Koirala College of Agriculture and Research Center, Purbanchal University, Gothgaun 222001, Morang, Nepal

Corresponding authors email Id: sushantpy8500@gmail.com

Manuscript received: July 9, 2022; Decision on manuscript, September 12, 2022; accepted: October 15, 2022

Abstract

To identify the high-yielding variety of okra, seven different varieties of okra were tested in a coordinated varietal trial using Randomized Complete Block Design (RCBD) following three replications from March 2022 to September 2022 at Girija Prasad Koirala College of Agriculture and Research Centre (GPCAR), Gothgaun, Morang, Nepal. The varieties include T1: Arka Anamika, T2: Chandani, T3: F1 Glory, T4: OH-940, T5: Punjab Selection, T6: R35 Selection, and T7: Swastik-2. The result of the study shows that out of seven varieties, Punjab selection (200.42 g) and Swastik-2 (200.12 g), gave the highest average yield/plant. Likewise, Arka Anamika (75.18 g), and R-35 Selection (98.06 g), gave the lowest average yield/plant. Thus, a substantial variation has been discovered among those varieties, and the utilization of Punjab selection and Swastik-2 varieties can boost the production of the okra crop considerably.

Keywords: Okra, yield, varieties, variation, parameters

Introduction

Among various types of food, vegetables are indispensable components for humans as they contain different nutrients (Oppong-Sekyere *et al.,* 2012). Okra (*Abelmoschus esculentus*) is geographically African (Ethiopian in origin) and falls under the Malvaceae family. It is grown in various parts of the country's subtropical and tropical regions and is a good source of vitamins, carbohydrates, minerals, proteins, and unsaturated fats (Binalfew and Alemu, 2016; Oppong-Sekyere *et al.,* 2012). There is variation between plants in height, flowering and fruiting time, pod size, pod length, etc. depending upon the variety; such variation is caused by the effects of polygene (Binalfew and Alemu, 2016). It is best grown in a warm climate in tropical and subtropical regions, and its production is low in waterlogging, frost, and drought conditions (Binalfew and Alemu, 2016; Sachan *et al.,* 2017). Okra is a vegetable crop that is highly cherished for its wider adaptability in soil and its fresh pod and succulent types of leaves and can be grown under rainfed conditions (Akpan-Idiok *et al.,* 2012). Flowers of okra are located in the axillary part, which turns into fruits within 2–3 days. Depending on the variety, fruits contain rows of greyish-to-greenish seeds that are round in shape (Moosavi *et al.,* 2018). It is a fast-growing herbaceous annual crop where fertilizers like N, P, and K play a major role in obtaining the quality of production (Sachan *et al.,* 2017). Poor status of the soil, such as nutrition and water holding capacity, as well as a lack of knowledge about the scientific way of production, poor knowledge of diseases and pest management, etc., result in low production of okra (Fagwalawa and Yahaya, 2016; Sachan *et al.,* 2017).

Production of okra varies from plant to plant depending upon soil structure, application of fertilizers, intercultural operation, application of water, disease control method, and so on (Sachan *et al.,* 2017). It is best grown at a temperature of 25 to 3 °C in sandy-clay soil with a PH between 6 and 7 under rainfed or irrigated conditions (Chittora *et al.,* 2017; *Tiamiyu et al.,* 2012). Okra is a good source of vitamins, minerals, and probiotics. 100 grams of unripe okra contains about 13 grams of vitamin C. 2-gram protein and 6.5-gram carbohydrate 1.2 g of fibre, 0.7 g of minerals, and other important nutrients (Chittora *et al.,* 2017; Sachan *et al.,* 2017). The Carbohydrates present in okra are mainly in the form of mucilage which can be used as a blood volume expander and has the potential alleviate renal disease, reduce proteinuria and improve renal function (Benchasri, 2012; Simon *et al.,* 2013). Okra (seed, stem, and leaves) has high fibre content, with 25% crude fibre and 18% protein (Ugwu and Enweremadu, 2019). We can use different parts of okra for the production of different types of eco-friendly products such as fibre and polymers for the textile industry, biomass can be utilized for the production of various types of bioenergy, for making paper, various types of ropes flowers from okra can be used for decoration purpose (Tiamiyu *et al.,* 2012; Ugwu and Enweremadu, 2019). Okra leaves contain the following nutrients in 100 g: 81.50 g of water, 235.00 kJ (56.00 kcal) of energy, 4.40 g of protein, 0.60 g of fat, 11.30 g of carbohydrate, 2.10 g of fibre, 532 mg of calcium, and so on (Benchasri, 2012). Besides its important nutritional okra is useful against various treatments as iodine contained in okra helps for the treatment of goitre, it is useful against urinary disorders, and chronic dysentery and PH of okra helps to neutralize digestive acid (Chittora *et al.,* 2017; Simon *et al.,* 2013). Therefore, the main objective of this study was to evaluate the different okra varieties to find the best-performing varieties for the eastern Terai region of Nepal.

Materials and methods

The field experiment was conducted to study the yield of different varieties of okra in the Girija Prasad Koirala College of Agriculture and Research Center located at Gothgaun, Morang Nepal from April 9, 2022. The experimental site lies at 26º 40’ 49.3" North latitude and 87º 21’ 16.1" East longitude and the altitude at 120 masl. The average maximum temperature and minimum temperature were 33.46°c and 22.86°c respectively with a total annual rainfall of 1254.20 mm. The experiment was laid out in an RCBD with seven different varieties of okra following three replications. The individual plot was a square block of size 9 m2 (3×3 m^2) with coverage of a total area of 270m2. The space between 2 replication was 1m and between treatments, 0.5m respectively. In each small block area, 40 plants were planted with a spacing of 0.6m Row to Row and 0.35m plant to plant. There were seven different varieties of okra (Treatments) used during the study such as T1: Swastik-2, T2: Arka Anamika, T3: Chandani, T4: F_1 glory, T5: R35 Selection, T6: Punjab selection, T7: OH-940, respectively. Data were collected from ten randomly chosen plants until the yield fell to the first harvesting results. The data was taken every week. Different growth and yield parameters were recorded during the study such as plant height, primary branches, pod diameter, pod length, pod per plant, weight per pod, yield per plant, and days to 50% flowering. The collected data was entered in chronological order for replication and treatment blocks respectively in MS excel and then the final data was analyzed through Gen-stat (19^{th} edition). Then the tables, charts, and graphs were constructed using MS excel.

Results and discussion

Generally, all the okra varieties showed a high degree of variation in terms of yield and yield parameters, including plant height, primary branches, pod length, pod diameter, pods/plant, yield/plant, weight/pod and days to 50% flowering. Arka Anamika, an okra variety, was the tallest and reached the highest height at 84 DAS, while F_1 Glory was the shortest at 84 DAS. The highest overall mean was observed in 84 DAS (196 cm), and the lowest mean was observed in 28 DAS (92.65cm) (Table 1). According to Dahal *et al.,* (2021), observed the plant height differnces, which may differ due to nutrient uptake, fertilizer application, climatic conditions, and plant density. Furthermore, according to the findings, at 28 DAS, F_1 Glory had the most primary branches and Arka Anamika had the fewest. At 56 days, the highest number of primary branches was observed in F_1 Glory, whereas Arka Anamika recorded the lowest. Similarly, Chandani produced more primary branches at 84 days (Table 1). The highest overall mean was 2.86, which was observed at 56 DAS. The present findings show similarity with Singh and Singh (2013). Moreover, R35 selection had the largest pod diameter up to 28 DAS, which gradually increased up to 56 DAS, whereas Arka Anamika had the lowest (4.9) (Table 2). The overall highest mean was observed in 28 DAS (4.58). The results show alignment with the findings of Mal *et al.,* (2013) and Dahal *et al.,* (2021). Similarly, OH 940 showed the highest pod length up to 28 DAS (15.19 cm), which increased gradually up to 56 DAS (18.57 cm) (Table 2). The present result shows conformity with Mal *et al., (*2013). Comparatively, the yield performance of F1 glory is the highest among all up to 56 DAS, followed by Punjab selection and Swastik-2. Following that, Swastik-2 and Punjab selection yielded the highest yield, followed by OH-940.Arka Anamika had the lowest yield throughout the growth stage (Table 3). The average yield of okra per plant was found to be higher in the results obtained by Choudhary *et al.,* (2015) and Shannag *et al.,* (2007). Likewise, Punjab Selection had the highest number of pods at 56 DAS, and Arka Anamika had the lowest number at 28 DAS. The highest overall mean was observed at 56 DAS (8.22), and the lowest mean was observed at 28 DAS (2.79) (Table 3). The present findings seem to disagree with Choudhary *et al.,* (2015). Whereas in the case of weight/pod, the study shows that Swastik-2 has the maximum weight/pod at 56 DAS (32.29 g) and Chandani has the minimum weight per pod at 28 DAS (15.87 g). The overall highest mean was observed at 56 DAS (31.06 g) (Table 4). The weight per pod was found to be the highest (32.29 g), which was more significant than the result reported by Aminu *et al.,* (2017) (16.88 g). This might be due to the additive effect of biofertilizers, which might have to provide better soil conditions, or the difference in the genotype of okra. Moreover, the study showed that Punjab Selection reached 50% flowering earlier (43.44 days), which was followed by R35 Selection (48.33 days). Likewise, Chandani took more days (61.67 days) to reach 50% flowering (Table 4). The number of days required to achieve 50% flowering was discovered to be greater than that reported by Shannag *et al.,* (2007). This may be because of the difference in genotype of okra or the higher content of soil organic matter in the field. The variations in yield and yield parameters among these varieties may be interpreted as varietal differences owing to genetic variables and their interaction with environmental circumstances since all these varieties are evaluated under identical soil, management, and agro-climatic conditions. According to the research parameter, the varieties Swastik-2 and Punjab selection were selected as promising and recommended for further evaluation and utilization as vegetable crops.

Table 1: Plant height and primary branches of okra varieties at different time frame

Variety	Plant height (cm)			Primary branches		
	28 DAS	56 DAS	84 DAS	28 DAS	56 DAS	84 DAS
Arka Anamika	118.07^{a}	183.39^{a}	226.15^{a}	1.81^{e}	1.51^{c}	1.67^{a}
Chandani	83.05^{cd}	162.31^{bc}	210.07^{ab}	3.11^{bc}	3.24^{ab}	3.82^{a}
F_1 Glory	96.48^{bc}	150.21^{c}	170.74^{d}	3.88^{a}	3.73^{a}	3.71^{a}
OH-940	88.37^{bcd}	164.44^{b}	190.86^{bcd}	2.66^{bcd}	2.58^{b}	3.80^{a}
Punjab Selection	77.59^{d}	148.37^{c}	184.66^{cd}	3.33^{ab}	3.53^{a}	3.39^{a}
R35 Selection	101.40^{b}	165.78^{b}	196.99^{bc}	2.23^{de}	2.89^{ab}	2.75^{a}
Swastik-2	83.62^{cd}	158.14^{bc}	192.53^{bcd}	2.52^{cd}	2.52^{b}	2.57^{a}
Mean	92.65	161.81	196.00	2.79	2.86	3.10
SEM	4.613	4.268	7.499	0.221	0.268	0.667
CV (%)	8.6	4.6	6.6	13.7	16.3	2.056
LSD	14.213	13.150	23.107	0.680	0.827	37.3
F-Test	***	**	**	***	**	^{NS}

*** Highly significant at 0.1%; ** Very significant at 1%; * Significant at 5%; ^{NS} Non-significant

Table 2: Pod diameter and pod length of different okra varieties at different time frame

Variety	Pod diameter (cm)			Pod length (cm)		
	28 DAS	56 DAS	84 DAS	28 DAS	56 DAS	84 DAS
Arka Anamika	5.05^{ab}	7.27^{ab}	4.98^{e}	12.58^{a}	16.33^{b}	10.77^{c}
Chandani	3.96^{b}	6.67^{bc}	6.06^{cd}	10.51^{a}	18.56^{a}	15.66^{b}
F_1 Glory	4.50^{ab}	6.56^{c}	6.69^{bc}	11.99^{a}	17.63^{ab}	16.29^{ab}
OH-940	4.67^{ab}	6.82^{bc}	7.60^{a}	15.19^{a}	18.57^{a}	17.58^{ab}
Punjab Selection	3.83^{b}	6.98^{abc}	7.37^{ab}	10.90^{a}	18.15^{a}	18.18^{ab}
R35 Selection	5.74^{a}	7.53^{a}	5.66^{de}	14.62^{a}	17.98^{a}	12.57^{c}
Swastik-2	4.31^{ab}	6.81^{bc}	7.12^{ab}	12.21^{a}	19.13^{a}	18.60^{a}
Mean	4.58	6.95	6.50	12.57	18.05	15.66
SEM	0.454	0.186	0.261	1.599	0.450	0.852
CV (%)	17.2	4.6	6.9	22.0	4.3	9.4
LSD	1.399	0.574	0.803	4.926	1.388	2.626
F-Test	^{NS}	*	***	^{NS}	*	***

*** Highly significant at 0.1%; ** Very significant at 1%; * Significant at 5%; ^{NS} Non-significant;

Table 3: Yield/plant and pod/plant of different okra varieties at different time frame

Variety	Yield per plant (gram)			Pod per plant		
	28 DAS	56 DAS	84 DAS	28 DAS	56 DAS	84 DAS
Arka Anamika	58.03^{c}	151.37^{b}	75.18^{c}	1.87^{b}	5.21^{b}	2.92^{c}
Chandani	67.27^{bc}	258.81^{a}	194.73^{ab}	2.34^{b}	8.67^{a}	6.84^{a}
F_1 Glory	117.63^{a}	303.68^{a}	131.55^{abc}	3.66^{a}	8.91^{a}	4.91^{abc}
OH-940	91.79^{abc}	257.66^{a}	170.14^{abc}	3.57^{a}	8.65^{a}	6.00^{ab}
Punjab Selection	116.67^{ab}	297.25^{a}	200.42^{a}	2.57^{ab}	9.13^{a}	7.10^{a}
R35 Selection	77.85^{abc}	252.24^{a}	98.06^{bc}	2.92^{ab}	8.40^{a}	3.97^{bc}
Swastik-2	76.30^{abc}	272.38^{a}	200.12^{a}	2.61^{ab}	8.53^{a}	7.34^{a}
Mean	86.51	256.20	152.89	2.79	8.22	5.58
SEM	14.689	22.238	29.201	0.347	0.600	0.839
CV (%)	29.4	15.0	33.1	21.6	12.7	26.0
LSD	20.773	68.523	89.977	1.070	1.849	2.586
F-Test	^{NS}	**	*	*	**	*

*** Highly significant at 0.1%; ** Very significant at 1%; * Significant at 5%; ^{NS} Non-significant

Table 4: Weight/pod and days to 50% flowering of okra varieties at different time frame

Variety	Weight per pod (gram)			Days to 50% flowering (days)
	28 DAS	56 DAS	84 DAS	
Arka Anamika	23.51[a]	29.82[a]	16.86[b]	52.33[bc]
Chandani	15.87[a]	29.48[a]	23.51[ab]	61.67[a]
F_1 Glory	22.50[a]	31.67[a]	26.97[a]	55.00[b]
OH-940	18.66[a]	31.07[a]	29.37[a]	50.00[bc]
Punjab Selection	17.08[a]	31.64[a]	30.62[a]	43.33[d]
R35 Selection	21.00[a]	31.45[a]	18.97[b]	48.33[cd]
Swastik-2	20.28[a]	32.29[a]	26.82[a]	53.67[bc]
Mean	19.84	31.06	24.73	52.05
SEM	2.353	1.400	2.226	1.891
CV (%)	20.5	7.8	15.6	6.3
LSD	7.251	4.314	6.859	5.825
F-Test	NS	NS	**	***

*** Highly significant at 0.1%; ** Very significant at 1%; * Significant at 5%; NS Non-significant

References

1. Akpan-Idiok, A. U., Udo, I. A., and Braide, E. I. 2012. The use of human urine as an organic fertilizer in the production of okra (*Abelmoschus esculentus*) in South Eastern Nigeria. Resour. Conserv. Recycl., 62: 14–20.
2. Aminu, D., Bello, O. B., Gambo, B. A., Azeez, A. H., Agbolade, J. O., Abdulhamid, U. A., and Iliyasu, A. 2017. Varietal performance and correlation of okra pod yield and yield components. Bangladesh. J. Plant Breed. Genet., 29(1): 11–20.
3. Benchasri, S. 2012. Okra (*Abelmoschus esculentus* (L .) Moench) as a valuable vegetable of the world. Ratar. Povrt., 49: 105–112.
4. Binalfew, T., and Alemu, Y. 2016. Characterization of Okra (*Abelmoschus esculentus* (L.) Moench) germplasms collected from western Ethiopia. Int. J. Res. Agril. Forestry., 3(2): 11–17.
5. Chittora, A., Singh, N., and Singh, D. K. 2017. Production technology of Okra. Mrumega, 2(1): 44–47.
6. Choudhary, K., More, S.J. and Bhanderi, D. R. 2015. Impact of biofertilizers and chemical fertilizers on growth and yield of okra (*Abelmoschus esculentus* L. Moench). The Ecoscan, 9(1–2): 67–70.
7. D. Oppong-Sekyere, Akromah, R., Nyamah, E. Y., Brenya, E., and Yeboah, S. 2012. Evaluation of some okra (*Abelmoschus spp* L.) germplasm in Ghana. African J. Plant Sci., 6(5): 166–178.
8. Dahal, K. M., Karki, S., Timsina, G. P., R. Chapagain, T., and Pokharel, S. 2021. Evaluation of growth and yield attributes of okra variety. Nepalese J. Agril. Sci., 20(1): 39–45.
9. Fagwalawa, L. D., and Yahaya, S. M. 2016. Effect Organic Manure On The Growth And Yield Of Okra. Imperial J. Interdisciplinary Res., 2(3): 130–133.
10. Mal, B., Mahapatra, P., Mohanty, S., and Mishra, H. N. 2013. Growth and yield parameters of okra (*Abelmoschus esculentus*) influenced by Diazotrophs and chemical fertilizers. J. Crop and Weed, 9(2): 109–112.
11. Moosavi, S. A., Aghaalikhani, M., Ghobadian, B., and Fayyazi, E. 2018. Okra: A potential future bioenergy crop in Iran. Renewable Sustainable Energy Rev., 93: 517–524.
12. Sachan, S., Singh, D., Kasera, S., Pradesh, U., Sudhir Kumar Mishra, I., Tripathi, Y., Mishra, V., Singh, R. K., and Mishra, K. 2017. Integrated nutrient management (INM) in Okra (*Abelmoschus esculentus* (L.) Moench) for better growth and higher

yield. *J. pharmacogn. Phytochem.*, 6(5): 1854–1856.

13. Shannag, H. K., Al-Qudah, J. M., Makhadmeh, I. M., and Freihat, N. M. 2007. Differences in growth and yield responses to Aphis gossypii Glover between different okra varieties. Plant Protect. Sci., 43(3): 109–116.
14. Simon, S. Y., Gashua, I. B., and Musa, I. 2013. Genetic variability and correlation studies in Okra (*Abelmoschus esculentus* (L.) Monech). Agril. Bio. J. North America, 4(5): 532–538.
15. Singh, G. C., and Singh, S. K. 2013. Impact of on farm trials of various varieties of Okra on the Farmers field. The J. Rural Agril. Res., 13: 78–80.
16. Tiamiyu, R. A., Ahmed, H. G., and Muhammad, A. S. 2012. Effect of Sources of Organic Manure on Growth and Yields of Okra (*Abelmoschus esculentus* L.) in Sokoto, Nigeria. Nigerian J. Basic Appl. Sci., 20(3): 213–216.
17. Ugwu, S. N., and Enweremadu, C. C. 2019. Effects of pre-treatments and co-digestion on biogas production from Okra waste. J. Renewable Sustainable Energy 11, 013101.