# Genetic Improvement of Some Tomato Genotypes for Abiotic Stress Tolerance in Egypt


**By**

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# ABSTRACT

The development of a few exceptional new tomato varieties is a substantial breeding challenge. The present experiment was performed to classify best combiner parents and cross combinations for developing hybrids for quality components in tomato under drought stress (E2) compared with irrigated control (E1), using half diallel analysis for six parents and their fifteen hybrids. The parental genotypes are *Solanum pimpenillifolium* (LA:411) and five cultivated genotypes *Solanum lycopersicum*, i. e., Edkawi, Super Marmande, Super Strain B, Castle Rock and Peto 86 for some characters, i. e., length of fruit (cm), fruit diameter (cm), fruit shape index, locules number, average fruit weight (g), fruit flesh thickness (cm), fruit firmness ($g/_{3mm}$), and total soluble solid (TSS) as a metric of fruit maturity (Brix).

The results indicated that heterosis over mid parent gave significant values in most crosses, i. e., the hybrid Peto 86 × LA:411for length of fruit, fruit diameter, fruit flesh thickness, the hybrid Edkawi × Super Marmande for fruit firmness and TSS and the hybrid Edkawi×Super Strain B for average fruit weight. While, the hybrid Edkawi × Super Marmande for length of fruit, fruit shape index, fruit firmness and total soluble solid gave significant values for heterosis over better parent. Also, these hybrids showed high values for specific combining ability (SCA). Based on the general combining ability (GCA) effects, the best combiners were the parental genotypes LA411 for total soluble solid, Edkawi for fruit diameter, locules number and average fruit weight and Peto 86 for length of fruit, fruit flesh thickness and fruit firmness.

On the other hand, a molecular study, used ten SSR primers for drought tolerance on the same parents and their fifteen crosses in this study. Five primers were successful and showed positive and negative markers for drought tolerance. Genetic diversity using SSR data was estimated to be between 0.485 and 0.947, while there was very high genetic similarity (0.999) between (F18 and F17) (super Marmande x LA:411 and super Marmande x Edkawi) respectively. In conclusion, LA:411 and Edkawi could be good source of drought tolerance. Breeding and selection for drought-tolerant genotypes is a significant strategy for addressing this challenge.

***Keywords*:** half diallel; GCA & SCA effects; abiotic stress; drought tolerant; *Solanum lycopersicum*; *Solanum pimpenillifolium*; SSR Markers.

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| | |
|---|---|
| **H** | Heterosis |
| **MP** | Mid-Parent |
| **HP** | High Parent |
| **$\sigma^2$g** | genotypic variance. |
| **$\sigma^2$s** | Pheno. variance. |
| **$\sigma^2$E** | environmental variance. |
| **H2ns** | heritability in narrow sense. |
| **H2bs** | heritability in broad sense. |
| **D.d** | degree of dominance. |
| **GCA** | general combining ability |
| **SCA** | specifice combining ability |
| **SSRs** | Short sequance repeats**.** |
| **PAGE** | polyacrylamide gel electrophoresis**.** |
| **PCR** | Polymerase Chain Reaction. |
| **QTLs** | Quantitative trait loci. |
| **DNA** | Deoxy ribose Nuclic Acid |
| **RCBD** | Randomized Complete Block Design |
| **ARC** | Agriculture Research Center |
| **DRC** | Desert Research Center |