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# Effect of moisture stress on growth and yield of cucumber genotypes

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## ABSTRACT

**The experiment was conducted during spring-summer season with twenty five cucumber genotypes subjected to four levels of drought stress (control, 75%, 50% and 25% of recommended irrigation) in the open field experiment using completely randomized design with three replications to assess the effects of drought on vegetative growth and fruit yield. Star flow meter instrument used to measure the amount of irrigation water as calculated to induce an artificial drought stress levels on the plants. ANOVA revealed significant differences amongst genotypes and genotype × drought stress level interaction for all the traits indicating differential response of the genotypes. Decreased amount of water levels resulted in progressive reduction in number of leaves (19.7, 15.3, 12.4 and 9.0), vine length (55.8, 55.4, 46.7 and 41.3 cm) and fruit yield per vine (0.982, 0.645, 0.546 and 0.487 kg), while increased in affected leaves at 18.8, 58.8, 67.2 and 84.6%, respectively in control (100%), 75%, 50% and 25% of recommended irrigation. Thus, these above phenotypic traits appeared to be promising as selection criteria for drought tolerance at morphological level. As a result, the genotypes DGC-1 and WBC-13 observed drought tolerant, whereas DGC-8 and GS-3 were drought susceptible.**

**Key words**: *Cucumis sativus*, drought stress, vegetative growth, fruit yield.

## INTRODUCTION

Among abiotic stress, drought is considered as one of the most adverse environmental factors limiting crop productivity. Dry land areas cover more than 40 percent of the world's land surface {CGIAR (http://drylandsystems.cgiar.org/content/worlds-dry-areas)}. Deficit water detrimental effects on crop growth and development in general but varies depending on the severity of stress and the crop growth stage (Aroca, 2). The main consequences of drought in crop plants are reduced in rate of cell division and expansion, leaf size, stem elongation, root proliferation, disturbed stomatal oscillations, plant water, nutrient relations with diminished crop productivity and water use efficiency (WUE) (Yangyang *et al.*, 7; Farooq *et al.*, 5). One of the most effective approaches to overcome drought stress problems is to use drought tolerant varieties. In this context, breeding efforts should be made to identify genotypes those required minimum amount of water towards crop growth and development. This will not only help to save water but also to improve plant fitness to cope abiotic stresses and thereby minimizes the loss of yield. Plants under drought stress react with alterations in growth, metabolism and production and it depends on the level of plant tolerance which is species and cultivar specific. The degree of this tolerance can be assessed through the analysis of some morphological and yield traits. Extensive research has been done on effects of drought stress on cereals, leguminous crops and some field grown vegetable crops. Though, inter-varietal differences are pronounced with respect to drought tolerance in *Cucumis sativus* (Botia *et al.*, 3), yet systematic studies on consequences of drought stress on vegetative growth of cucumber are limited. Understanding effects of drought stress and mechanism of tolerance are essential to breed for drought tolerant cucumber. The best criterion in this regard is to select for higher yield. A reliable and quick method of screening would be necessary for the rapid progress in breeding for drought stress tolerance (Tiwari *et al.*, 6). Identifying selection criteria during early growth and vegetative stages is an alternative to reduce time required for screening large number of germplasm. In the present study, the consequences of drought stress on vegetative growth and yield component trait in cucumber were investigated to identify the trait/ criteria important for drought tolerance during early growth and vegetative stages of cucumber.

## MATERIALS AND METHODS

The present investigation was carried out at the Division of Vegetable Science, IARI, New Delhi. Twenty five cucumber genotypes, namely, WBC-37, WBC35, WBC17, WBC14, WBC13, WBC10, WBC1, RK40, Pusa Uday, Pahari Barsati, HS-5, HS-1, GS-3, DGC9, DGC-8, DGC7, DGC6, DGC-505, DGC-29, DGC19, DGC-11, DGC1, Barsati, 7026-C and 7026-B-76, previously collected from different parts

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of India, were taken for study. Cucumber seeds were sown in the field in lines with 15 m length, spacing intervals of 50 cm between each line and spacing between each plant was 30 cm. Plants were exposed to four levels of water irrigation which includes three levels of drought stress, *viz*., 100% (control), 75%, 50% and 25% of the recommended irrigation. The water amount has been measured by using the Star flow meter (model No. 6526 E/C, UNIDATA, Australia). The recommended irrigation water amount (100% treatment) was calculated based on crop evapotranspiration calculated using FAO Irrigation and Drainage Paper No. 56 Crop evapotranspiration guidelines for computing crop water requirements (Allen, 1).

Experiment was laid out of completely randomized design (CRD) with three replications and five holes per replication per treatment. Irrigation started normally as 100% of recommended amount of irrigation for all treatments up to 2 weeks till germination completed. After germination, one plant was retained in each hole. At the end of the experiment (60 DAS) when majority of the genotypes started showing wilt symptoms, the observations such as number of leaves, affected leave percentage was recorded. Affected leaves percentage was calculated by recording number of affected leaves out of total leaves. Fruit yield per vine was taken by averaging the total weight of fruits from all the pickings from the surviving vines in each treatment. In order to allow comparisons among genotypes, scoring and ranking on a 1-6 scale procedures was followed as described by (Zeng *et al*., 8). Accordingly, a drought susceptible genotype DGC-8 was chosen susceptible check based on morphological traits and drought tolerance index (DTI), which was estimated and score of 6 was given to this genotype. The DTI was calculated with by using following formula:

All agriculture practices have been followed as recommended and all other environmental factors have been taken care during investigation. Data analysis for RBD was carried out using SAS software.

## RESULT AND DISCUSSION

In the present investigation of drought stress, observations were recorded up to 25% of the recommended irrigation, since none of the genotypes survived and yield was severely affected in the crops grown without irrigation. Analysis of variance of the normally distributed data for the percentage, parameters of vegetative growth and fruit yield per vine revealed significant differences among genotype and genotype × drought stress level interaction indicating the existence of considerable genetic variability among the genotypes. The highest mean number of leaves was recorded in WBC-13 (17.8) followed by DGC-1(16.8), which also observed the highest drought tolerance index (1.835 and 1.732) and the highest drought tolerance score (1 and 2) in that order. The lower mean number of leaves was recorded in DGC-8 (9.7) and 'Barsati' (10.0) and these two genotypes had lower drought tolerance index (1.000 and 1.031) and score (6 and 6), respectively. The lowest mean percentage of affected leaves was observed in DGC-1 (0.553) followed by WBC-13 (0.578), while the highest was recorded in DGC-8 followed by GS-3. For per cent affected leaves, the genotypes DGC-1 and WBC-13 had top drought tolerance score of 1, while DGC-8, Barsati and GS-3 recorded the lowest score of 6 (Tables 1 & 4).

**Table 1.** Effect of different irrigation levels on vegetative growth characters in cucumber genotypes.

| Genotype | No. of leaves per vine | | | | | Affected leaves (%) | | | | | Vine length (cm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Water Irrigation treatment | | | | | Water Irrigation treatment | | | | | Water Irrigation treatment | | | | |
| | 100% | 75% | 50% | 25% | Mean | 100% | 75% | 50% | 25% | Mean | 100% | 75% | 50% | 25% | Mean |
| WBC-37 | 18.0 | 13.0 | 10.5 | 6.0 | 11.9 | 19.5 | 73.5 | 80.4 | 90.3 | 65.9 | 37.3 | 34.0 | 34.3 | 31.0 | 34.1 |
| WBC-35 | 21.0 | 17.0 | 14.0 | 11.0 | 15.8 | 15.3 | 39.3 | 53.6 | 77.4 | 46.4 | 85.2 | 80.3 | 64.0 | 51.8 | 70.3 |
| WBC-17 | 19.0 | 16.0 | 13.5 | 9.0 | 14.4 | 23.0 | 69.5 | 75.0 | 86.4 | 63.4 | 45.9 | 41.3 | 31.9 | 35.8 | 38.7 |
| WBC-14 | 19.0 | 14.0 | 12.5 | 10.0 | 13.9 | 21.9 | 67.7 | 74.8 | 88.4 | 63.2 | 39.9 | 36.0 | 34.8 | 33.0 | 35.9 |
| WBC-13 | 24.0 | 19.0 | 15.0 | 13.0 | 17.8 | 11.0 | 32.3 | 44.9 | 75.7 | 41.0 | 102.5 | 102.9 | 97.5 | 74.6 | 94.4 |
| WBC-10 | 20.0 | 16.0 | 14.0 | 9.0 | 14.8 | 19.2 | 63.8 | 68.2 | 81.6 | 58.2 | 51.1 | 54.1 | 42.1 | 41.3 | 47.1 |
| WBC1 | 21.0 | 18.0 | 14.0 | 10.0 | 15.8 | 22.3 | 45.0 | 57.9 | 81.4 | 51.6 | 54.1 | 54.9 | 40.9 | 42.0 | 48.0 |
| RK-40 | 18.0 | 15.0 | 12.3 | 7.0 | 13.1 | 22.4 | 67.6 | 76.1 | 89.3 | 63.8 | 35.9 | 30.6 | 36.4 | 32.0 | 33.7 |
| Pusa Uday | 21.0 | 17.0 | 15.0 | 11.0 | 16.0 | 19.3 | 50.4 | 58.7 | 80.4 | 52.2 | 55.4 | 64.8 | 43.9 | 44.5 | 52.1 |
| Pahari Barsati | 20.0 | 17.0 | 13.0 | 8.0 | 14.5 | 21.2 | 62.6 | 70.2 | 84.7 | 59.7 | 48.3 | 45.9 | 34.8 | 36.8 | 41.4 |

| Genotype | No. of leaves per vine | | | | | Affected leaves (%) | | | | | Vine length (cm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Water Irrigation treatment | | | | | Water Irrigation treatment | | | | | Water Irrigation treatment | | | | |
| | 100% | 75% | 50% | 25% | Mean | 100% | 75% | 50% | 25% | Mean | 100% | 75% | 50% | 25% | Mean |
| HS-5 | 19.0 | 15.0 | 12.7 | 9.0 | 13.9 | 22.2 | 71.6 | 76.3 | 87.4 | 64.4 | 44.0 | 34.9 | 32.6 | 31.9 | 35.8 |
| HS-1 | 22.0 | 17.0 | 15.0 | 10.0 | 16.0 | 11.1 | 37.4 | 50.3 | 76.3 | 43.8 | 96.4 | 96.3 | 76.7 | 59.8 | 82.3 |
| GS-3 | 16.0 | 12.0 | 7.0 | 5.0 | 10.0 | 23.4 | 80.3 | 82.3 | 95.2 | 70.3 | 22.5 | 22.5 | 24.7 | 17.5 | 21.8 |
| DGC-9 | 20.0 | 16.0 | 13.7 | 10.0 | 14.9 | 20.2 | 61.5 | 69.7 | 85.7 | 59.3 | 46.4 | 43.5 | 37.0 | 36.1 | 40.8 |
| DGC-8 | 15.0 | 11.0 | 7.7 | 5.0 | 9.7 | 26.4 | 77.6 | 82.5 | 97.2 | 70.9 | 21.2 | 22.1 | 24.3 | 16.8 | 21.1 |
| DGC-7 | 21.0 | 16.0 | 13.3 | 10.0 | 15.1 | 16.3 | 48.6 | 55.5 | 78.4 | 49.7 | 68.3 | 74.1 | 51.3 | 48.6 | 60.6 |
| DGC-6 | 22.0 | 16.0 | 16.0 | 10.0 | 16.0 | 12.0 | 40.5 | 51.6 | 77.0 | 45.3 | 87.2 | 89.0 | 73.5 | 55.8 | 76.4 |
| DGC-505 | 22.0 | 16.0 | 13.7 | 10.0 | 15.4 | 17.3 | 49.2 | 56.5 | 78.3 | 50.3 | 55.8 | 71.8 | 49.3 | 46.1 | 55.7 |
| DGC-29 | 18.0 | 13.0 | 8.7 | 7.0 | 11.7 | 19.5 | 67.3 | 77.8 | 91.3 | 63.9 | 29.1 | 26.9 | 30.2 | 28.0 | 28.5 |
| DGC-19 | 22.0 | 17.0 | 14.3 | 11.0 | 16.1 | 11.4 | 37.0 | 48.1 | 75.2 | 42.9 | 100.5 | 101.5 | 82.8 | 67.9 | 88.2 |
| DGC-11 | 20.0 | 16.0 | 14.5 | 10.0 | 15.1 | 19.4 | 64.4 | 69.6 | 84.4 | 59.4 | 49.0 | 51.3 | 32.9 | 40.0 | 43.3 |
| DGC-1 | 23.0 | 18.0 | 14.0 | 12.0 | 16.8 | 10.8 | 29.7 | 41.2 | 75.0 | 39.2 | 124.6 | 117.3 | 101.7 | 84.0 | 106.9 |
| Barsati | 16.0 | 12.5 | 5.5 | 6.0 | 10 | 19.0 | 82.6 | 85.8 | 93.5 | 70.2 | 25.5 | 24.5 | 24.0 | 20.0 | 23.5 |
| 7026-C | 19.0 | 14.0 | 11.5 | 8.0 | 13.1 | 24.2 | 73.8 | 78.4 | 89.0 | 66.3 | 36.1 | 34.0 | 34.8 | 32.5 | 34.3 |
| 7026-B-76 | 17.0 | 12.0 | 7.5 | 7.0 | 10.9 | 22.9 | 77.9 | 84.4 | 92.0 | 69.3 | 28.9 | 26.4 | 30.4 | 24.0 | 27.4 |
| Mean | 19.7 | 15.3 | 12.4 | 9.0 | | 18.83 | 58.845 | 67.16 | 84.56 | | 55.8 | 55.4 | 46.7 | 41.3 | |
| $CD_{0.05}$ | | 0.311 | | | 0.779 | | 0.274 | | | 0.685 | | 2.146 | | | 5.364 |

**Table 2.** Effect of different irrigation levels on vegetative growth characters in cucumber genotypes.

| Genotype | Yield per vine (kg) | | | | | Yield reduction (%) over control | | | | No of fruits per vine | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Water Irrigation treatment | | | | | Water Irrigation treatment | | | | Water Irrigation treatment | | | | |
| | 100% | 75% | 50% | 25% | Mean | 75% | 50% | 25% | Mean | 100% | 75% | 50% | 25% | Mean |
| WBC-37 | 0.865 | 0.47 | 0.352 | 0.308 | 0.499 | 45.553 | 59.263 | 64.093 | 56.303 | 3.33 | 3.33 | 2.67 | 3.33 | 3.17 |
| WBC-35 | 1.035 | 0.802 | 0.676 | 0.624 | 0.784 | 22.560 | 34.610 | 39.673 | 32.281 | 4.67 | 4.33 | 3.67 | 3.00 | 3.92 |
| WBC-17 | 0.91 | 0.537 | 0.427 | 0.375 | 0.562 | 41.080 | 52.937 | 58.747 | 50.921 | 3.67 | 3.33 | 3.33 | 3.00 | 3.33 |
| WBC-14 | 0.87 | 0.493 | 0.379 | 0.338 | 0.52 | 43.367 | 56.397 | 60.943 | 53.569 | 4.33 | 3.00 | 4.00 | 3.33 | 3.67 |
| WBC-13 | 1.365 | 1.149 | 1.051 | 0.903 | 1.117 | 15.833 | 22.750 | 33.677 | 24.087 | 8.33 | 7.33 | 5.67 | 5.67 | 6.75 |
| WBC-10 | 0.962 | 0.644 | 0.553 | 0.534 | 0.673 | 33.180 | 42.353 | 44.447 | 39.993 | 4.67 | 4.00 | 3.67 | 4.00 | 4.08 |
| WBC1 | 1.017 | 0.711 | 0.627 | 0.574 | 0.732 | 30.180 | 38.237 | 43.500 | 37.306 | 4.33 | 4.33 | 3.67 | 3.00 | 3.83 |
| RK-40 | 0.84 | 0.467 | 0.356 | 0.309 | 0.493 | 44.190 | 57.490 | 62.743 | 54.808 | 3.67 | 3.00 | 3.00 | 3.67 | 3.33 |
| Pusa Uday | 0.997 | 0.697 | 0.616 | 0.57 | 0.72 | 30.120 | 38.047 | 42.860 | 37.009 | 4.33 | 4.00 | 3.33 | 4.00 | 3.92 |
| Pahari Barsati | 0.908 | 0.558 | 0.472 | 0.479 | 0.604 | 38.370 | 47.783 | 47.170 | 44.441 | 4.33 | 4.33 | 3.33 | 3.33 | 3.83 |
| HS-5 | 0.945 | 0.539 | 0.415 | 0.357 | 0.564 | 43.100 | 55.967 | 62.297 | 53.788 | 3.67 | 3.67 | 4.00 | 3.33 | 3.67 |
| HS-1 | 1.11 | 0.874 | 0.813 | 0.629 | 0.856 | 21.260 | 26.747 | 43.343 | 30.45 | 6.00 | 4.67 | 5.00 | 4.00 | 4.92 |
| GS-3 | 0.828 | 0.361 | 0.265 | 0.248 | 0.426 | 56.227 | 67.760 | 69.840 | 64.609 | 2.67 | 2.67 | 2.00 | 2.00 | 2.33 |
| DGC-9 | 0.905 | 0.541 | 0.456 | 0.379 | 0.57 | 40.237 | 49.460 | 57.920 | 49.206 | 3.67 | 3.67 | 3.00 | 2.67 | 3.25 |
| DGC-8 | 0.783 | 0.346 | 0.263 | 0.241 | 0.408 | 55.643 | 66.243 | 69.060 | 63.649 | 2.33 | 2.33 | 1.67 | 1.67 | 2.00 |
| DGC-7 | 1.02 | 0.781 | 0.673 | 0.615 | 0.772 | 23.497 | 34.000 | 39.620 | 32.372 | 5.00 | 4.67 | 3.67 | 4.00 | 4.33 |
| DGC-6 | 1.095 | 0.854 | 0.725 | 0.645 | 0.83 | 21.983 | 34.197 | 41.040 | 32.407 | 5.00 | 4.33 | 4.00 | 4.00 | 4.33 |
| DGC-505 | 1.032 | 0.735 | 0.645 | 0.582 | 0.748 | 28.787 | 37.337 | 43.580 | 36.568 | 4.33 | 4.00 | 3.33 | 3.67 | 3.83 |

*Contd...*

*Table 2 Contd...*

| Genotype | Yield per vine (kg) | | | | | Yield reduction (%) over control | | | | No of fruits per vine | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Water Irrigation treatment | | | | | Water Irrigation treatment | | | | Water Irrigation treatment | | | | |
| | 100% | 75% | 50% | 25% | Mean | 75% | 50% | 25% | Mean | 100% | 75% | 50% | 25% | Mean |
| DGC-29 | 0.86 | 0.451 | 0.342 | 0.303 | 0.489 | 47.330 | 60.227 | 64.330 | 57.296 | 3.67 | 3.00 | 3.00 | 3.33 | 3.25 |
| DGC-19 | 1.238 | 0.944 | 0.946 | 0.812 | 0.985 | 23.673 | 23.507 | 34.380 | 27.187 | 8.00 | 5.67 | 5.00 | 4.67 | 5.83 |
| DGC-11 | 0.928 | 0.579 | 0.497 | 0.503 | 0.627 | 37.673 | 46.147 | 45.753 | 43.191 | 4.33 | 3.33 | 3.67 | 3.67 | 3.75 |
| DGC-1 | 1.528 | 1.295 | 1.14 | 0.986 | 1.237 | 15.257 | 25.403 | 35.467 | 25.376 | 8.33 | 7.33 | 6.33 | 6.67 | 7.17 |
| Barsati | 0.813 | 0.383 | 0.282 | 0.252 | 0.432 | 52.567 | 65.003 | 68.307 | 61.959 | 3.00 | 2.33 | 2.67 | 1.67 | 2.42 |
| 7026-C | 0.845 | 0.472 | 0.364 | 0.318 | 0.5 | 44.060 | 56.917 | 62.237 | 54.404 | 3.67 | 3.33 | 3.67 | 3.33 | 3.50 |
| 7026-B-76 | 0.845 | 0.435 | 0.307 | 0.298 | 0.471 | 48.340 | 63.517 | 64.287 | 58.714 | 3.00 | 2.67 | 2.67 | 2.67 | 2.75 |
| Mean | 0.982 | 0.645 | 0.546 | 0.487 | | 36.163 | 46.492 | 51.973 | | 4.49 | 3.95 | 3.60 | 3.51 | |
| $CD_{0.05}$ | | 0.018 | | | 0.045 | | 1.568 | | 4.525 | | 0.272 | | | 0.68 |

**Table 3.** Drought tolerance index and score among cucumber genotypes at mean value of drought stress treatments.

| Genotype | No. of leaves per vine | | Affected leaves (%) | | Vine length (cm) | | Yield per vine (kg) | |
|---|---|---|---|---|---|---|---|---|
| | Index | Score | Index | Score | Index | Score | Index | Score |
| WBC-37 | 1.227 | 5 | 0.929 | 6 | 1.616 | 6 | 1.22 | 6 |
| WBC-35 | 1.629 | 2 | 0.654 | 2 | 3.332 | 3 | 1.92 | 4 |
| WBC-17 | 1.485 | 3 | 0.894 | 5 | 1.834 | 5 | 1.38 | 5 |
| WBC-14 | 1.433 | 4 | 0.891 | 5 | 1.701 | 5 | 1.27 | 6 |
| WBC-13 | 1.835 | 1 | 0.578 | 1 | 4.474 | 2 | 2.74 | 1 |
| WBC-10 | 1.526 | 3 | 0.821 | 4 | 2.232 | 5 | 1.65 | 5 |
| WBC1 | 1.629 | 2 | 0.728 | 3 | 2.275 | 5 | 1.79 | 4 |
| RK-40 | 1.351 | 4 | 0.900 | 5 | 1.597 | 6 | 1.21 | 6 |
| Pusa Uday | 1.649 | 2 | 0.736 | 3 | 2.469 | 4 | 1.76 | 4 |
| Pahari Barsati | 1.495 | 3 | 0.842 | 5 | 1.962 | 5 | 1.48 | 5 |
| HS-5 | 1.433 | 4 | 0.908 | 5 | 1.697 | 5 | 1.38 | 5 |
| HS-1 | 1.649 | 2 | 0.618 | 2 | 3.900 | 3 | 2.10 | 3 |
| GS-3 | 1.031 | 6 | 0.992 | 6 | 1.033 | 6 | 1.04 | 6 |
| DGC-9 | 1.536 | 3 | 0.836 | 5 | 1.934 | 5 | 1.40 | 5 |
| DGC-8 | 1.000 | 6 | 1.000 | 6 | 1.000 | 6 | 1.00 | 6 |
| DGC-7 | 1.557 | 3 | 0.701 | 3 | 2.872 | 4 | 1.89 | 4 |
| DGC-6 | 1.649 | 2 | 0.639 | 2 | 3.621 | 3 | 2.03 | 3 |
| DGC-505 | 1.588 | 3 | 0.709 | 3 | 2.640 | 4 | 1.83 | 4 |
| DGC-29 | 1.206 | 5 | 0.901 | 5 | 1.351 | 6 | 1.20 | 6 |
| DGC-19 | 1.660 | 2 | 0.605 | 2 | 4.180 | 2 | 2.41 | 2 |
| DGC-11 | 1.557 | 3 | 0.838 | 5 | 2.052 | 5 | 1.54 | 5 |
| DGC-1 | 1.732 | 2 | 0.553 | 1 | 5.066 | 1 | 3.03 | 1 |
| Barsati | 1.031 | 6 | 0.990 | 6 | 1.114 | 6 | 1.06 | 6 |
| 7026-C | 1.351 | 4 | 0.935 | 6 | 1.626 | 6 | 1.23 | 6 |
| 7026-B-76 | 1.124 | 6 | 0.977 | 6 | 1.299 | 6 | 1.15 | 6 |
| Range | 1.000-1.227 | | 0.553-1.000 | | 1.000-5.066 | | 1.00-3.032 | |
| $CD_{0.05}$ | 0.139 | | 0.074 | | 0.65 | | 0.338 | |

**Table 4.** Characterwise score range.

| Score | No. of leaves per vine | Affected leaves (%) | Vine length (cm) | Yield per vine (kg) |
|---|---|---|---|---|
| 1 | 1.768-1.974 | 0.496-0.580 | 4.860-5.746 | 2.690-3.032 |
| 2 | 1.624-1.768 | 0.580-0.662 | 4.012-4.860 | 2.350-2.690 |
| 3 | 1.490-1.624 | 0.662-0.747 | 3.149-4.012 | 2.014-2.350 |
| 4 | 1.345-1.490 | 0.747-0.834 | 2.377-3.149 | 1.670-2.014 |
| 5 | 1.139-1.345 | 0.834-0.926 | 1.680-2.377 | 1.336-1.670 |
| 6 | 1.000-1.139 | 0.926-1.000 | 1.000-1.680 | 1.000-1.338 |

Vine length decreased as drought stress level was increased. Longest mean vine length was observed in DGC-1 (106.9 cm) Followed byWBC-13 (94.4 cm), whereas, shortest mean vine length was recorded in DGC-8 (21.1 cm) followed by GS-3(21. 3 cm) and Barsati (23.5 cm). From table 3, maximum drought tolerant index (5.066) was observed in DGC-1 with a score of 1 followed by WBC-13, whereas, the lowest drought tolerance index (1) was observed for DGC-8 with lowest drought tolerance score of 6. There was a progressive reduction in fruit yield per vine as drought stress increased in all the genotypes (Table 2). Highest fruit yield per vine average was observed in DGC-1 (1.237 kg) followed by WBC-13 (1.117 kg), whereas, the lowest in DGC-8 followed by GS3, *i.e.* 0.408 and 0.426 kg, respectively. It could be noted that under normal irrigation (100% irrigation treatment) conditions, the fruit yield of DGC-1 and WBC-13 was 1.528 and 1.365 kg, respectively (Table 3). The maximum index of (3.032) was observed in DGC-1 with a score of (1) followed by WBC-13 (2.738) with and score 1. The lowest index (1.0) was observed for DGC-8 and GS-3 whose index was at par with those of Barsati, 7026-B-76, DGC-29, RK40, 7026-C, WBC-37 and WBC-14 with a score of 6. The average fruit yield reduction under different drought stress conditions was 36.16, 46.492 and 51.97 percent at 75%, 50% and 25% of recommended irrigation, respectively (Table 2). Among the genotypes, minimum yield reduction under drought stress was observed in WBC-13 (24.08%) followed by DGC-1 (25.37%) and DGC-19 (27.18%). Further, highest reduction under drought stress was seen in GS-3 (64.6%) followed by DGC-8 (63.64%) and Barsati (61.95%). Results of the present investigation are in agreement with previous findings in melon by Bustan *et al*. (4). Thus, in the present investigation, the traits such as affected leaves and vine length were identified promising as selection criteria for drought tolerance at morphological level in cucumber. The genotypes DGC-1 and WBC-13 appeared to be drought tolerant with high mean values of drought tolerance index and score (1.1 and 1.8) and accordingly both may be included as one of the parents in cucumber breeding programmers for drought tolerance.

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