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# Studies on genetic variability, heritability, and genetic advance for selection of genotypes in Cucumber (*Cucumis sativus* L.)

**Sateesh Pratap Singh, Sunil Malik, Bijendra Singh, LK Gangwar, MK Singh, Mukesh Kumar and Abhishek Chandra**

**Abstract**
The present experiment was carried out at the Horticulture Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut during summer season 2020 with taken Twenty cucumber genotypes under Randomized Block Design with three replications to assess the PCV, GCV, heritability and genetic advance for various horticultural traits. In this study phenotypic coefficient of variation (PCV) were higher than the corresponding values of genotypic coefficient of variation (GCV) while the difference between PCV and GCV was very less for No of primary branches, Days to open first female flower, Days to open first Male flower, Days to open first fruit set, Days to open last fruit, fruit weight, Fruit length, Fruit diameter, Vine length, Number of fruits per plant, Number of seed per fruits, Total soluble solids, and Yield per plant and these traits are less influenced by environment. moderate PCV and GCV were observed in Days to open first female flower, Days to open first Male flower, fruit weight, Fruit length, Fruit diameter, Vine length, Total soluble solids, high PCV and GCV were Observed in No of primary branches, Number of fruits per plant, Yield per plant and low PCV and GCV were found in Days to open first fruit set, Days to open last fruit, Number of seed per fruits. In this experiment all the studied traits had high heritability coupled with low to moderate genetic advance except Fruit weight (g)-and Number of seeds per fruit appearance.

**Keywords:** Cucumber, variability, heritability and genetic advance

## Introduction
Cucumber (*Cucumis sativus*, L.) is a remarkable member of the Cucurbitaceae Family, with chromosome number 2n = 14 with comprising of 118 genera and 825 species (Jeffrey, 1990). grown extensively in tropical and sub-tropical parts of India. has a cooling effect and is thus helpful in causing relief from sun burns. The fruits possess medicinal properties and are used in the treatment of jaundice, constipation and arthritis. Its primary Centre of origin is India (Zeven and Deweb 1982) and secondary Centre of diversification is China (De Candolle 1882). Vegetables are important sources of many nutrients, including potassium, dietary fiber, folate (folic acid), vitamin A, and vitamin C. Diets rich in potassium may help to maintain healthy blood pressure. Cucumber is a rich source of vitamin C (2mg), iron(1.5mg), calcium and phosphorus (Yawalkar 1985) and rich minerals like K (50mg), P (25mg), S (17mg), Cl(15mg), Mg(11mg), Na(10.2mg) Ca (10mg) and Vitamin C(7mg) (Choudhary,1998). Besides being primarily consumed as a salad vegetable, it is also used in cosmetic industry. Variability is the pre- requisite for starting any crop improvement programme. the development of promising genotypes is primarily based on the magnitude of genetic variability existing for the desired character. Improvement in the productivity in order to keep pace with increasing demand of country is the new at present. Crop improvement depends on the magnitude of genetic variability and extent to which desirable character are heritable Thus, the study of genetic variability is having much importance for breeders in making the final selection of genotype for yield improvement.

## Method and Material
The present investigation was conducted at Horticultural Research Centre, Department of Horticulture, Sardar Vallabhbhai Patel University of Agriculture & technology Meerut (India). The experimental materials comprised of 20 strains of Cucumber *viz*., Pusa white cucumber-1, Gujrat cucumber-1, DC-54, JLG, PCUC-9, Swarana Ageti, Kalyanpur green, Himangi,

Swarana Poorna, Russion Picklies, Pusa long green, Boro patta, DC-55, DC-306, KTS-07, Pusa Uday, Pant khira-1, Pusa barkha, Punjab Naveen and Swarana Sheetal collected from different parts of India. The experiment was laid out in a Randomized Block Design with three replications. The seeds were sown in the nursery bed on February 05th and transplanting was done in 10 March 2021. All the recommended agronomic package of practices was followed. The observation was recorded on five randomly selected plants per treatment from each replication for 13 quantitative and qualitative traits, *viz*., No of primary branches, Days to open first female flower, Days to open first Male flower, Days to open first fruit set, Days to open last fruit, fruit weight 9 (gr), Fruit length (cm), Fruit diameter (mm), Vine length (m), Number of fruits per plant, Number of seed per fruits, Total soluble solids (%), and Yield per plant (kg). Analysis of variance was done by method suggested by Panse and Sukhatme (1969). The genotypic and phenotypic coefficients of variation were calculated using the formulae of Burton (1952) and Johnson *et al.* (1955).

The heritability and genetic advance were calculated according to Allard (1960) and genetic advance as per cent of mean was estimated using the method of Johnson *et al.* (1955).

## Results and Discussion

**Table 1:** Analysis of variance for thirteen characters in cucumber genotypes

| Source of variation | Replication | Treatment | Error | Total |
|---|---|---|---|---|
| DF | 2 | 94 | 188 | 284 |
| No of primary branches | 0.04 | 5.30** | 0.28 | 1.94 |
| Days to open first female flower | 2.49 | 51.87** | 1.24 | 18.01 |
| Days to open first Male flower | 5.86 | 57.84** | 1.40 | 20.11 |
| Days to first fruit set | 0.27 | 48.39** | 1.84 | 17.23 |
| Days to last fruit harvest- | 12.07 | 82.39 | 5.83 | 32.03 |
| Fruit weight (g) | 204.52 | 4294.9** | 518.00 | 1778.84 |
| Fruit length (cm) | 25.45 | 26.03** | 0.92 | 9.40 |
| Fruit diameter | 0.90 | 1.03** | 0.12 | 0.43 |
| Vine length (cm) | 3.60 | 2.70** | 0.30 | 1.12 |
| Number of fruits per plant | 1.66 | 4.08** | 1.45 | 2.45 |
| Number of seeds per fruit- | 143.07 | 1340.38 | 480.98 | 763.05 |
| Total soluble solids (%)- | 0.070 | 0.258 | 0.027 | 0.104 |
| Yield per plant (Kg) | 0.627 | 1.071** | 0.078 | 0.410 |

*, ** significant at 5% and 1% level, respectively

**Table 2:** Estimation of genetic variability parameters for thirteen characters in cucumber

| Genotypes | Mean | Min | Max | var (g) | var (p) | Heritability (%) | GA | GA% mean | GCV (%) | PCV (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| No of primary branches | 5.17 | 2.52 | 8.06 | 1.67 | 1.95 | 85.76 | 2.47 | 47.78 | 25.05 | 27.05 |
| Days to open first female flower | 39.22 | 31.25 | 47.54 | 16.88 | 18.12 | 93.17 | 8.17 | 20.83 | 10.48 | 10.85 |
| Days to open first Male flower | 38.20 | 27.62 | 47.22 | 18.81 | 20.21 | 93.08 | 8.62 | 22.56 | 11.35 | 11.77 |
| Days to first fruit set | 47.91 | 38.33 | 57.98 | 15.52 | 17.35 | 89.40 | 7.67 | 16.01 | 8.22 | 8.69 |
| Days to last fruit harvest- | 79.24 | 67.46 | 90.08 | 25.52 | 31.35 | 81.40 | 9.39 | 11.85 | 6.38 | 7.07 |
| Fruit weight (g)- | 219.11 | 112.18 | 303.41 | 1258.97 | 1776.97 | 70.85 | 61.52 | 28.08 | 16.19 | 19.24 |
| Fruit length (cm) | 16.77 | 8.59 | 22.26 | 8.37 | 9.29 | 90.09 | 5.66 | 33.72 | 17.25 | 18.17 |
| Fruit diameter(mm) | 4.72 | 3.24 | 6.10 | 0.30 | 0.42 | 71.51 | 0.96 | 20.34 | 11.67 | 13.80 |
| Vine length (cm) | 4.30 | 1.78 | 6.06 | 0.80 | 1.10 | 72.62 | 1.57 | 36.49 | 20.79 | 24.39 |
| Number of fruits per plant- | 12.13 | 8.65 | 14.12 | 0.88 | 2.33 | 37.64 | 1.18 | 9.75 | 7.72 | 12.58 |
| Number of seeds per fruit- | 248.07 | 206.06 | 305.77 | 286.47 | 767.44 | 37.33 | 21.30 | 8.59 | 6.82 | 11.17 |
| Total soluble solids (%)- | 2.52 | 1.96 | 3.08 | 0.08 | 0.10 | 73.83 | 0.49 | 19.50 | 11.02 | 12.82 |
| Yield per plant (kg) | 2.72 | 0.97 | 4.27 | 0.33 | 0.41 | 80.94 | 1.07 | 39.23 | 21.17 | 23.53 |

The results with regard to mean, range, Genetic variability parameters like genotypic coefficient of variation and phenotypic coefficient of variation, heritability, genetic advance and genetic advance as per cent mean for all thirteen characters are mentioned in Table-2. The details of these variability parameters are presented below.

No of primary branches range from 2.52 to 8.06 with a mean value 5.17, the value of GCV (25.50%) and PCV (27.50%) was High. In case of days to open first female flower which valve range from 31.25 days to 47.54 days with mean valve 39.22 days, value of PCV (10.48%) and GCV (10.85) was found to Moderate. Across All the genotypes, days to open first male flower which value range from 27.62 to 47.22 days with mean value 38.20 days, Value of GCV (11.35%) and PCV (11.77%) was observed Moderate. Days to first fruit set varied from 38.33 days to 57.98 days with a mean value 47.91 days, Value of GCV (8.22%) and PCV (8.69%) was low. Considering every genotype of Day to last fruit harvest which range from 67.46 days to 90.08 days with mean value 79.24 days, GCV (6.38%) and PCV (7.07%) was to be low. In case of Fruit weight range from 112.18 gram to 303.41 gram with mean value 219.11 gram, PCV (16.19%) and GCV (19.24%) was note moderate. across the whole parameter of Fruit length varied from 8.59 cm to 22.6 cm with mean value of this observation is found 16.77 cm, GCV (17.25%) and PCV (18.17%) was Moderate. Fruit diameter value range from 3.24 mm to 6.10 mm with mean value 4.72 mm, GCV (11.67%) and PCV (13.80%) was noted to be moderates. Vine length per plant which range from 1.78 cm to 6.06 cm with a mean value 4.30 cm, GCV (20.79%) and PCV (24.39%) was recorded high. The number of seeds per fruit range from 206.06 to 305.77 with a mean value was recorded 248.07,

GCV (6.82%) and PCV (11.17%) was observed low. Total soluble solids range from 1.96% to 3.08% with a mean valve 2.52%, GCV (11.02%) and PCV (12.82%) was reported moderate. Yield per plant range from 0.97 kg to 4.27 kg with average value which 2.72 kg, GCV (21.17%) and PCV (23.53%) was to be high. Rawat *et al*., (2017) [7], Deepa *et al*, (2018) [1].

No of primary branches showed high heritability (85.76%) coupled with low genetic advance (2.47). Days to open first female flower had very high heritability (93.08%) accompanied with low genetic advance (8.17). Days to open first Male flower observed high heritability (93.08%) with low genetic advance (8.62). Days to open first fruit set calculated high heritability (89.40%) with low genetic advance (7.67). for Days to open last fruit was showed high heritability (81.40%) with low genetic advance (7.67). fruit weight determines Moderate heritability (70.25%) with high genetic advance (61.52). Fruit length observed high heritability (90.09%) per with low genetic advance (5.66). Fruit diameter showed high heritability (71.51%) with very low genetic advance (0.96). Vine length calculated Moderate (72.62%) with low genetic advance (1.57) The Number of fruits per plant showed low heritability (37.64%) with also low genetic advance (1.18). Number of seed per fruits was to be determined low heritability (37.33%) accompanied with High genetic advance (21.30). Total soluble solids showed Moderate (73.83%) with very low genetic advance (0.49) and Yield per plant show high Heritability (80.94%) with low genetic advance (1.07). Ene *et al*., (2016) [2], Rajawat *et al*., (2017) [6] Shet *et al*., (2018) [9],

Highest genetic advance as percent mean was observed in trait No of primary branches (47.78%), Days to open first female flower (20.83%), Days to open first Male flower(22.56%), Days to open first fruit set(16.01%), Days to open last fruit(11.85%), fruit weight(28.08%), Fruit length(33.72%), Fruit diameter(20.34%), Vine length(36.49%), Number of fruits per plant (9.75%), Number of seed per fruits(8.59%), Total soluble solids(19.50%) and Yield per plant(39.23%). All the findings are in association with Yadav *et al.* (2009) [11], Ullah *et al.* (2012) [10], Mehdi and Khan (2009) [5], Karthick *et al*., (2019) [3], Kumari *et al*., (2020) [4], Sahoo *et al*., (2020) [8].

## Conclusion

Analysis of variance revealed significant differences for all the genotypes for all the characters. The values of PCV were of higher magnitude than GCV for all the characters indicating influence of environment over the genotype. High to very high heritability (broad sense) was observed for all the traits. No of primary branches, Days to open first female flower, Days to open first Male flower, Days to open first fruit set, Days to open last fruit, fruit weight, Fruit length, Fruit diameter, Vine length, Number of fruits per plant, Number of seed per fruits, Total soluble solids, and Yield per plant having high heritability and low genetic advance as a per cent of the mean could be exercised for improvement through simple direct selection.

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