Project Assignment

Table 1: Morphological characteristics of plants under different treatments

Treatment	Fruit Weight (g)	Fruit Diameter (cm)	Fruit Length (cm)	Yield per Plant (g)
T1	38.7±0.0577e	3.3±0.0577f	14.5±0.0577e	220.7±0.0577c
T2	42.1±0.0577c	3.9±0.0577b	14.9±0.0577d	198.7±0.0577e
T3	36.2±0.0577h	3.5±0.0577e	13.4±0.0577f	186.9±0.0577g
T4	29.1±0.0577j	2.8±0.0577h	12.1±0.0577h	120.6±0.0577k
T5	44.5±0.0577b	3.7±0.0577cd	15.6±0.0577b	229.8±0.0577b
T6	37.5±0.0577g	3.6±0.0577de	15.4±0.0577c	219.5±0.0577d
T7	47.8±0.0577a	4.5±0.0577a	16.4±0.0577a	243.8±0.0577a
T8	39.8±0.0577d	3.7±0.0577cd	14.8±0.0577d	195.8±0.0577f
T9	37.9±0.0577f	3.8±0.0577bc	15.4±0.0577c	180.6±0.0577h
T10	32.5±0.0577i	3.1±0.0577g	13.5±0.0577f	167.5±0.0577i
T11	27.8±0.0577k	2.8±0.0577h	12.7±0.0577g	131.2±0.0577j
T12	26.1±0.0577l	2.1±0.0577i	11.8±0.0577i	110.5±0.0577l

Table 1 shows the effects of different treatments on plant morphological attributes, specifically Fruit Weight (g), Fruit Diameter (cm), Fruit Length (cm), and Yield per Plant (g). Each treatment is listed with corresponding mean values ± standard error (SE), illustrating significant differences among treatments. Treatment T1 serves as the control, featuring 500 ppm saline without salicylic acid; T2 introduces 100 ppm salicylic acid; T3 includes 500 ppm saline; T4, 2500 ppm saline; T5, 5000 ppm saline; T6, 7500 ppm saline; T7 combines 500 ppm saline with 50 ppm salicylic acid; T8, 2500 ppm saline with 50 ppm salicylic acid; T9, 5000 ppm saline with 50 ppm salicylic acid; T10,

7500 ppm saline with 50 ppm salicylic acid; T11, 2500 ppm saline with 100 ppm salicylic acid; and T12, 7500 ppm saline with 100 ppm salicylic acid. Each entry shows mean values ± SE for Fruit Weight (g), Fruit Diameter (cm), Fruit Length (cm), and Yield per Plant (g), with groupings based on significant differences from ANOVA.

Result and Discussion

Table 1 shows how different treatments from T1 to T12 affected the morphological traits of the plants, specifically Fruit Weight, Fruit Diameter, Fruit Length, and Yield per Plant. Treatment T7, which includes 500 ppm saline with 50 ppm salicylic acid, delivered the best performance across all measured attributes, showing the highest Fruit Weight (47.8 g), Fruit Diameter (4.5 cm), Fruit Length (16.4 cm), and Yield per Plant (243.8 g). These results, marked by statistical grouping 'a,' were significantly higher than those of other treatments. In contrast, Treatment T12, featuring the highest saline concentration (7500 ppm) combined with 100 ppm salicylic acid, resulted in the lowest values across all parameters: Fruit Weight (26.1 g), Fruit Diameter (2.1 cm), Fruit Length (11.8 cm), and Yield per Plant (110.5 g), indicating severe stress and reduced plant growth and productivity. This was reflected in the statistical grouping 'l,' showing marked inferiority.

In contrast to some treatments with higher concentrations of saline or salicylic acid, including T2 and T6, the control treatment T1 showed moderate values but a better yield. The effects of intermediate treatments varied. Notably, the addition of salicylic acid at moderate saline levels (seen in T5 and T7) appears to buffer against the negative effects of saline, suggesting a protective role for salicylic acid against salt stress. The observed trends point to a complex interaction between salicylic acid and saline levels, where specific concentrations of salicylic acid may enhance tolerance to saline stress, thus improving plant morphology and yield. These findings support the hypothesis that salicylic acid can play a key role in bolstering plant resilience to abiotic stress, providing valuable insights for agricultural practices in saline conditions. Overall, the results emphasize the importance of optimizing both salicylic acid and saline levels to maximize plant growth and yield, underscoring the potential of targeted agronomic strategies to improve crop performance under stress.

Project Assignment

PCA, Dendogram and Correlation plot of the treatment dataset

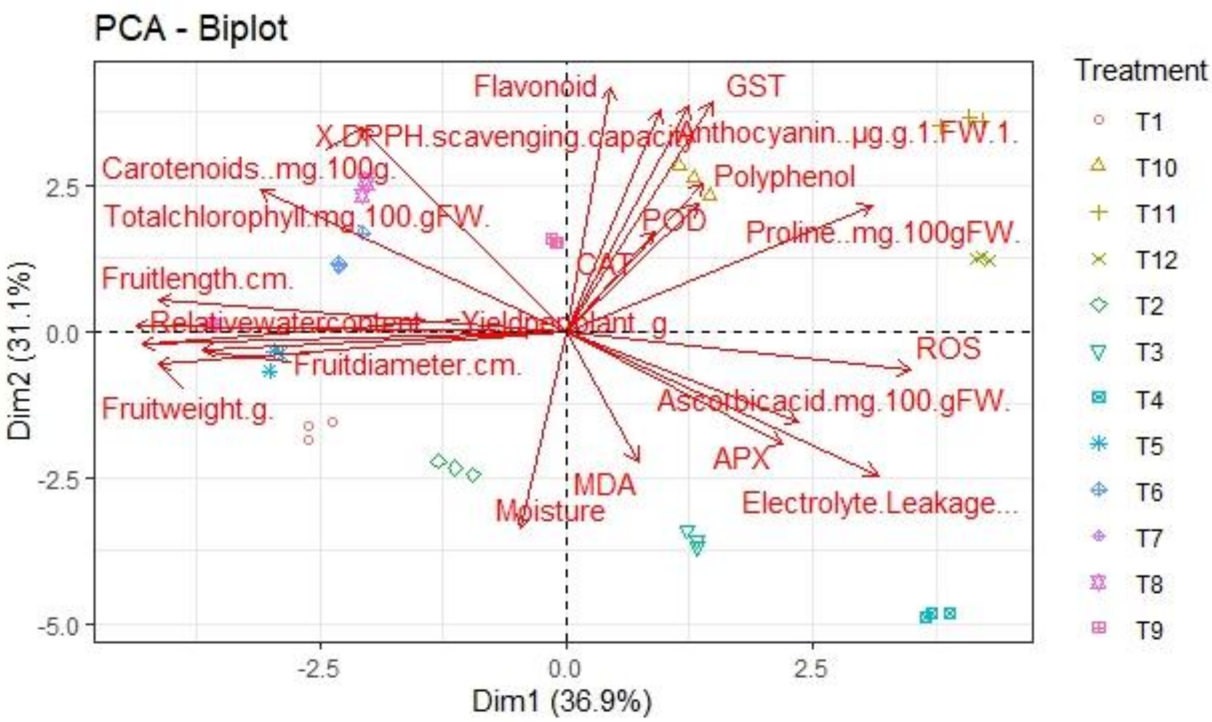

Figure. 1: PCA iplot illustrates the distribution of treatments and their associated trait responses. PC1 and PC2 account for 36.9% and 31.1% of the total variance, respectively. Traits such as flavonoid, GST, and anthocyanin are closely linked with treatments that involve higher levels of salicylic acid and salinity. In contrast, yield-related traits (like yield per plant and fruit weight) are more aligned with treatments involving lower saline levels. This visualization emphasizes the impact of salinity and salicylic acid on plant traits, revealing distinct clustering patterns among the treatments.

2. Correlation (Pearson)

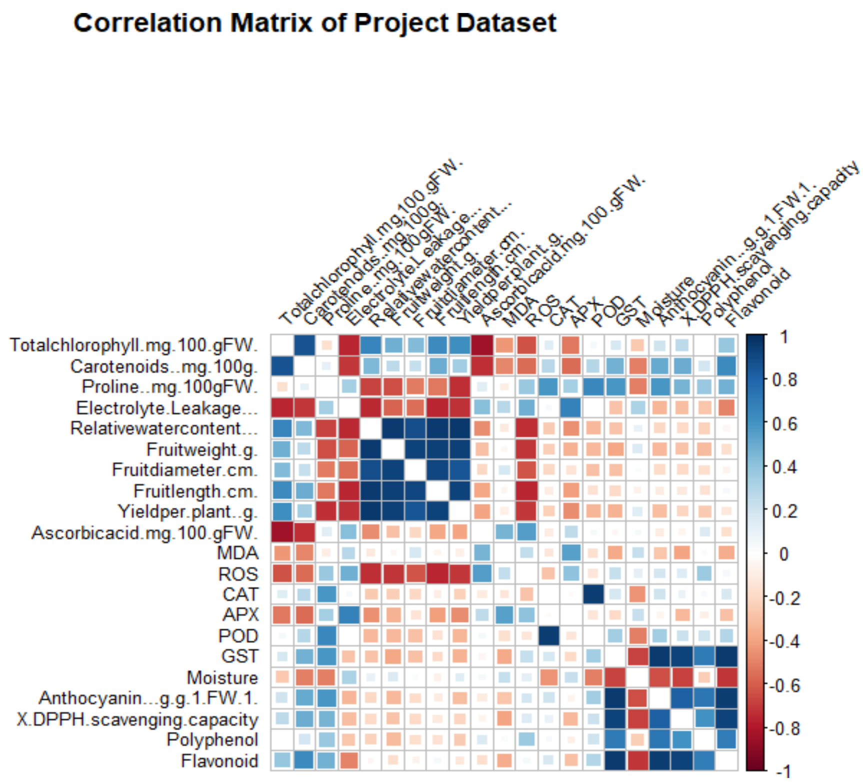

Figure.2: The project dataset's correlation matrix shows how distinct plant attributes relate to one another across treatments. Shades of blue and red represent positive and negative correlations, respectively; darker hues denote higher correlation values. Significant clusters emerge, with strong positive correlations observed among traits linked to fruit characteristics (such as fruit weight and fruit diameter) and biochemical components like polyphenol and flavonoid levels. This matrix offers insights into the interconnections between physiological and biochemical traits impacted by saline and salicylic acid treatments.

3. Dendogram

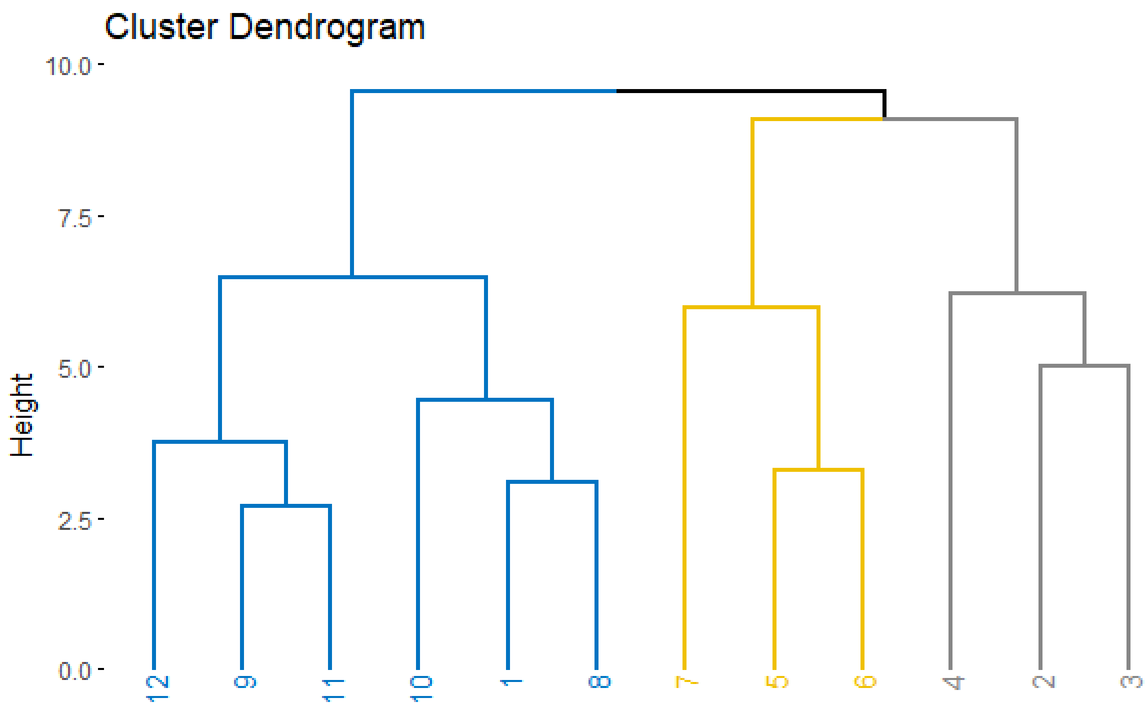

Figure 3: The hierarchical cluster dendrogram organizes treatments based on physiological and biochemical traits, grouping them according to their similarities. Treatments such as T12, T9, T11, T10, and T8 cluster together, reflecting similar stress response profiles under high salinity and/or salicylic acid conditions. Different reaction patterns are indicated by the various clusters formed by lower-salinity treatments, such as T3, T2, and T4. This dendrogram highlights treatments with similar stress adaptations and provides insights into how different salinity and salicylic acid levels impact clustering patterns.