



Morpho-Physiological Trait Based Drought Effects Assessment on Different Bread Wheat Genotypes

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Introduction

The fluctuating climatic patterns of the world significantly affecting the grain yield output of wheat crop. It is direly needed for the development of climate resilient wheat varieties that can cope with the environmental hazards having yield sustainability for ensuring food security in the countries of developing world like Pakistan.

Methodology

Fifty-six wheat genotypes including checks (Akbar-2019 & Barani-2017) were tested under drought stress during 2020-21. The experiment was planted under rainfed conditions i.e. only one pre sowing irrigation was applied following alpha lattice design in duplicate at Wheat Research Institute, Faisalabad, Punjab, Pakistan Various yield contributing traits were recorded under drought stress.

Results

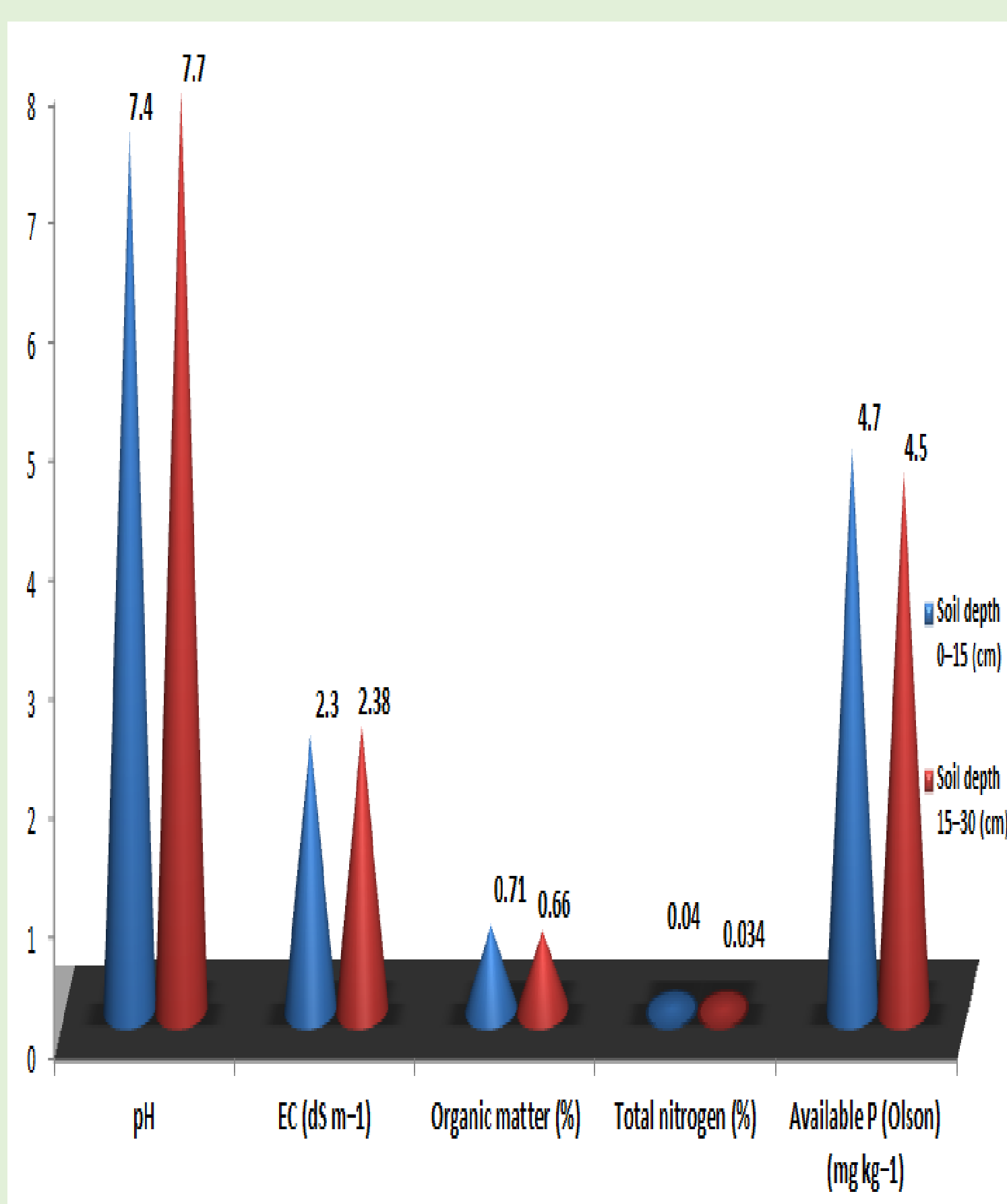


Figure 1: Soil of experimental site:

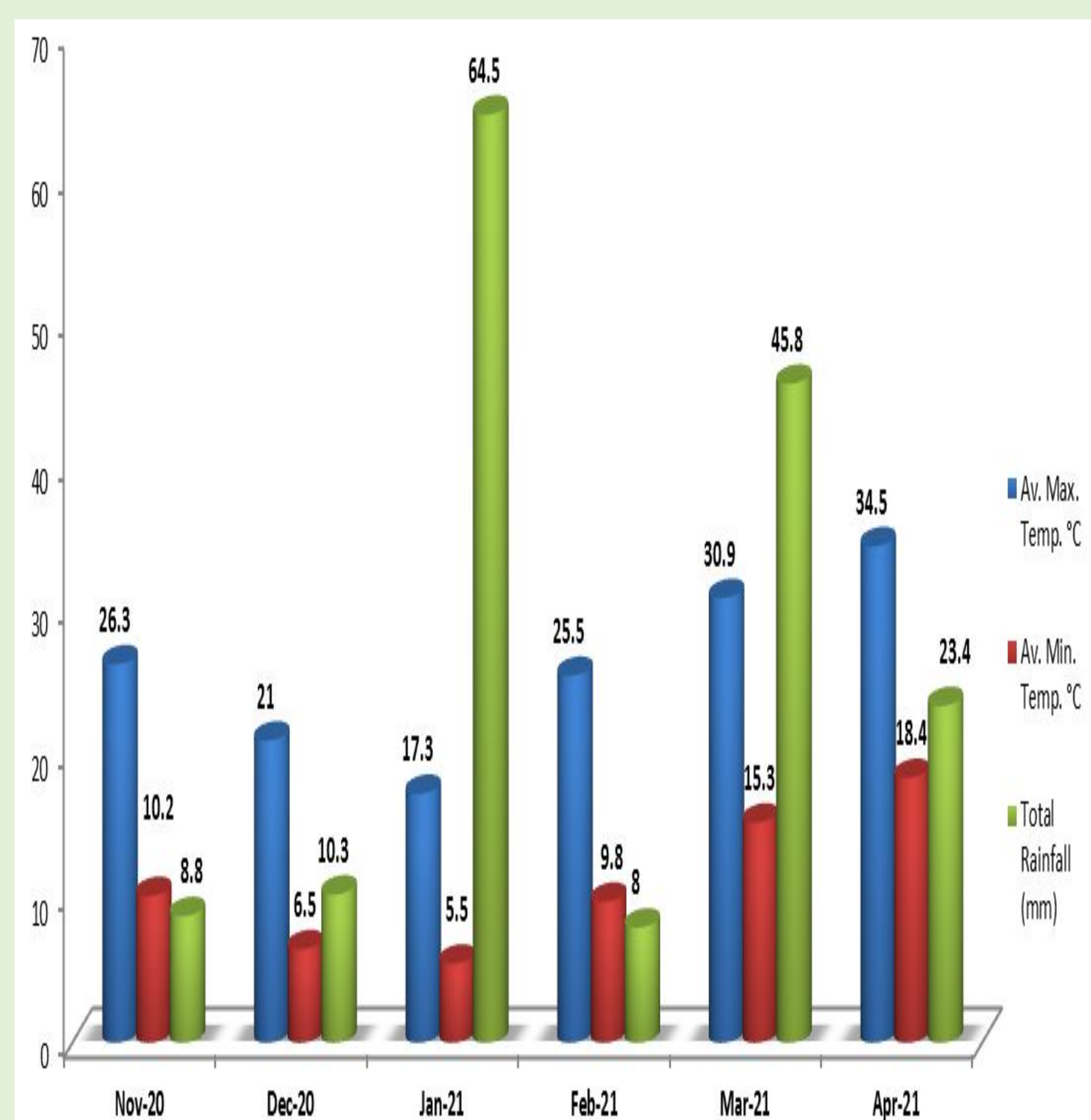


Figure 2: Weather Data:

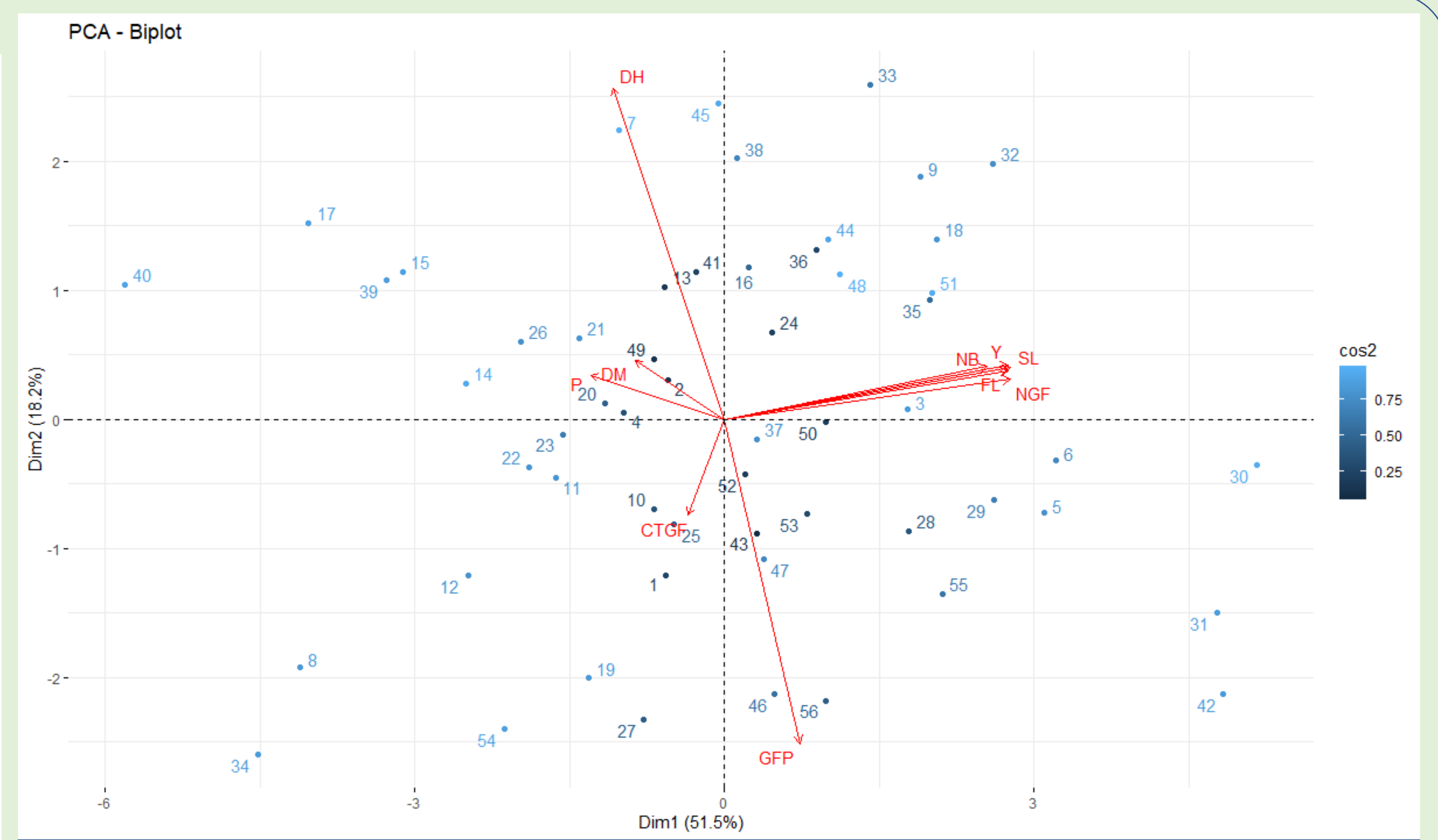


Figure 4 PCA analysis of Data: The biplot explained the positive association of yield (Kg ha^{-1}) with spike length (cm), flag leaf area (cm^2), NDVI at booting and NDVI at grain filling stage. The negative association of yield (Kg ha^{-1}) with days to 50% heading, days to 50% maturity, plant height (cm) and canopy temperature at grain filling ($^{\circ}\text{C}$) and grain filling period (days) was noted in PCA-biplot. The results of PCA explained that genotypes V-19274 ($4536.2 \text{ Kg ha}^{-1}$) and V-19177 ($4450.5 \text{ Kg ha}^{-1}$) were found best regarding yield and its contributing traits under drought stress.

| | Y | PH | SL | FL | DH | DM | GFP | NB | NGF | CTGF |
|------|----------|----------|----------|----------|----------|---------|----------|---------|----------|-------|
| Y | 1 | -0.36 ** | 0.99 ** | 0.99 ** | -0.24 | -0.26 | 0.15 | 0.89 ** | 0.99 ** | -0.10 |
| PH | -0.31 ** | 1 | -0.44 ** | -0.43 ** | 0.30 * | 0.35 ** | -0.17 | -0.30 * | -0.45 ** | 0.20 |
| SL | 0.98 ** | -0.32 ** | 1 | 0.99 ** | -0.25 | -0.24 | 0.16 | 0.90 ** | 0.99 ** | -0.09 |
| FL | 0.97 ** | -0.34 ** | 0.98 ** | 1 | -0.24 | -0.20 | 0.18 | 0.86 ** | 0.99 ** | -0.09 |
| DH | -0.23 * | 0.21 * | -0.22 * | -0.22 * | 1 | 0.39 ** | -0.91 ** | -0.23 | -0.28 * | -0.12 |
| DM | -0.22 * | 0.31 ** | -0.18 | -0.17 | 0.33 ** | 1 | 0.01 | -0.24 | -0.25 | -0.03 |
| GFP | 0.13 | 0.07 | 0.14 | 0.15 | -0.87 ** | 0.17 | 1 | 0.14 | 0.18 | 0.11 |
| NB | 0.87 ** | -0.24 * | 0.89 ** | 0.85 ** | -0.22 * | -0.19 * | 0.13 | 1 | 0.88 ** | -0.17 |
| NGF | 0.97 ** | -0.34 ** | 0.98 ** | 0.99 ** | -0.25 ** | -0.19 * | 0.16 | 0.86 ** | 1 | -0.09 |
| CTGF | -0.11 | 0.15 | -0.09 | -0.08 | -0.07 | -0.01 | 0.07 | -0.16 | -0.07 | 1 |

Figure 3 Phenotypic and Genotypic correlation of wheat genotypes for recorded traits: Correlation coefficients were studied for all the traits to estimate the genotypic and phenotypic effects. The results revealed that yield (Kg ha^{-1}) had highly significant and positive correlation with spike length (cm), flag leaf area (cm^2), NDVI at booting and grain filling stage while highly significant negative association with plant height (cm) at both phenotypic and genotypic level.

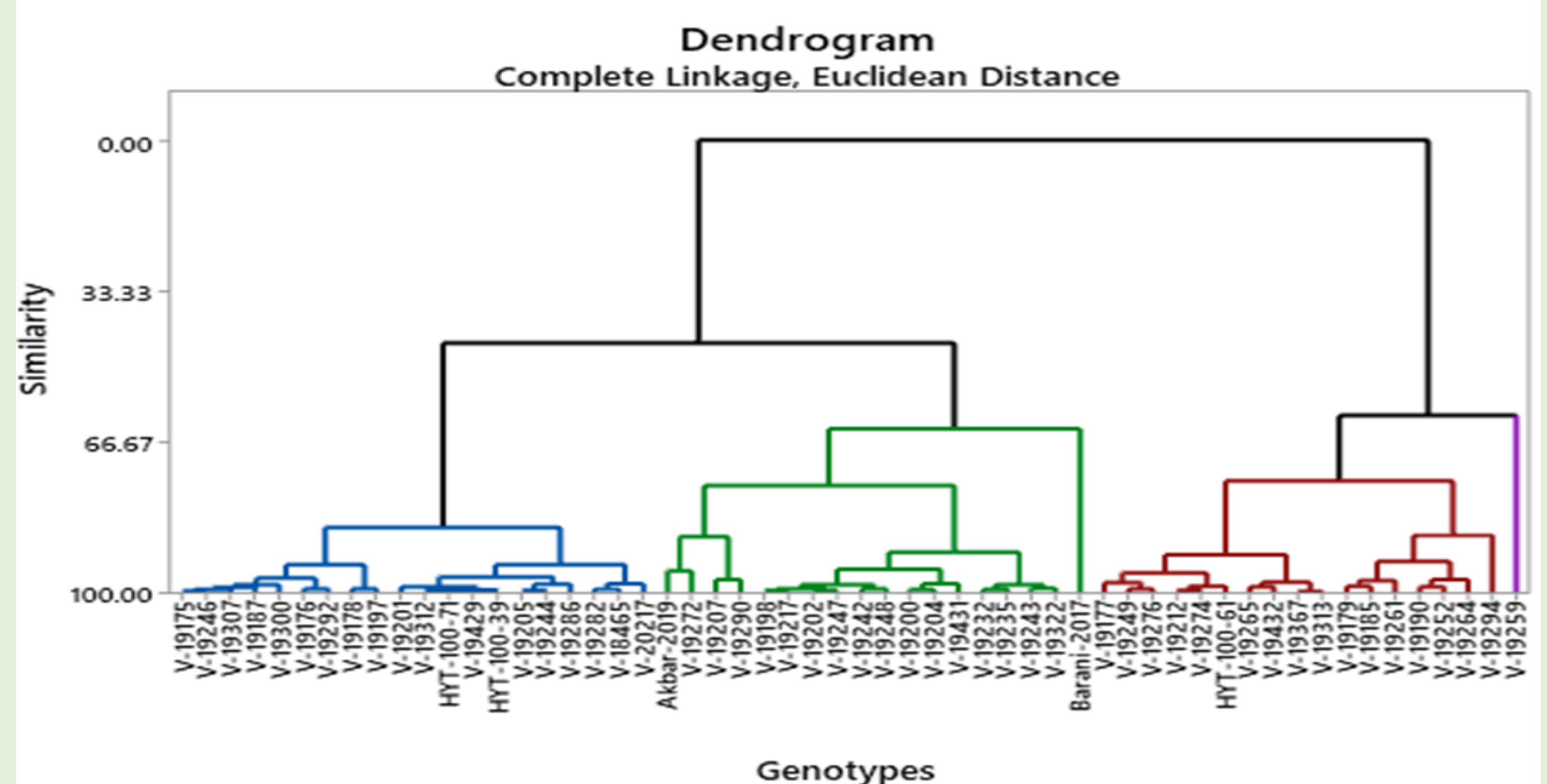


Figure 5: linkage between fifty six wheat genotypes: The genotypes in cluster 4 demonstrated high magnitude of yield (Kg ha^{-1}), spike length (cm), flag leaf area (cm^2), grain filling period (days), NDVI at booting and NDVI at grain filling stage, while they showed lower magnitude regarding plant height (cm), days to 50% maturity, days to 50% heading and canopy temperature at grain filling stage as compared to other three clusters.

Conclusion

Genotype V-19274 ($4536.2 \text{ Kg ha}^{-1}$) and genotype V-19177 ($4450.5 \text{ Kg ha}^{-1}$) were found best regarding yield and its contributing traits under drought stress. These identified wheat genotypes can be used in different wheat breeding programs for yield and its contributing traits under water deficient environment.