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# Assessment of *per se* performance and variability of key fruit traits of oriental pickling melon (*Cucumis melo var. conomon*) genotypes

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**Abstract**
Key fruit characters of 27 segregating variants of Oriental pickling melon (*Cucumis melo var. conomon*) local variety of Telangana state were assessed. Analysis of variance had shown highly significant (P=0.01) difference among variants for all the five fruit parameters, with the highest variation in average fresh fruit weight. Based on *per se* performance, MCHCM-26 for fruit weight, MCHCM-22 for fruit polar diameter and MCHCM-08 followed by MCHCM-22 for fruit equatorial diameter were identified as promising variants. While, for flesh thickness, MCHCM- 06 and MCHCM-25 for desirable cavity diameter was scored better. Greater variability was assessed for all the five fruit traits based on *per se* performance in the present study. The variants can be used as parents or inbred lines for improving melon varieties. The estimates of PCV are in perfect agreement with GCV in all the characters studied indicating no influence of environment of expression of characters. High GCV and PCV (>20%) were observed for all the five key fruit traits. High heritability (>60%) was also registered for almost all the traits. Direct selection of these traits is effective for increasing the commercial fruit yield.

**Keywords:** *Per se* performance, variability, key fruit traits, Oriental pickling melon, *Cucumis melo* var. *conomon*

## Introduction
Oriental pickling melon (*Cucumis melo L. var. conomon*), 2n=2x=24 is a fruit that has a great representation in the global fruit market, and in Telangana, a large amount of the fruit is for consumed, especially in the Adilabad, Nalgonda, Suryapet, Wanaparthy, Nagarkurnool, Jogulamba Gadwal and Mahabubnagar districts. It is an ideal summer vegetable crop mainly growing for fresh vegetable as well as for pickling and cooking purpose (Gondi *et al.*, 2016) [6] and contributing to the socioeconomic development of the region. It is an herbaceous plant that belongs to the Cucurbitaceae family. The species has a wide phenotypic diversity in its varieties, which does not necessarily indicate a large genetic variability. To keep on an oriental pickling melon breeding program, it is required to assess the genetic variation that is important for efficient management. Detection and usage of the genetic variation and cultivar identification are, therefore, some important tasks for Oriental pickling melon breeders (Carvalho *et al.*, 2017) [4].

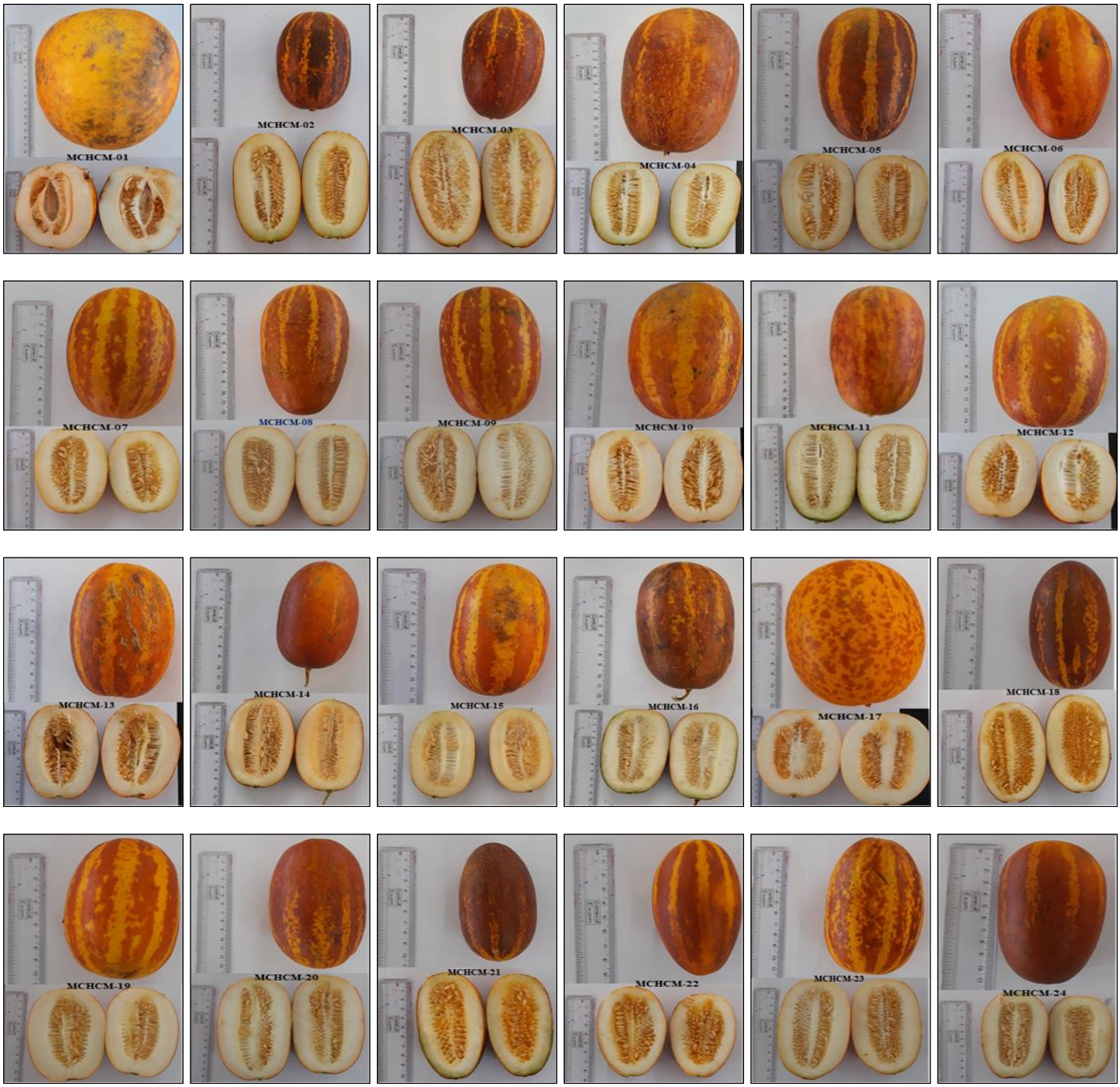
In addition, oriental pickling melon survives in varying climate conditions and also acts as a very important food source in difficult times. These fascinating properties make Oriental pickling melon an interesting crop for a detailed and widespread characterization of its germplasm. Productivity of cucumber in India is lower as compare to world productivity. In spite of its considerable morphological variability, Oriental pickling melon showed a narrow genetic base, which restricts development of new Oriental pickling melon cultivars by cross-breeding. Being a largely consumed vegetable cucumber had great scope to improve the production productivity to meet the requirement by adoption of improved varieties/hybrids (Pandey *et al*. 2013) [10]. Choice of selection of good parents for hybridization depends upon the variation available in the gene pool. Identification of the parents is the most important step for breeding programme, which is at present entirely based on morphological trials in snap melon. Hence, keeping the above in view, the present study was conducted to identify the promising variants for using in crop improvement.

## Material and methods

The material for the present investigation comprised of 27 genotypic segregating variant collections of oriental pickling melon augmented from different parts of Nalgonda district of Telangana during August- September, 2020. The fruit characters were studied in 3 replications. In each replication, twenty representative fruits of each variant were labelled to record data on five characters *viz.*, fruit Fresh weight (g), fruit Polar diameter (cm), fruit equatorial diameter (cm), flesh thickness (cm) and fruit cavity diameter (cm). The data were analyzed for CRBD using ANOVA technique (Panse and Sukhatme, 1967) [11]. Genetic variability parameters like phenotypic and genotypic co-efficient of variation (PCV and GCV) were computed as per Burton and Devane (1953) [3]. The heritability in broad sense was determined by using the formula given by Johnson *et al*. (1955) [8]. The GCV and PCV were classified as low (0-10%), moderate (10-20%) and high (20-100%). Whereas, heritability is categorized as low (0-30%), moderate (30-60%) and high (60-100%).

## Results and discussion

**Analysis of variance:** Analysis of variance exhibited highly significant (P=0.01) difference among genotypic variants (Fig.1) for all the five fruit characters (Table 1). This indicates the existence of high degree of genetic variability among the variants and enough scope for bringing out fruit characters improvement in the desirable direction.



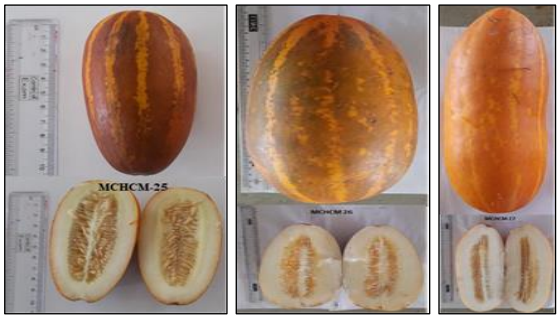



**Table 1:** ANOVA of key fruit traits in oriental pickling melon variants

| S. No. | Character | Mean Sum of Squares | | |
|---|---|---|---|---|
| | | Replication (df=2) | Genotypes (df=26) | Error (df=52) |
| 1. | Fruit Fresh weight (g) | 447.63 | 818633.63** | 476.74 |
| 2. | Fruit Polar diameter (cm) | 0.09 | 49.09** | 0.19 |
| 3. | Fruit equatorial diameter (cm) | 1.22 | 13.99** | 1.16 |
| 4. | Flesh thickness (cm) | 0.02 | 0.94** | 0.01 |
| 5. | Fruit Cavity diameter (cm) | 0.03 | 4.03** | 0.02 |

**indicates significance at 1% LOS

### *Per se* performance

Average fruit weight is one of the major yield attribute in oriental pickling melon. Among the 27 variants (Table 2), MCHCM-26 (2350.28g) recorded the highest average fruit weight, while the lowest fruit weight was recorded by MCHCM-22 (142.39g). Fifteen variants recorded more weight fruits than typical genotype, MCHCM-16 (269g).

With respect to polar diameter, CHMCM-22 (27.2cm) registered the highest value and the lowest polar diameter was displayed by MCHCM-14 (8.73cm). As many as nine variants were with more polar diameter than original genotype (MCHCM-16) with 11.8cm. MCHCM-08 (14.17cm) followed by MCHCM-22 (13.53cm) produced fruits with equatorial diameter larger than rest of the variants. Two variants *viz*., MCHCM-15 and MCHCM-18 (5.5 cm) expressed fruits with smaller equatorial diameters, while more than 17 variants were at par and produced similar diameter fruits.

Thickness of fruit flesh determines the commercial value of the oriental pickling melon. In the present study, out of 27 variants investigated, the variant MCHCM-18 (3.1cm) followed by MCHCM-08 (3cm) displayed more flesh thickness compared to rest of the variants. MCHCM-06 followed by eleven genotypes produced lesser flesh thickness and were at par. Compared to original genotype MCHCM-16 (1.67cm), more than eleven genotypes resulted in production of more flesh thickness containing fruits.

Cavity diameter in smaller size is appreciable in commercial varieties for amenability to transport and more keeping quality. This is one of the current breeding objectives of oriental pickling melon. MCHCM-25 (2.83cm) produced the smallest cavity fruits, while MCHCM-03 (7.47cm) followed by all other variants, which were at par and produced larger cavity fruits. The typical local variety displayed cavity size of 4.03 cm and over 15 other genotypes were recorded fruits with larger cavity. The results are in conformity with the reports of Pidigam *et al*., 2019 [12] in Yardlong Bean, Ravali *et al*. 2017 [16] in Brinjal, Rajashekar Reddy *et al*., 2017 [14] in cluster bean, Srivastava *et al*. 2019 [20] in Brinjal and Somraj *et al*., 2017 [19] in tomato, Triveni *et al*., 2017 [24] in tomato.

The present investigation displayed greater variability for all the five fruit traits based on *per se* performance. Out of 27 variants, compared with typical local genotype MCHCM-16, the variants, MCHCM-26 for fruit weight, MCHCM-22 for fruit polar diameter and MCHCM-08 followed by MCHCM-22 for fruit equatorial diameter were promising. MCHCM-25 for cavity diameter and MCHCM-06 for flesh thickness were identified desirable. The variants can be used as parents or inbred lines for improving melon varieties.

**Table 2:** Per se performance of oriental pickling melon variants for key fruit traits

| Cucumber Variant | Fresh Fruit weight (g) | Polar diameter (cm) | Equatorial Diameter (cm) | Flesh thickness (cm) | Cavity diameter (cm) |
|---|---|---|---|---|---|
| MCHCM-01 | 1197.31 | 15.43 | 13.53 | 3.00 | 7.13 |
| MCHCM-02 | 207.17 | 9.57 | 6.07 | 1.77 | 3.07 |
| MCHCM-03 | 287.76 | 12.43 | 6.50 | 1.23 | 4.20 |
| MCHCM-04 | 407.01 | 14.93 | 7.40 | 1.87 | 3.83 |
| MCHCM-05 | 249.72 | 10.97 | 6.40 | 1.43 | 4.13 |
| MCHCM-06 | 208.07 | 11.13 | 6.40 | 1.53 | 3.13 |
| MCHCM-07 | 274.59 | 10.47 | 7.03 | 1.50 | 3.57 |
| MCHCM-08 | 241.38 | 12.07 | 6.20 | 1.30 | 2.90 |
| MCHCM-09 | 283.73 | 11.43 | 7.00 | 1.27 | 4.00 |
| MCHCM-10 | 384.75 | 11.20 | 7.40 | 1.67 | 4.83 |
| MCHCM-11 | 332.15 | 14.07 | 7.93 | 1.33 | 4.13 |
| MCHCM-12 | 318.32 | 10.33 | 7.90 | 1.73 | 4.63 |
| MCHCM-13 | 355.66 | 10.63 | 8.20 | 1.53 | 4.97 |
| MCHCM-14 | 190.65 | 10.30 | 5.97 | 1.30 | 4.03 |
| MCHCM-15 | 208.12 | 11.43 | 6.00 | 1.13 | 4.03 |
| MCHCM-16 | 267.00 | 11.80 | 6.43 | 1.27 | 3.80 |
| MCHCM-17 | 661.78 | 11.83 | 10.63 | 2.10 | 6.33 |
| MCHCM-18 | 173.07 | 9.50 | 6.00 | 0.97 | 4.33 |
| MCHCM-19 | 333.01 | 10.13 | 7.93 | 2.10 | 4.27 |
| MCHCM-20 | 352.34 | 13.20 | 6.67 | 1.57 | 3.90 |
| MCHCM-21 | 153.22 | 10.20 | 5.50 | 1.23 | 3.10 |
| MCHCM-22 | 142.39 | 8.73 | 5.93 | 1.13 | 3.83 |
| MCHCM-23 | 302.96 | 11.03 | 7.13 | 1.33 | 4.10 |
| MCHCM-24 | 181.66 | 10.70 | 5.50 | 1.43 | 2.83 |
| MCHCM-25 | 181.97 | 10.33 | 5.80 | 1.30 | 3.33 |
| MCHCM-26 | 2350.28 | 23.13 | 14.17 | 3.10 | 7.47 |
| MCHCM-27 | 1843.24 | 27.20 | 7.80 | 2.83 | 5.20 |
| SEm for Treatments | 12.61 | 0.25 | 0.62 | 0.06 | 10.07 |
| SEd for Pairwise Treatment Differences | 17.83 | 0.35 | 0.88 | 0.09 | 0.11 |
| C.D. for Treatments At (1%) Level of Significance | 48.21 | 0.95 | 2.38 | 0.25 | 10.29 |
| C.D. for Treatments At (5%) Level of Significance | 36.03 | 0.71 | 1.78 | 0.18 | 0.21 |
| CV | 4.88 | 3.47 | 14.59 | 6.88 | 3.03 |

**Genetic variability:** For any population, variability is the most important characteristic feature. For realizing response to selection as the progress in breeding depends upon its amount, nature and magnitude of genetic variability, estimation of genetic variability is an important pre-requisite. An insight into the magnitude of variability and heritability of characters is essential and it provides the basis of effective selection (Anandhi and Oommen, 2007) [1]. The breeder should have the capability of distinguishing the genetic and non-genetic components of variation occurring in a

population. In the current investigation, the similar analysis of variability was performed.

In general, the estimates of PCV were in perfect agreement with GCV in all the characters studied (Table 3) and indicated the no influence of environment on genotypic variants. This indicates the presence of greater amount of genetic variability for these characters. Hence, there is ample scope for improving these characters. High GCV and PCV (>20%) were observed for fruit fresh weight (116.63, 116.73), fruit polar diameter (32.62, 32.80), fruit equatorial diameter (28.00, 31.57), flesh thickness (34.14, 34.82) and fruit cavity diameter (27.12, 27.29). These results are in agreement with the reports of earlier researchers *viz.*, Sunil *et al*., 2017, Saidaiah *et al*., 2010 [18] in rice, Reddy and Shanthi (2013) [17], PoteKar *et al.* (2014) [13], Janghel *et al.* (2018) [7] in musk melon for average fruit weight; Reddy and Shanthi (2013) [17], PoteKar *et al.* (2014) [13] in musk melon for fruit yield per vine and Srivastava *et al*. 2019a,b [21, 22] in Brinjal.

**Table 3:** Genetic variability parameters of oriental pickling melon variants for key fruit traits

| Variability parameter | Average fruit weight (g) | Polar diameter (cm) | Equatorial Diameter (cm) | Flesh thickness (cm) | Cavity diameter (cm) |
|---|---|---|---|---|---|
| Environmental variance (Ve) | 476.74 | 0.18 | 1.16 | 0.01 | 0.02 |
| Genotypic variance (Vg) | 272718.96 | 16.30 | 4.28 | 0.31 | 1.34 |
| Phenotypic variance (Vp) | 273195.71 | 16.49 | 5.44 | 0.32 | 1.35 |
| Genotypic coefficient of variation (GCV %) | 116.63 | 32.62 | 28.00 | 34.14 | 27.12 |
| Phenotypic coefficient of variation (PCV %) | 116.73 | 32.80 | 31.57 | 34.82 | 27.29 |
| Heritability ($H_2$%) | 99. 82 | 98.88 | 78.64 | 96.10 | 98.77 |

**Heritability:** The genotypic coefficient of variation helps in measuring the genetic variability in a character and accordingly, it is not possible to partition existing heritable variation in population based solely, on this estimate. According to this, the maximum heritability (Table 3) was observed for fresh fruit weight (99.82), polar diameter (98.88), cavity diameter (98.77), flesh thickness (96.10) and equatorial diameter (78.64). These findings are in accordance with the observations made by Sunil *et al*., 2018, Srivastava *et al*. 2019 [20] in Brinjal, Ravali *et al*., 2017 [16], Triveni *et al*., 2017 [24], Somraj *et al*., 2017 [19], Naveen *et al*., 2018 [9], Chandrashekhar *et al*., 2018 [5], Rajashekar Reddy *et al*., 2017 [15], 2019, Pidigam *et al*., 2019 [12], Anuradha *et al*., 2020 [2], while, Reddy and Shanthi (2013) [17] reported low to moderate heritability for certain characters in muskmelon. High heritability in broad sense indicated that large proportion of phenotypic variance was attributable to the genotypic variance and were less influenced by environment. High heritability indicates less influence of environment and is governed by additive gene effects. For the character with low heritability, selection may be considerably difficult or virtually impractical due to the masking effect of environment on genotypic effect. Even though, the cross pollinated nature of crop attributable to dominance and dominance-additive based epistatic interaction of genes controlling different traits. The predominance of additive component in the present study for above traits would be more effective for direct selection in improvement of oriental pickling melon.

Considering the diverse nature of the genotypic variant material, the genotypes under investigation in the present study had the greater quantity of heritable variation particularly for fruit fresh weight, fruit polar diameter, fruit equatorial diameter, flesh thickness and fruit cavity diameter. High estimates of heritability provide good scope for further improvement in advance generation, if characters are subjected to mass progeny or family selection. There is good scope for improvement of these traits by selection.

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