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# Association of Seed Traits with Fruit Yield in Cucumber (*Cucumis sativus* L.)

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**A B S T R A C T**

With the objective to find the association of different seed characters with fruit yield in cucumber, an experiment was conducted with 30 indigenous genotypes, collected from five different states, at the Experimental Farm of the Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan during *Kharif*, 2015. Results revealed that yield per plant had positive and significant association with all the seed characters under study *viz.*, seed length, seed breadth, hundred seed weight, germination percentage, seed vigour index-I and seed vigour index-II. The success or failure of any crop production programme depends largely upon the potential and quality of the seed, which is regarded as the most important input in agriculture. From our results, it is suggested to carry out indirect selection for these seed traits in order to improve fruit yield in cucumber.

## Introduction

Cucumber (*Cucumis sativus* L.) is one of the most important Cucurbitaceous vegetable crops grown in India. It ranks fourth among most important vegetable crops of Asia after tomato, cabbage and onion (Tatlioglu, 1993). Cucumbers is mainly valued for its immature fruits, eaten raw as salad, believed to have cooling effects on our body and are considered good for people suffering from constipation, jaundice and indigestion. In India, it is grown in open field as well as protected conditions to meet the domestic demands as well as for export. Although India is considered as the primary centre of origin of cucumber, very less attention has been paid for its genetic improvement. As a result, a considerable gap is observed between the expected and the actual yield of this crop.

Yield, being a complex and polygenic character, is often difficult to improve through direct selection for a particular trait as the final

yield depends upon the interrelationship of a number of attributing traits. Generally, it is stated that healthier the seed, better will be the yield but in this regard, much information is not available, especially regarding seed selection in cucumber for a better harvest. Therefore, the present study was undertaken to estimate the nature and magnitude of association among different seed traits with fruit yield in cucumber by using variance and covariance matrix as suggested by Al-Jibouri *et al.*, (1958).

## Materials and Methods

The present study was conducted at the Experimental Farm of the Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, during *Kharif*, 2015. The experimental materials comprised of thirty indigenous cucumber genotypes collected from five different states of the country (Table 1). The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications at a spacing of 125 cm × 50 cm, keeping ten plants in each replication in each entry.

Standard cultural practices recommended in the Package and Practices for Vegetable Crops were followed to ensure a healthy crop stand (Anonymous, 2013). Data were recorded for six important seed traits *viz.*, seed length (mm), seed breadth (mm), hundred seed weight (g), germination percentage, seed vigour index-I and II and yield per plant (kg). Seed length and seed breadth were recorded with the help of a digital Vernier caliper from 10 randomly selected self-pollinated seeds of each genotype in each replication. Seed germination of the self-pollinated seeds was tested in the laboratory by adopting the standard method of International Seed Testing Association (Anonymous, 1985) and seed vigour index-I and II were calculated as per the formula of Abdul-Baki and Anderson (1973), where, seed vigour index-I = germination percentage × seedling length (cm) and seed vigour index-II = germination percentage × seedling dry weight (mg). The genotypic and phenotypic correlations were calculated as per Al-Jibouri *et al.*, (1958) by using OPSTAT software (Sheoran *et al.*, 1998).

## Results and Discussion

Analysis of variance, presented in Table 2, indicated presence of significant differences among all the genotypes for all the seven characters under study. These differences indicated the presence of enormous variability in the studied germplasm that had ample scope for genetic improvement on the basis of seed selection in cucumber. The phenotypic and genotypic correlation coefficients among the seed characters and yield per plant have been presented in Table 3.

The genotypic correlation coefficients were higher in magnitude than the corresponding phenotypic correlation coefficients, indicating that the expression of these characters had a strong genetic backup and not merely due to the prevailing environment. The results revealed that seed vigour index-I had the strongest significant association with yield both at genotypic (0.966) and phenotypic (0.959) levels followed by seed vigour index-II (0.946, 0.872 respectively). Furthermore, yield per plant had significant positive association at both genotypic and phenotypic levels with germination percentage (0.554, 0.554), seed breadth (0.538, 0.465), seed length (0.469, 0.445) and hundred seed weight (0.285, 0.274). Moreover, the studied seed traits had positive significant correlations with each other except for seed germination percentage which was not correlated with three seed traits *viz.*, seed length, seed breadth and hundred seed weight.

**Table.1** List of cucumber genotypes under study along with their sources

| Genotypes | Sources | Genotypes | Sources |
|---|---|---|---|
| LC-1 | Jampur, Hooghly, WB | LC-16 | Uluberia, Howrah, WB |
| LC-2 | Maheshwarpur, Hooghly, WB | LC-17 | Mangalbaria, Sikkim |
| LC-3 | Sheoraphully, Hooghly, WB | LC-18 | Allahabad, UP |
| LC-4 | Champadanga, Hooghly, WB | LC-19 | Varanasi, UP |
| LC-5 | Bhanderhati, Hooghly, WB | LC-20 | Hubli, Dharwad, KN |
| LC-6 | Sibaichandi, Hooghly, WB | LC-21 | Ettinagudda, Dharwad, KN |
| LC-7 | Harit, Hooghly, WB | LC-22 | Bhuira, Sirmour, HP |
| LC-8 | Gopalpur, Nadia, WB | LC-23 | Narag, Sirmour, HP |
| LC-9 | Simurali, Nadia, WB | LC-24 | Gohar, Mandi, HP |
| LC-10 | Barasat, N-24 Parganas, WB | LC-25 | Manali, Kullu, HP |
| LC-11 | Amtala, S-24 Parganas, WB | LC-26 | Sarkaghat, Mandi, HP |
| LC-12 | Kamdebpur, N-24 Parganas, WB | LC-27 | Deothi, Solan, HP |
| LC-13 | Memari, Burdwan, WB | LC-28 | Joharji, Solan, HP |
| LC-14 | Diamond Harbour, S-24 Parganas, WB | LC-29 | Bhojnagar, Solan, HP |
| LC-15 | Paskura, West Medinipur, WB | K-75 | UHF, Nauni, Solan, HP |

**Table.2** Analysis of Variance of different seed characters and yield per plant in cucumber

| Characters \ Sources of variation | Mean Sum of Squares (MSS) | | |
|---|---|---|---|
| | Replications | Treatments | Error |
| | Degrees of Freedom | | |
| | 2 | 29 | 58 |
| Seed length (mm) | 0.404 | 4.240** | 0.178 |
| Seed breadth (mm) | 0.045 | 0.252** | 0.022 |
| 100 seed weight (g) | 0.016 | 1.159** | 0.020 |
| Seed germination (%) | 0.253 | 55.990** | 2.055 |
| Seed vigour index-I | 1981.444 | 542772.356** | 7503.252 |
| Seed vigour index-II | 19850.819 | 591981.344** | 37506.399 |
| Yield per plant (kg) | 0.001 | 1.539** | 0.006 |
| **Significant at 1% level of significance | | | |

**Table.3** Correlation coefficients of different seed characters and yield per plant in cucumber

| | Seed length | Seed Breadth | 100 Seed Weight | Germination % | Seed Vigour Index-I | Seed Vigour Index-II | Yield Per Plant |
|---|---|---|---|---|---|---|---|
| **Seed length** | **1.000** | 0.850** | 0.619** | -0.125 | 0.468** | 0.431** | 0.469** |
| **Seed Breadth** | 0.729** | **1.000** | 0.576** | 0.152 | 0.567** | 0.526** | 0.538** |
| **100 Seed Weight** | 0.553** | 0.494** | **1.000** | -0.091 | 0.337** | 0.342** | 0.285** |
| **Germination %** | -0.101 | 0.112 | -0.084 | **1.000** | 0.621** | 0.657** | 0.554** |
| **Seed Vigour Index-I** | 0.432** | 0.478** | 0.320** | 0.632** | **1.000** | 0.938** | 0.966** |
| **Seed Vigour Index-II** | 0.379** | 0.384** | 0.292** | 0.600** | 0.865** | **1.000** | 0.946** |
| **Yield Per Plant** | 0.445** | 0.465** | 0.274** | 0.554** | 0.959** | 0.872** | **1.000** |

****Significant at 1% level of significance. Genotypic correlation coefficients = upward right side of diagonal; Phenotypic correlation coefficients = downward left side of diagonal**

The success or failure of any crop production programme depends largely upon the potential and quality of the seed. Estimation of such parameters *viz.,* seed vigour index-I and seed vigour index-II require a sufficient number of seeds and lab facilities, which may not be available at the field or farmers' level. The traits *viz.,* seed length, seed breadth and hundred seed weight are easily observable at both breeders' as well as farmers' end. In our study, these three traits had positive and significant association with yield per plant as well as with seed vigour index-I and seed vigour index-II. Therefore, indirect selection for yield can be mediated through these traits in cucumber by the breeders as well as by the farmers. Similar correlations of yield with various seed traits were also reported by Rastogi and Rathore (1990), Singh (1997), Kumar *et al.,* (2008), Yadav *et al.,* (2010), Bhardwaj and Kumar (2012) and Veena *et al.,* (2013).

Cucumber, being indigenous to Indian subcontinent, enormous variability exists in Indian germplasm for different morpho-agronomic traits. As it belongs to family Cucurbitaceae, members of which suffer from negligible inbreeding depression, as a breeding method, individual plant selection has become popular among the breeders. Therefore, while conducting selection for yield, based on our results, greater emphasis might be given for selecting the genotypes having longer, broader and heavier seeds, which will give rise to vigourous plants and that will ultimately ensure a better harvest.

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