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# PERFORMANCE OF PUMPKIN (*CUCURBITA MOSCHATA* DUCH EX. POIR) GENOTYPES UNDER AKOLA (INDIA) CONDITIONS

**Narayani A. Deshmukh[1]*, Abhay P. Wagh[1], Prakash K. Nagre[2], Vijay S. Kale[3] and Navinchandra V. Kayande[4]**

[1]PG Department of Vegetable Science, Post Graduate Institute, Dr. P.D.K.V, Akola – 444 104, Maharashtra, India.

[2]College of Agriculture, Dr. P.D.K.V, Akola – 444 104, Maharashtra, India.

[3]College of Horticulture, Dr. P.D.K.V, Akola – 444 104, Maharashtra, India.

[4]Cotton Research Unit, Dr. P.D.K.V, Akola – 444 104, Maharashtra, India.

*Corresponding author E-mail : narayanideshmukh751@gmail.com

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**ABSTRACT**

A research study was carried out with the objective to evaluate comparative performance of pumpkin genotypes for growth yield and quality and to find out promising genotype of pumpkin suitable under Akola, India conditions, at the Instructional farm, Department of Vegetable Science, Dr. PDKV, Akola, Maharashtra India in *kharif* season of the year 2022. Nineteen genotypes of pumpkin alongside one check *i.e.*, Arka Chandan were evaluated for their growth, yield and quality. The experimental trial was conducted in Randomized Block design which was replicated twice. The local genotype, AKL-1 proved to be promising for all the yield and yield contributing parameters whereas the genotype IC599437 outperformed for the parameters such as the number of primary branches and days to first female flower appearance and the genotype AMT-1 for quality parameters under agroclimatic conditions of Akola, Maharashtra.

***Key words :*** *Cucurbita moschata*, Pumpkin, Arka Chandan, Breeding, Genotypes.

## Introduction

Pumpkin, botanically known as *Cucurbita moschata* Duch Ex. Poir, is an economically significant cucurbitaceous vegetable with a diploid chromosomal number of 2n = 40. There are 27 species under the genus *Cucurbita* and five of which are in cultivation. These are *C. moschata*, *C. maxima*, *C. ficifolia*, *C. pepo* and *C. mixta* commonly known as pumpkin (Jahan *et al.*, 2012). *Cucurbita moschata* is probably the most widely grown species of *Cucurbita* and this species is cross-compatible with *C. maxima*, *C. pepo* and *C. mixta* (Tindall, 1987). India's major pumpkin growing region encompasses Madhya Pradesh, West Bengal and Odisha. The crop covers an estimated 112.27 hectares of land that produces about 2400.07 tonnes of yield (Anonymous, 2023). Due to its exceptional productivity, outstanding nutritional qualities, exceptional storability, unparalleled transport quality, and extensive cultivation in subtropical and tropical regions across the globe, it is consumed in various processed forms and utilized as a vegetable in both the early and later stages of maturity. Numerous germplasms have been available since ancient times, but until lately, their intentional appraisal and commercialization have not received much attention. Collection and evaluation of genotypes are prerequisites for any crop improvement programme. However, the knowledge of inheritance and genetic performance of any traits is essential for planning an appropriate breeding strategy. The diversity in fruit colour, size and shape, leaf morphology, plant stature, shelf life and regular changing food pattern of the society has steered the breeders to evolve and improve cultivars as per demand. The emergence of new biotypes, strains, races of insect-pests and pathogens, abiotic stresses due to climate change and demand for nutritious food has reoriented breeding objectives as well as breeding methods to ascertain future demands (Dhatt *et al.*, 2020). In addition to focusing on direct contributing parameters such as the number of primary branches and vine length,

number of fruits per plant, fruit length, fruit diameter, flesh thickness, fruit weight preliminary identification of early maturing genotypes can be done based on characters like node number to first pistillate flower anthesis, days to first male flower anthesis. Plant breeders can use this to generate commercial varieties with desirable qualities by using it to identify the component traits that will allow for selection based on improved yield and quality. Thus, taking into account the significance of the crop, an experiment was conducted to characterising and evaluating the currently available pumpkin germplasm for their growth, yield and quality in context of agroclimatic conditions of Akola district of Maharashtra.

## Materials and Methods

The research trial was carried out during the *kharif* season of the year 2022, at the Instructional Farm, Department of Vegetable Science, Dr. PDKV, Akola, Maharashtra, India (22° 42′ N, 77° 02′ E). For the purpose of this study, nineteen genotypes were assessed in addition to one check Arka Chandan (Table 1). Genotypes were planted in Randomised Block Design, which were replicated twice with uniform spacing (3m×1.5 m) followed throughout the research plot. To ensure the production of a healthy crop, recommended fertilizer doses and plant protection methods were implemented based on the specific needs. For each genotype, data were collected on five randomly preferred plants for fifteen parameters.

**Table 1 :** Details of genotypes used in the experiment.

| Treatments | Genotypes | Source |
|---|---|---|
| $T_1$ | IC332324 | NBPGR |
| $T_2$ | IC320175 | NBPGR |
| $T_3$ | IC618054 | NBPGR |
| $T_4$ | IC613489 | NBPGR |
| $T_5$ | IC599425 | NBPGR |
| $T_6$ | IC595514 | NBPGR |
| $T_7$ | IC599437 | NBPGR |
| $T_8$ | IC284729 | NBPGR |
| $T_9$ | IC618052 | NBPGR |
| $T_{10}$ | IC599402 | NBPGR |
| $T_{11}$ | IC599405 | NBPGR |
| $T_{12}$ | IC599406 | NBPGR |
| $T_{13}$ | IC599403 | NBPGR |
| $T_{14}$ | IC599410 | NBPGR |
| $T_{15}$ | Amt-1 | Local Collection from Amravati |
| $T_{16}$ | AKL-1 | Local Collection from Akola |
| $T_{17}$ | AKL-2 | Local Collection from Akola |
| $T_{18}$ | AKL-3 | Local Collection from Akola |
| $T_{19}$ | AKL-4 | Local Collection from Akola |
| $T_{20}$ | Arka Chandan (Check) | IIHR, Bangalore |

The information gathered during the investigation was statistically analysed using Panse and Sukhatme (1967) method of analysis of variance. The significance and non-significance of the genotypes were assessed using the 'f' value (variance ratio), which was compared with the table value at a one percent significance level.

## Results and Discussion

### Growth parameters

According to studied genotypes, the mean values of various growth parameters are displayed in Table 2. The results of the analysis of variance showed that for every character, the mean sum of squares resulting from genotypes was highly significant (Table 3.). This suggests that there is enough variation among genotypes for yield and its contributing parameters.

Vine length is a vital parameter in achieving high fruit yield. Among the twenty genotypes longest length of vine at 30 DAS was measured by the genotype IC599437 (0.35 m), whereas at 60 DAS, the maximum length (2.78 m) was recorded by IC599425. The genotype IC595514 reported the highest vine length among the genotypes at both 90 and 120 DAS with mean values of 5.38 m and 7.34 m, respectively. The genotype IC332324 measured minimum length of vine (4.79 m) at 120 DAS. The variation might have been due to genetic or environmental reasons, which is mainly responsible for the growth of the crop. Similar results were obtained by Harika *et al*. (2012) in bottle gourd. Number of primary branches was found to be maximum (3.10) in the genotype IC599437, however, minimum (1.70) was reported by IC320175. Branching in pumpkin indicates response of genotypes to the prevailing climatic conditions. Results are in accordance with Thirumdasu and Chatterjee (2018).

Days to the appearance of first male and female flower indicates earliness. In terms of male flower appearance, earliness was exhibited by the genotypes AKL-1 (39.00 days). On the contrary, male flower appeared late (46.80 days) in the genotype IC595514. Similar results were observed by Muralidhara (2009). The genotype IC599437 took minimum (50.50 days) to anthesis of the first female flower as compared to other genotypes under study. However, female flowers appeared comparatively late (63.10 days) in genotype

**Table 2 :** Mean performance of the studied genotypes of pumpkin for growth, yield and quality parameters.

| Genotypes | VL (m) | | | | PB | MF | FF | NF | N/V | FW (kg) | FL (cm) | FD (cm) | FT (cm) | Y/V (kg) | Y/H (t) | S/F | TW (g) | TSS (°Brix) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAS | 60 DAS | 90 DAS | 120 DAS | | | | | | | | | | | | | | |
| **IC332324** | 0.34 | 1.02 | 3.00 | 4.79 | 2.20 | 43.40 | 57.30 | 23.20 | 2.40 | 2.48 | 21.55 | 19.99 | 2.54 | 6.23 | 13.84 | 161.00 | 7.04 | 4.48 |
| **IC320175** | 0.26 | 1.72 | 2.97 | 4.83 | 1.70 | 43.20 | 57.00 | 22.80 | 2.90 | 2.70 | 25.75 | 19.13 | 3.21 | 7.28 | 16.17 | 216.50 | 9.07 | 6.18 |
| **IC618054** | 0.24 | 2.41 | 3.22 | 5.09 | 2.10 | 42.20 | 54.20 | 20.00 | 2.50 | 2.50 | 19.00 | 21.53 | 2.24 | 5.80 | 12.91 | 173.50 | 11.05 | 6.35 |
| **IC613489** | 0.21 | 2.62 | 4.01 | 5.82 | 2.30 | 41.80 | 58.30 | 19.20 | 2.40 | 2.41 | 23.05 | 19.61 | 2.23 | 5.24 | 11.65 | 181.00 | 9.06 | 5.41 |
| **IC599425** | 0.26 | 2.78 | 3.76 | 4.88 | 2.00 | 45.70 | 57.05 | 21.60 | 2.30 | 2.69 | 29.60 | 16.87 | 2.59 | 6.09 | 13.53 | 293.50 | 11.15 | 5.60 |
| **IC595514** | 0.25 | 2.29 | 5.38 | 7.34 | 2.80 | 46.80 | 56.25 | 21.20 | 2.40 | 2.76 | 22.55 | 18.80 | 3.38 | 6.25 | 13.23 | 232.00 | 7.46 | 5.47 |
| **IC599437** | 0.35 | 2.58 | 4.47 | 6.26 | 3.10 | 40.50 | 50.50 | 18.20 | 3.50 | 3.42 | 26.35 | 22.39 | 3.84 | 7.75 | 17.22 | 251.50 | 9.58 | 6.07 |
| **IC284729** | 0.23 | 1.90 | 3.30 | 5.36 | 2.90 | 40.80 | 55.25 | 20.70 | 3.20 | 3.03 | 25.85 | 22.07 | 3.33 | 7.16 | 15.90 | 216.00 | 12.35 | 8.33 |
| **IC618052** | 0.30 | 2.55 | 4.76 | 6.47 | 1.90 | 42.40 | 54.50 | 20.90 | 2.40 | 2.41 | 26.20 | 23.02 | 2.89 | 5.41 | 12.02 | 211.50 | 10.25 | 5.80 |
| **IC599402** | 0.25 | 2.44 | 3.29 | 5.43 | 2.30 | 41.20 | 52.70 | 20.20 | 3.70 | 3.34 | 24.12 | 25.15 | 3.32 | 9.21 | 20.46 | 250.00 | 10.03 | 4.34 |
| **IC599405** | 0.22 | 1.22 | 3.01 | 5.13 | 2.50 | 44.30 | 54.65 | 19.20 | 2.70 | 3.00 | 21.60 | 23.20 | 3.32 | 7.74 | 17.19 | 233.00 | 10.89 | 5.64 |
| **IC599406** | 0.30 | 1.82 | 3.04 | 4.79 | 1.90 | 46.30 | 58.40 | 21.20 | 2.60 | 2.41 | 22.90 | 20.40 | 3.15 | 6.29 | 13.98 | 178.50 | 11.65 | 4.51 |
| **IC599403** | 0.26 | 2.68 | 3.37 | 5.26 | 2.30 | 41.20 | 51.35 | 17.60 | 3.50 | 3.07 | 34.25 | 22.01 | 2.91 | 7.86 | 17.47 | 336.50 | 6.33 | 6.94 |
| **IC599410** | 0.20 | 0.87 | 2.88 | 4.86 | 2.00 | 43.90 | 52.60 | 21.80 | 2.40 | 2.98 | 23.45 | 20.89 | 2.82 | 7.13 | 15.85 | 233.50 | 9.15 | 5.53 |
| **Amt-1** | 0.23 | 2.59 | 3.38 | 5.18 | 1.90 | 42.05 | 62.70 | 22.50 | 2.40 | 2.44 | 22.35 | 16.91 | 2.32 | 5.62 | 12.49 | 149.50 | 9.45 | 9.45 |
| **AKL-1** | 0.33 | 1.74 | 3.49 | 6.23 | 2.70 | 39.00 | 51.50 | 17.80 | 4.10 | 3.28 | 24.35 | 23.38 | 3.46 | 9.23 | 20.51 | 243.00 | 10.42 | 6.51 |
| **AKL-2** | 0.23 | 1.19 | 3.34 | 5.38 | 1.90 | 43.20 | 63.10 | 21.40 | 2.30 | 2.40 | 22.55 | 19.62 | 2.73 | 6.74 | 14.97 | 142.50 | 7.41 | 5.26 |
| **AKL-3** | 0.25 | 1.14 | 3.13 | 4.87 | 2.00 | 40.60 | 55.15 | 21.90 | 2.60 | 2.79 | 21.65 | 19.46 | 3.42 | 5.55 | 12.32 | 155.00 | 12.15 | 5.39 |
| **AKL-4** | 0.27 | 1.18 | 2.93 | 4.85 | 2.10 | 45.00 | 56.45 | 19.10 | 2.70 | 2.72 | 20.60 | 18.88 | 2.52 | 7.35 | 16.33 | 194.00 | 10.40 | 4.25 |
| **Arka Chandan** | 0.27 | 1.59 | 3.52 | 5.64 | 2.30 | 41.00 | 57.30 | 18.90 | 3.40 | 2.70 | 23.30 | 21.10 | 3.38 | 6.70 | 14.89 | 231.50 | 11.91 | 8.72 |
| **'F' test** | NS | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig |
| **SE (m) ±** | 0.03 | 0.13 | 0.24 | 0.36 | 0.15 | 1.42 | 1.98 | 0.74 | 0.15 | 0.13 | 1.60 | 1.01 | 0.15 | 0.47 | 1.05 | 9.78 | 0.38 | 0.25 |
| **CD at 5 %** | 0.08 | 0.39 | 0.70 | 1.06 | 0.43 | 4.19 | 5.87 | 2.18 | 0.44 | 0.37 | 4.74 | 3.00 | 0.45 | 1.39 | 3.09 | 28.94 | 1.14 | 0.73 |

VL: Vine length (m), PB: Number of primary branches, MF: Days to first male flower appearance, FF: Days to first female flower appearance, NF: Node at which first female flower appears, F/V: Number of fruits per vine, FW: Fruit weight (kg), FL: Fruit length (cm), FD: Fruit diameter (cm), FT: Flesh thickness (cm), Y/V: Yield per vine (kg), Y/H: Yield per hectare (t), S/F: Number of seeds per fruit, TW: Test weight (g), TSS: Total Soluble Solids (°Brix).

**Table 3 :** Analysis of variance (ANOVA) for fifteen parameters in twenty pumpkin genotypes.

| S. no. | Parameters | Mean Sum of Squares | | |
|---|---|---|---|---|
| | | Replications | Genotypes | Error |
| | **Degrees of freedom** | 1 | 19 | 19 |
| 1 | Vine length (m) at 30 DAS | 0.00 | 0.00 | 0.00 |
| | Vine length (m) at 60 DAS | 0.09 | 0.84** | 0.03 |
| | Vine length (m) at 90 DAS | 0.03 | 0.89** | 0.11 |
| | Vine length (m) at 120 DAS | 0.28 | 0.94** | 0.13 |
| 2 | Number of primary branches | 0.05 | 0.29** | 0.04 |
| 3 | Days to first male flower appearance | 0.03 | 8.90** | 4.02 |
| 4 | Days to first female flower appearance | 1.89 | 22.59** | 7.87 |
| 5 | Node at which first female flower appears | 0.02 | 5.54** | 1.08 |
| 6 | Number of fruits per vine | 0.00 | 0.59** | 0.04 |
| 7 | Fruit weight (kg) | 0.01 | 0.22** | 0.03 |
| 8 | Fruit length (cm) | 21.37 | 22.85** | 5.13 |
| 9 | Fruit diameter (cm) | 8.23 | 9.24** | 2.06 |
| 10 | Flesh thickness (cm) | 0.00 | 0.46** | 0.05 |
| 11 | Yield per vine (kg) | 0.35 | 2.64** | 0.44 |
| 12 | Yield per hectare (t) | 1.22 | 13.25** | 2.18 |
| 13 | Number of seeds per fruit | 570.02 | 4864.12** | 191.13 |
| 14 | Test weight (g) | 0.28 | 6.11** | 0.29 |
| 15 | TSS (°Brix) | 0.08 | 4.05** | 0.12 |

** Significant at p=0.01 level of significance.

AKL-2. Results are validated with the findings of Kumar *et al*. (2011). In cucurbits, number of nodes required for the appearance of first female flower also indicates earliness which makes it important parameter to be considered for any crop improvement programme. The genotype IC599403 produced female flower at the lowest number of nodes (17.60) as against the genotype IC332324, which took greater number of nodes (23.20). Similar results were obtained by Ahmed *et al*. (2011).

**Yield and yield contributing parameters**

Since, fruit length, diameter, fruit weight, and number of fruits all have a significant impact on yield, the ideal genotype for selection should produce greater number of fruits and have a higher fruit weight, diameter and flesh thickness.

Among the genotypes, AKL-1 produced significantly higher number of fruits per vine (4.10) as compared to the check Arka Chandan (3.40). More number of fruits could be attributed due to long length of vine and higher number of primary branches. Results are in accordance with Pradeepika *et al*. (2016). For fruit weight and flesh thickness, both, the genotype IC599437 was reported to be significantly superior over the check variety Arka Chandan with mean values of 3.42 kg and 3.84 cm, respectively. Higher flesh thickness has resulted into higher weight in fruits of the superior genotype. Similar results were obtained by Masud (2016) and Verma *et al*. (2023). Fruit diameter also influences yield in pumpkin. In the present investigation, genotype IC599402 was found to be significantly superior (25.15 cm) over check Arka Chandan (21.10 cm). In terms of yield, genotype AKL-1 was reported to be significantly superior over check with average values of 9.23 kg per vine and 20.51 t/ha respectively. Significant variation in might be due to number of fruits per vine and fruit weight. Results are in conformity with the results of Nagar (2015). For seed production, more number of seeds is a desirable parameter. Among the genotypes, IC599403 produced more number of seeds per fruit (336.50). Similar results were obtained by Chaudhari *et al*. (2017). Higher test weight (12.35 g) was measured for the genotype IC284729. Significant variations were also reported by Ramjan *et al*. (2018).

### Quality parameters

For quality parameters *viz*., TSS highest (9.45 °Brix) was obtained in the genotype AMT-1 while minimum (4.25 °Brix) was reported by the genotype AKL-4. High TSS content might be due to hydrolysis of complex carbohydrates present in fruit pulp (Gajera, 2017). Such variations were also observed by Yogananda *et al*. (2021) in bottle gourd. Therefore, the genotypes displaying results superior over check Arka Chandan can be used for future breeding programme or can be tested over years for commercial exploitation.

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## References

Ahmed, K.U., Akhter B., Islam M.R., Ara N. and Humauan M.R. (2011). An assessment of morphological and yield characteristics of Pumpkin (*Cucurbita moschata* Duch Ex. Poir) genotypes in Northern Bangladesh. *Trop. Agril. Res. Ext*., **14**, 07-11.

Anonymous (2023). Indian Horticulture Database. National Horticulture Board, Ministry of Agriculture and Farmers Welfare, Government of India, Gurgaon.

Chaudhari, D.J., Acharya R.R., Gohil S.B. and Patel N.A. (2017). Genetic divergence study in pumpkin (*Cucurbita moschata* Duch Ex. Poir). *J. Pharmacogn. Phytochem*., **6**, 744-747.

Dhatt, A.S., Sharma M. and Kaur B. (2020). Advances in Improvement of Pumpkin and Squashes. In: Gosal, S. and Wani S. (eds). *Accelerated Plant Breeding*, vol. **2**, Springer, Cham: 301-335

Gajera, R.R. (2017). Effect on juice quality of medicinal fruit bottle gourd during storage. *J. Med. Plants*, **5**, 56-60.

Harika, M., Gasti V.D., Shantappa T., Mulge R., Shirol A.M., Mastiholi A.B. and Kolkarni M.S. (2012). Evaluation of bottle gourd genotypes [*Lagenaria siceraria* (Mol.) Standl.] for various horticultural parameters. *Karnataka J. Agric. Sci*., **25**, 241-244.

Jahan, T.A., Islam A.K.M.A., Rasul M.G., Mian M.A.K. and Haque M.M. (2012). Heterosis of qualitative and quantitative characters in a sweet gourd (*Cucurbita moschata* Duch Ex. Poir). *Afr. J. Food. Agr. Nutr. Dev*., **12**, 6186-6199.

Kumar, J., Singh R.K. and Pal K. (2011). Variability and character association in pumpkin (*Cucurbita moschata* DUCH. ex. Poir). *Indian J. Agric. Res*., **45**, 87-90.

Masud, M.A.A. (2016). Evaluation of pumpkin (*Cucurbita moschata* Duchesne Ex. Poir) genotypes based on phenotypic traits. *Unpublished M.Sc. Thesis*. SAU, Bangladesh.

Muralidhara, M.S. (2009). Genetic variability studies in pumpkin (*Cucurbita moschata* Duch Ex. Poir). *Unpublished M.Sc (HORT) Thesis*. UAS, G.K.V.K, Bengaluru.

Nagar, A. (2015). Assessment of genetic variability for horticultural traits in pumpkin. *Unpublished M.Sc. Thesis*, IARI, New Delhi.

Panse, V.G. and Sukhatme P.V. (1967). *Statistical methods for Agriculture Workers*. II Ed ICAR, New Delhi.

Pradeepika, C., Gasti V.D., Vardhini T.K., Evoor S.C., Rathod V. and Rai P.S. (2016). Per se performance of pumpkin genotypes (*Cucurbita moschata* Duch Ex. Poir). *Enviorn. Ecol*., **35**, 51-54.

Ramjan, Md., Pandey A.K., Megha R., Lian H.N. and Ansari M.T. (2018). Variations in pumpkin (*Cucurbita moschata* Duch Ex. Poir) landraces for earliness, yield and quality attributes in North East India. *Int J. Curr. Microbiol. App. Sci*., **7**, 741-748.

Thirumdasu, R.K. and Chatterjee R. (2018). Pumpkin (*Cucurbita moschata* Duch Ex. Poir) genotypes collected from different parts of India and their performance under Eastern Himalayan Region. *Int. J. Agric. Sci*., **10**, 5431-5436.

Tindall, H.D. (1987). *Vegetables in the tropics*. Macmillan Education, London. p. 166.

Verma, A.K., Singh P., Singh A.K., Prajapati J., Gangwar V., Singh H., Singh V.B. and Mishra A.C. (2023). Performance of pumpkin (*Cucurbita moschata* Duch Ex. Poir) genotypes for earliness and yield parameters. *Biol. Forum*, **15**, 18-21.

Yogananda, M., Rafeekher M., Sarada S. and Shruthy O.N. (2021). Yield and quality performance of bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] genotypes in humid tropical lowland of Kerala. *Annals Plant Soil Res*., **23**, 314-318.