Mitigation adverse effects of salt stress on *Prunus persica*. L Florida prince peach cultivar

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ABSTRACT:

Background and aim: Many horticultural plants, especially fruit trees, can have severely reduced growth, productivity, and fruit quality due to salinity. Methods:Under salt circumstances, soil applications of low spray irrigation systems, humic acid, Uni-sal, and mulching resulted in much higher vegetative growth than control, including shoot length, leaf number, and leaf area in shoots. Results: The maximum of photosynthetic pigments were obtained when using sprinkler irrigation systems and Uni-sal at a rate of 6 L/feddan in comparison with control and other treatments. All soil application treatments under salinity conditions led to a decreased proline content in the leaves of every peach tested cultivar in contrast to the control. Soil applications significantly increased potassium, calcium, magnesium, iron, and zinc while causing a decrease in chloride content as compared with control. The maximum values of fruit weight, fruit size, fruit volume, T.S.S.%, ascorbic acid, T.S.S/acidity ratio, and anthocyanin, while these treatments led to a decrease in total acidity percent when the trees received Uni-sal at a rate of 6 L/feddan and sprinkler water system, compared with control. The highest yield was obtained when both Uni-sal at a rate of 6 L/feddan and the sprinkler water system were used. Conclusion: The Florida Prince Peach cultivar may benefit from soil application to increase growth, productivity, and fruit quality in the face of salt stress under climate change condition.

Keywords*: Prunus persica.* L; Salinity; yield; soil application; Peach; EDX.

INTRODUCTION

Irrigated agriculture contributes more than 40% of global food output, making it critical to global food security (Wilson *et al.,* 2021). To meet the growing demand for food, irrigated land needs to expand from 202 million ha to 242 million ha by 2030 (Bruinsma, 2009; FAO News, 2021; Faurès *et al.,* 2002). Furthermore, in arid and semi-arid countries where irrigation is used for more than 90% of agriculture, the need for irrigation is higher. In addition, soil salinity and land degradation are more prevalent in these areas (Brady *et al.,* 2008). In irrigated drylands, a number of mechanisms—either working together or separately—promote human-induced secondary soil salinization (Cuevas *et al.,* 2019; Daliakopoulos *et al.,* 2016; Qureshi *et al.,* 2008). Peaches are cultivated in Egypt on recently reclaimed soils with a wide range of soil types add refer. In general, woody plants are salt-tolerant during the first germination stage of seed, but young seedlings are more sensitive at this time and progressively become more tolerant as they mature add refer. Temperate fruit trees are often sensitive to soluble salts and, in particular, chloride, and irrigation with saline water can diminish tree yields dramatically (Najafian *et al.,* 2008). Additionally, most stone fruit trees are susceptible to salt stress, and at salt concentrations above 1.5 dSm-1, yields regularly decrease until they reach less than half at 4 dSm-1 (Hassan and El-Azayem 1990). Prunus species belong to the salt sensitive species category, with varying degrees of salt tolerance. Different *Prunus* species that lose yield by 50% as a result of salt concentration (expressed as conductivity) (Kotuby-Amacher *et al.,* 2000). In large parts of Egypt's agricultural land, soil salinity is a big issue. Fruit tree production in salty soil requires particular treatments to increase growth, productivity, and fruit quality. To prevent or decrease the harm or to restore homeostatic circumstances in the new stressful environment is the first step toward to salt tolerance (Parida and Das, 2005). Many horticultural plants, notably fruit trees, are well known to be affected by salt. Due to the high salt content in the soil solution, osmotic stress increases, which is the principal harmful effect of salinity. Due to the ion toxic effects on physiological processes like growth control, photosynthesis, respiration, and enzyme activity, as well as the imbalance in total ion concentrations, the soil's water potential has decreased (Ali *et al.,* 2013). Many methods have been used to increase plant salt resistance

(Osman and Rady, 2012) To reduce salt in the soil, there has recently been a lot of emphasis on employing organic ingredients like humic acid and synthetic agrochemicals like Uni-sal. A component of organic soil matter called humic acid is crucial for soil fertility and has advantageous effects on the biological, chemical, and physical characteristics of soil. Additionally, the carbon and nitrogen cycles, as well as carbon sequestration, are impacted by the stability of these molecules. One strategy for countering the harmful effects of salt on plants is the administration of humic acid (HA) (Arjumend *et al.,* 2015). Humic compounds are the main source of organic carbon in the world and are produced through chemical and biological transformations of plant or animal sources. HA contains significant amounts of carbon, nitrogen, hydrogen, oxygen, and sulphur (Arjumend *et al.,* 2015). Because the "indole acetic" group is clearly present in its structure, HA exerts a hormone-like effect when applied to plants (Nardi *et al.,* 2002). Additionally, HA affects numerous biochemical processes in the cell wall, cell membrane, and cytoplasm (Bakhoum *et al.,* 2019). HA application has already begun to boost agricultural productivity in both conventional and non-conventional contexts, but research focusing on the influence of HA on salt tolerance of wild plants, particularly halophytes, are limited (Sera and Novak, 2011). Uni-sal is made up of polyethylene glycol (PEG), minerals, and amino acids. Uni-sal, which includes amino acids (gliteric acid), activates the plant by bio forming proline, which is one of the most significant amino acids that aids in the plant's resistance to most stresses, such as salt and drought (Shahein *et al* ., 2015). This study main goal is to find out how various soil amendments, including mushing, Uni-sal, humic acid, and spray irrigation affected the vegetative growth, yield, and fruit quality of "Florida Prince" peach trees cultivated in salt.

MATERIALS AND METHODS:

This study was carried out during the two successive seasons of 2018/2019 and 2019/2020 on ten-year old of (*Prunus Persica* L.) cv. Florida prince is grown in sandy loam soil in a private orchard located at Alkhatatbeh, Menofia Governorate, Egypt. To elucidate the effect of some anti-salinity agents on growth, productivity and fruit quality of cv Florida prince under salinity condition, the trees was planted at 3 × 5 meters apart (280 tree/fed.). Winter pruning system was carried out in the first of December in both seasons. All trees of peach are irrigated using drip irrigation system. The experimentation was done on nine trees (3 replicates each has 3 trees) for each treatment. The trees were similar in growth and receiving similar agricultural practices. A complete randomized block design was adopted, and Duncan multiple range test was used for comparing between the means of treatments. Chemical properties of irrigation water and soil experimental site are shown in Tables (1 and 2). This study included one experiments as soil application treatments.

Soil application experimental:

This experiment was done to study the effect of some anti-salinity agents such as Sprinkler irrigation, Uni-sal, mulching with black polyethylene sheets and humic acid on growth, yield and fruit quality of cv. Florida prince so, the peach trees were treated as following:

Control (the peach trees were untreated).

Using of sprinkler irrigation system under canopy of peach trees.

Addition of Uni-sal (2 liter /feddan) on January 15th (bud burst stage), where this treatment was repeated until maturity stage of fruits once every month, then after fruits harvested the treatment was repeated until August 1st once every month.

Mulching the soil with black polyethylene sheets 100 micron thickens on January 15th (bud burst stage).

Addition of Humic acid (2 liter /feddan) on January 15th (bud burst stage), where this treatment was repeated until maturity stage of fruits once every month, then after fruits harvested the treatment was repeated until August 1st once every month.

Thus, the experiment comprised of 5 treatments each replicated thrice with three peach trees per one replicated.

Effect of some anti-salinity agents as soil application on vegetative growth

Shoot length (cm): After vegetative bud burst, five shoots/trees were chosen at random and labelled to ascertain their maximum length (cm) at the beginning and conclusion of growth. In addition, the shoot growth rate was calculated by measuring the length of the shoot (cm) from the start of shoot growth to the end of shoot growth, as described in Ruiz *et al.,* (1997) as follows:

Shoot growth rate = shoot length/time period in days- = --- cm/day.

Number of leaves/ shoot: Five shoots/trees were identified at the start of development (within the spring flush), approximately uniform in width and length. At the end of each season growth, the number of leaves/shoots was counted.

Leaf area (cm^2): At the end of each growing season, the average leaf area (cm^2) was measured, and calculated using the following equation, which was adapted by LA (cm^2) = -0.5+ (0.23× L/W) + (0.67 × L×W) according to (Serdar and Demirsoy 2006): and the average was expressed as (cm^2). Where LA is a leaf area, L is leaf length and W is leaf width.

Photosynthetic pigments content of leaf:

Chlorophyll a, b, total Chlorophyll and Carotenoids contents were measured after thirty day used the method of (Lichtenthaler and Buschmann 2001). 0.2 g sample of fresh tissue of plant leaf was abraded in a mortar with 15 mL, acetone 80% and after filtering, its absorption was red by spectrophotometer UV-Vis model 715 Jenway at 470, 663 and 646 wave length for calibrating the device, we used acetone 80%. The concentrations of pigments were calculated using the following equations:

Chl, a = (12.25 A 663.2 - 2.79 A 646.8)

Chl, b = (21.21 A 646.8 – 5.1 A 663.2)

Car= 1000A 470- 1.8 chl,a – 85.02 chl,b

Where Chl, a, Chl, b, T, Chl and Carotenoids represent the concentrations of chlorophyll a, chlorophyll b, total chlorophyll and carotenoids. The measurements of photosynthetic pigments content were based on fresh weight.

***Proline content*:** Proline (μ mole / g) fresh weight was determined in approximately 0.5 g of leaf samples from each group was homogenized in 3% (w/v) sulphosalicylic acid, and the homogenate was filtered through filter paper. After adding acid ninhydrin and glacial acetic acid, the resulting mixture was heated at 100 C for 1 h in a water bath. The reaction was then stopped with an ice bath. The mixture was extracted with toluene, and the absorbance of the fraction with the 4 ml toluene aspired from the liquid phase was read at 520 nm. Proline concentration was measured with a calibration curve and expressed as micrograms of Proline per gram fresh weight. The proline concentrations was determine from standard curve and calculated on a fresh weight basis as follows **(** (μg proline /ml x ml toluene) / 115.5 μg /μ mole) / **(**(g sample) /5**)** = μ moles proline of fresh weight material. (Bates *et al*., 1973).

Photosynthetic pigment and proline content have been measured and recorded in the end of season.

Relative water content:

leaf relative water content (RWC) was calculated according to Yamasaki and Dillenburg (1999) method. Two leaves were randomly chosen from middle parts of the shoot. At first, leaves were separated from the stems and their fresh masses (FM) were calculated. In order to measure the saturation mass (TM), they were placed into the distilled water in closed containers for 24 hours under the air condition of 22° C, for the purpose of being reached to their greatest amount of saturation mass and then, they were weighed. Then leaves were placed inside the electrical oven for 48 hours under the air condition of 80° C and the dry mass of the leaves (DM) were obtained (DM). All of the measurements were done by scales with 0.001g accuracy and were placed into the following formula: RWC (%) = [(FM-DM) (TM –DM)] ×100.

Nutrient contents of leaf:

elements in leaves of cv. Florida prince. Estimation accumulation of some elements such as N, P, Ca, Mg, Fe, Mn, Zn, in leaf of .*Florida prince* cv by using (EDX).The samples were examined under X- ray microanalyzer (Module Oxford 6587 INCAx-sight) attached to JEOL JSM-5500 LV scanning electron microscopy at 20KV at Regional Center of Mycology and Biotechnology, Cairo, Egypt.

Yield and fruit quality:

Total Yield: The yield per tree was individually weighed and the average yield per a tree was adjusted. Average yield per feddan was estimated by using yield per tree and the number of trees per feddan in tons at harvesting date. Yield increasing % must be calculated.

Fruit physical characteristics: At harvest, ten fruits were randomly selected per tree to determine the morphological and biochemical parameters of the fruit. The physical characteristics involved: Fruit weight (g), fruit width (cm), fruit length (cm) and fruit volume (cm^3).

Fruit biochemical characteristics: TSS (%) and total acidity (%), T.S.S / acid ratio, fruit firmness and Anthocyanin content**.** The biochemical components were determined as follows:

***Total soluble solids percentage*:** Total soluble solid percentage was determined in 10 ml. of filtrate of fruit juice by using refractometer apparatus as described in **(A.O.A.C, 2005).**

Total acidity%: Total acidity percentage was determined in 10 ml. of berry juice. Titration method was used. The berry sample mixed with 100 ml distilled water. Total acidity percentage was measured by titration using 0.1 N NaOH. The total acidity was expressed malic acid, equivalent to g/100 ml. juice, as outlined in (A.O.A.C, 2005).

***Fruit firmness*:** Each fruit firmness (lb/in^2) was assessed on two opposing sides of the equatorial area with an 8 mm dip penetrometer (Magness Taylor, Japan).

***Anthocyanin Content*:** 0.5 g of peach fruit peel samples were immersed in 10 mL of methanol: n hydrochloric acid (99:1, v/v) for 10 minutes. The extractions were carried out in the dark at 4 °C overnight. A spectrophotometer UV-Vis model 715 Jenway was used to measure the absorbance of each extract at 530 nm. The following formula was used to standardize the relative anthocyanin content.

Anatomical study:

***Scanning Electron Micrograph*:** The specimens were coated by gold sputter coater (PSI-Module, USA). A fully computer-controlled scanning electron microscope (Model: JSM-5500 LV, JEOL, Ltd. - Japan). Using high vacuum, it was scanned with the electron beam at 30 kV from different angles. The SEM photograph was conducted at the Regional Center of Mycology and Biotechnology, Al-Azhar University, Cairo, Egypt.

Statistical analysis:

The data of all parameters were input into Co-Stat software. Then, the replicated average values of all parameters data were subjected to analysis of variance (ANOVA) to determine the significance of measured parameters. LSD at 5% test was used for statistical Analysis according to Stern (1991).

RESULTS AND DISCUSSION

Effect of some against-salinity treatments on vegetative growth of *Florida prince*.L cv peach

The data in Fig. 1 (A, B, and C) indicated that under salinity conditions, soil application of mulching, humic acid, uni-sal, and spray irrigation greatly boosted all vegetative growth such as shoot length and leaf number. At the same time, leaf area (cm^3) was increased by using soil application such as mulching, humic acid, uni-sal and sprinkler irrigation under salinity conditions of *Florida prince* peach cv compared with control in the two studied seasons. Uni-sal and Sprinkler irrigation treatments possessed the highest shoot length, leaves number and leaf area (cm^3) of *Florida prince* peach cv, compared with control and other treatments. These findings are consistent with those made by Ennab (2016), who found that adding various concentrations of humic acid to the soil around Egyptian lime trees (*Citrus aurantifolia* Swingle) exposed to salt stress led to a significant increase in the size and growth of the trees relative to the control in terms of shoot length, leaf number/shoot, leaf area, and canopy volume. Furthermore, Abobatta, (2015) reported that using humic acid as an anti- salinity application method possessed the highest tree canopy volume of Valencia Orange Trees (*Citrus Sinensis* L.) under salinity conditions compared with those of control and other treatments. As well as, Fathy *et al.,* (2010) concluded that humic acid application levels from 0.0 to 75 cm3/tree to soil had a positive effect on leaves number per shoot and leaf area of Canino apricot trees compare with control. In the same line, Soliman *et al.,* (2017) illustrated that adding 30 cm^3/ tree of uni-sal at gave the highest value of leaves number and leaf area of Florida Prince, compared with those of control. Moreover, Ali *et al.,* (2013) studied the effect of adding Uni-sal at concentration 6 liter/feddan at three times i.e. growth start, after berry set and three weeks later after setting, on growth of Thompson seedless grown under salinity condition. They indicated that Uni-sal significantly increased shoot length, total leaf area/vine and coefficient of wood ripening compared to control. Also, Masoud and Abdelaal (2014) discovered that mulching the soil with black polyethylene sheets improved red globe grapevine growth characteristics over control, including main shoot length (cm) and leaf area (cm2). Several studies have demonstrated that saline stress reduces the number of leaves, growth, and area of leaves on fruit trees, since salts block activities that lead to the creation of gibberellins and cytokinins, which are responsible for the formation of shoots and branches in the plant (Bastam *et al.,* 2013; Hajiboland *et al.,* 2014). So, the favorable impact of anti-salinity compounds like humic acid and its role in enhancing plant development by boosting nutrient absorption may explain the rise in shoot length (cm). Furthermore, increased nutrient absorption (such as nitrogen) was revealed to be the major cause for higher vegetative development when potassium humate was utilized, and humic acids, such as gibberllic acid, may be used as a growth regulator to boost plant growth and stress tolerance. Humic acids could be used in combination with gibberllic acid as growth regulators to enhance plant growth and stress tolerance. The key factor that improved shoot growth was nitrogen uptake (Mackill *et al.,* 2010). Furthermore, mulching provided a favorable growth environment, resulting in more robust, healthier plants that may be more resistant to pest harm, as well as enhanced soil temperature and moisture content, which promoted root development, resulting in more plant growth Sharma and Bhardwaj (2017).

Effect on Photosynthetic pigments (mg /100g f.w) of peach leaf:

Data in Fig. (2A, B, C, and D) demonstrated that mulching, humic acid, Uni-sal, and spray watering significantly increased chlorophyll (a), chlorophyll (b), total chlorophyll, and carotenoids of Florida prince peach cv in the two examined seasons compared to control. Humic acid and Sprinkler irrigation treatments possessed the highest chlorophyll a of tested cultivar compared with those of control and other treatments. These findings are consistent with those obtained by AbdEl-Hameid and Adel (2018) who recorded that application of humic acid at concentrations 20 and 40 ml/ tree/season increased total chlorophyll content of Keitt mango trees as compared to control. In the same line, Soliman *et al.,* (2017) found that adding humic acid on peach tree lead to an increase in leaf- photosynthetic pigments, while causing a decrease in proline content compared with control. Additionally, according to Soliman *et al.,* (2017), adding Uni-sal to Florida prince peach trees at a rate of 30 cm3/tree resulted in a considerably higher level of total and leaf chlorophyll (a and b) than the control. Abdelaal *et al.,* (2013) tested the impact of mulching with black polyethylene sheets on leaf biochemical content of superior grapevines. They revealed that mulching increased the total chlorophyll and percentage of N, P and K in the leaves compared to the control. Furthermore, Abdelaziz *et al.,* (2017) asserted that mulching (using black or blue polyethylene sheets) to reduce weeds resulted in an increase in total chlorophyll and chlorophyll a and b when compared to control. Other than that, a higher osmotic effort from increased soil salinity could prevent the plant from absorbing as much water. As salt accumulation lowers the levels of chlorophyll pigment in plants' leaves due to an increase in sodium concentration, which inhibits the activity of the enzymes that form the chlorophyll pigment, as well as a decrease in stem cells' bulging effort, which results in less cell elongation and, as a result, a decrease in plant height rate (David and Nilsen, 2000; Ramoliya and Pandey, 2003). So, increased mineral transport, improved protein synthesis, hormone-like activity in plants, promoted photosynthesis, modified enzyme activities, solubility of micro- and macro-elements, decreased active levels of toxic minerals, and increased microbial populations are some of the direct and indirect benefits of HA on plant growth and development (Abd Hamideh *et al .,* 2013).In terms of using humic acid in conjunction with various salinity levels, it appears that humic acid can aid respiration and photosynthetic processes by altering mitochondrial and chloroplast activity (Orlov *et al .,* 2005). As a result, the usage of humic acid can reduce the harmful impacts of biotic stressors on plants (Ferrara and Brunetti 2008). Mulching is a beneficial strategy that has the ability to conserve moisture, reduce evaporation, change soil temperature, improve aeration, and release nutrients in the soil profile (Sharma and Bhardwaj 2017). Soil mulch improved photosynthetic net (Pn) rate, delayed salt buildup, raised soil warmth, and reduced moisture loss (Dong *et al.,* 2009). The use of polyethylene film (plastic mulching) grows leaf area and chlorophyll levels. When compared to no mulch, these advantages were mostly attributable to a delay in salt buildup, an increase in soil warmth, and a reduction in moisture loss (Dong *et al.,* 2009). By holding onto moisture and assisting in temperature regulation, mulch also enhances the physical, chemical, and biological qualities of soil, as well as the development and yield of crops. Mulch also improves the soil's physicochemical and biological properties by supplying it with nutrients (Dilip Kumar *et al.,* 1990). Numerous theories have been proposed to explain the benefits of Uni-sal and humic acid, including higher nutrient and fertilizer uptake in plants, increased salt tolerance via promoting osmotic adjustment, and increased soil capacity to remove salts Munir and Aftab (2009). The significant effect of HA on photosynthetic pigments may result from an increase in photosynthetic rate and CO_2 assimilation (Tehranifar and Ameri, 2012).

Proline leaf content (mg/g FW):

According to data in Fig. 3, in the two study seasons of 2018/2019 and 2019/2020, mulching, humic acid, uni-sal, and spray watering significantly reduced the proline content of Florida Prince Peach cv as compared to control. These outcomes are comparable to those attained by Mehanna *et al.,* (2010) who investigated the impact of adding Uni-sal at a rate of 5 cm per tree vine on the biochemical content of the leaves of the two rootstocks grape in saline water. They showed that compared to control, Uni-sal dramatically decreased proline in leaves. Additionally, according to Ali *et al.,* (2013), applying Uni-sal at a concentration of 6 liters/feddan three timesat the beginning of growth, after berry set, and after three weeks—reduced the accumulation of proline amino acid content in Thompson Seedless grapevines when compared to control treatment. Likewise, Soliman *et al.,* (2017) discovered that applying humic acid to peach tree larvae reduced their proline levels in comparison to the control treatment. The impact of applying Uni-sal at rates of (12, 18, 24, and 30 cm/tree) on the biochemical composition of Valencia orange leaves was investigated by Abd El-Hamied (2014). He drew attention to the fact that Uni-sal had lower leaf-Na and proline content than the control treatment. Additionally, Abd El-Hamed et al. (2017) investigated how applying Uni-sale at a rate of 7.9 L/fed affected the biochemical composition of some leaves on Murcott mandarin trees grown under salt stress. In comparison to control, they discovered that Uni-sal reduced leaf proline content and lessened the effects of salt stress. Also, Soliman *et al.,* (2017) indicated that adding Uni-sal at rate 30 cm^3/tree to Florida prince peach trees significantly decreased leaf-Na and proline content as compared to the control

One of the most common responses to water scarcity and saline conditions is the accumulation of proline in the control trees, which serves as a compatible solute, an osmoprotectant, and a protective agent for cytosolic enzymes and cellular organelles (Jimenez-Bremont *et al.,* 2006). Proline is also a nitrogen source that can be used to support the body's ability to recover from stress and grow once more (Trotel *et al.,* 1996). Proline buildup caused by salt is typically a late reaction, showing up only after cells have been damaged and elevated amounts of proline have been present for an extended period after being stressed tissues long enough. The osmotic conditions have restored to normal. (Trotel *et al.,* 1996). Proline accumulation in stressed tissues is thought to have a variety of roles, including osmotic adjustment, protein and cell membrane stabilization, free radical scavenging, improved stability of several cytoplasmic and mitochondrial enzymes, greater protein and enzyme protection (Sakr *et al.,* 2012; Ozdemir *et al.,* 2004). Furthermore, humate treatment in the soil reduced the harmful consequences of any stress (unfavorable temperature, pH, and salinity) Serenella *et al.,* (2002). Uni-sal includes polyethylene glycol (PEG), as well as certain minerals and amino acids, which reduce the osmotic potential of nutritional solutions and increase osmotic stress tolerance (Munir and Aftab, 2009).

Leaf nutrients content:

Data in Table (5) showed that under salinity circumstances, using mulching, Humic acid, Uni-sal, and spray irrigation significantly increased element accumulation in leaves of Florida prince peach cv such as K, P, Ca, and Mg., while these treatments resulted in a decrease in the accumulation of specific elements such as Cl and Na when compared to the control in the two seasons investigated (2018/2019 and 2019/2020). These outcomes were in conformity with the report Abdelaziz *et al.,* (2017) who found that using both humic acid an or mulching caused an increase in accumulation of some elements macro and micro elements in leaf of superior grapevines compared with control. According to Ennab (2016), humic acid treatment at a rate of 20 mL/tree has a lot of promise for reducing salt stress on the development and production of Egyptian lime trees in saline soil. Also, Abd El-Razek *et al.,* (2012) showed that adding humic acid from 0.25 to 0.50% led to an increase in NPK accumulation in the leaves of a peach tested cultivar compared with control. Furthermore, Soliman *et al.,* (2017) demonstrated that the use of humic acid and Uni-sal increased the accumulation of several elements in the leaves of examined peach cultivars. Grown on salty clay soil, the Uni-sal treatment outperformed the control in terms of vegetative growth metrics, leaf-N, K, Ca, Mn, and Zn concentrations, and other treatments. By reducing H_2O_2 production, K and HA from an external source reduced oxidative stress. The overactivation of plasma membrane K and Ca permeability cation channels such GORK, SKOR, and annexins has been linked to excessive ROS generation. This causes an excessive outflow of K from these channels, resulting in apoptosis. (Lee *et al.,* 2017) Uni-sal contains polyethylene glycol (PEG), several metals, particularly Ca, and amino acids. The effect of unproductive Uni-sal was due to its ability to lower the osmotic potential of nutritive solutions and increase tolerance to osmotic stress (Munir and Aftab, 2009). By reducing runoff, soil loss, weed invasion, and water evaporation, mulching also stops soil deterioration. It therefore enhances the physical, chemical, and biological characteristics of soil, adds nutrients to the soil, permits more soil moisture retention, aids in regulating temperature changes, and ultimately leads to an improvement in crop development and output (Dilip Kumar *et al.,* 1990). Humic acid is the most active component of soil and compost organic matter., Influence on plant growth can be classified as direct or indirect under salt condition. Direct effects include various biochemical actions that stimulate plant growth and yield by acting on mechanisms involved in cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, and enzyme activities of the cell. Indirect effects include soil nutrient enrichment, microbial population growth, increased cation exchange capacity, and soil structure improvement. Direct effects include various biochemical processes that stimulate plant growth and yield by acting on mechanisms involved in cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, enzyme activities of the cell wall membrane or cytoplasm, and are primarily hormonal in nature. Indirect effects include soil nutrient enrichment, microbial population growth, increased cation exchange capacity, and soil structure improvement (Nardi *et al.,* 2002).

Effect on fruit physical characteristics of Florida prince peach cv.:

Data in fig. (4) showed the effect of soil application of mulching, humic acid, Uni-sal and sprinkler irrigation on fruit Physical characteristics of *Florida prince* peach cv under salinity conditions. It was clear that adding all treatments to the soil under salt condition caused the improvement of fruit weight, fruit volume; fruit size; h.d fruits and yield of tested cultivar compared with control. The results indicated that both Uni-sal and sprinkler irrigation possessed the highest value of above physical parameters on fruits of tested peach cultivar as compared to the results of the control and other treatments. These findings are consistent with those obtained by researchers Ali et al., (2013) on vine and Sheren (2014) on Valencia orange. They cleared that high level 9 liters/feddan of humic acid and 6 liters/feddan of Uni-sal caused a decrease in salt impacts and improved tree via enhanced efficiency yield and number of fruits/tree. In addition, Soliman et al., (2017) reported that adding Uni-sal to the tested peach cv. led to an increase in fruit set percent, fruit weight, and yield, as well as the lowest pre-harvest fruit drop percentage, compared with control. The presence of carboxylic and phenolic groups in humic acids, which boost H+-ATP activity in root cells and increase nutrient absorption capacity, may be responsible for the rise in output (Canellas *et al.,* 2002).

Chemical characteristics:

The influence of mulching, humic acid, Uni-sal, and sprinkler irrigation on fruit Chemical characteristics of Florida prince peach c**v** Under salinity conditions was demonstrated in fig. (5).It was obvious that in comparison to the control, applying all treatments to the soil under salt conditions improved the T.S.S %, total acidity, T.S.S / Acid ratio, ascorbic acid, fruit firmness (lb/in^2) and anthocyanin (mg/g F. W.) content of the studied cultivar. When compared to the results of the control and other treatments, the results showed that both Uni-sal and sprinkler irrigation had the greatest value of the above Chemical parameters on fruits of the tested peach cultivar. These results are consistent among those Abobatta (2014), who found that both humic acid and Uni-sal enhancement nutrient cycling, growth, and fruit quality in Valencia orange trees (*Citrus sinensis* L) by improving soil microbial activity. Furthermore, Ali et al., (2013) found that soil application by adding 9 and 6 liters/feddan of humic acid and Uni-sal respectively caused an increase in growth, yield, and fruit quality of the grape tested cultivar compared with control and other treatments. Additionally, Sheren (2014) illustrated that adding 30 and or 40 ml Uni-sal as soli application to adverse salt stress for Valencia orange trees led to an increase in vegetative growth parameters, photosynthetic pigments, number of fruit per tree, and T.S.S percentage, while causing a decrease in total acidity compared with control.

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Table 1: Chemical analysis of irrigation water in the experimental site.

pH	EC dS/m	Ca^{++} (mg/L)	Na^{+} (mg/L)	Mg^{++} (mg/L)	Cl^{-} (mg/L)	CO_3- (mg/L)	HCO_3^- (mg/L)	$CaCo_3$ (mg/L)
7.42	3	172	415.85	48	607.1	100	170.8	528.4

Table 2: Chemical characteristics of soil experimental site.

Soil texture	EC (dS/m)	pH (1:2.5)	Soluble cations (meq/L)				Soluble anions(meq/L)			SAR* (meq/L)
			K^{+}	Ca^{++}	Mg^{++}	Na^{+}	Cl^{-}	HCO_3^-	SO_4^-	
Sandy loam	3.5	8.3	0.35	6.95	3.91	21.35	15.1	5.49	11.97	9.16

(*)SAR: is sodium adsorption ratio.

Table 5: Effect of some soil application on accumulation of elements characteristics of Florida prince cultivar growing under salinity conditions:

	Season 2019								
Treatments	Potassium%	Magnesium%	Silicon %	Sulfur %	Color%	Calcium%	Iron%	Copper%	Zinc
Control	26.88	11.44	5.1	2.4	20.13	11.00	1.29	4.011	2.44
Mulching	30.91	12.31	3.85	0	17.22	11.20	0.75	3.122	2.15
Humic Acid	31.98	15.33	5.70	3.89	10.62	13.22	1.24	7.441	5.50
Unisal Component	36.20	13.90	7.66	2.80	8.221	15.32	1.20	3.122	2.66
Sprinkle irrigation	41.52	12.82	5.18	2.69	7.20	15.66	0.89	6.331	3.33
LSD at 0.5 %	0.38	0.44	0.52	0.09	0.816	0.31	0.04	0.17	0.12
	Season 2020								
	Potassium%	Magnesium%	Silicon %	Sulfur %	Color%	Calcium%	Iron%	Copper%	Zinc
Control	28.96	12.66	4.93	2.70	19.53	13.00	1.46	4.767	2.967
Mulching	31.06	14.46	6.76	0	17.16	13.40	1.46	3.467	2.333
Humic Acid	33.10	17.73	6.60	4.26	9.53	15.133	0.867	8.133	5.8
Unisal Component	38.80	16.70	8.23	3.00	19.47	17.033	1.367	3.467	2.933
Sprinkle irrigation	45.26	14.33	6.76	3.16	6.80	17.067	1	7.033	3.633
LSD at 0.5 %	1.60	1.87	0.93	0.162	0.15	1.45	0.08	0.28	0.14

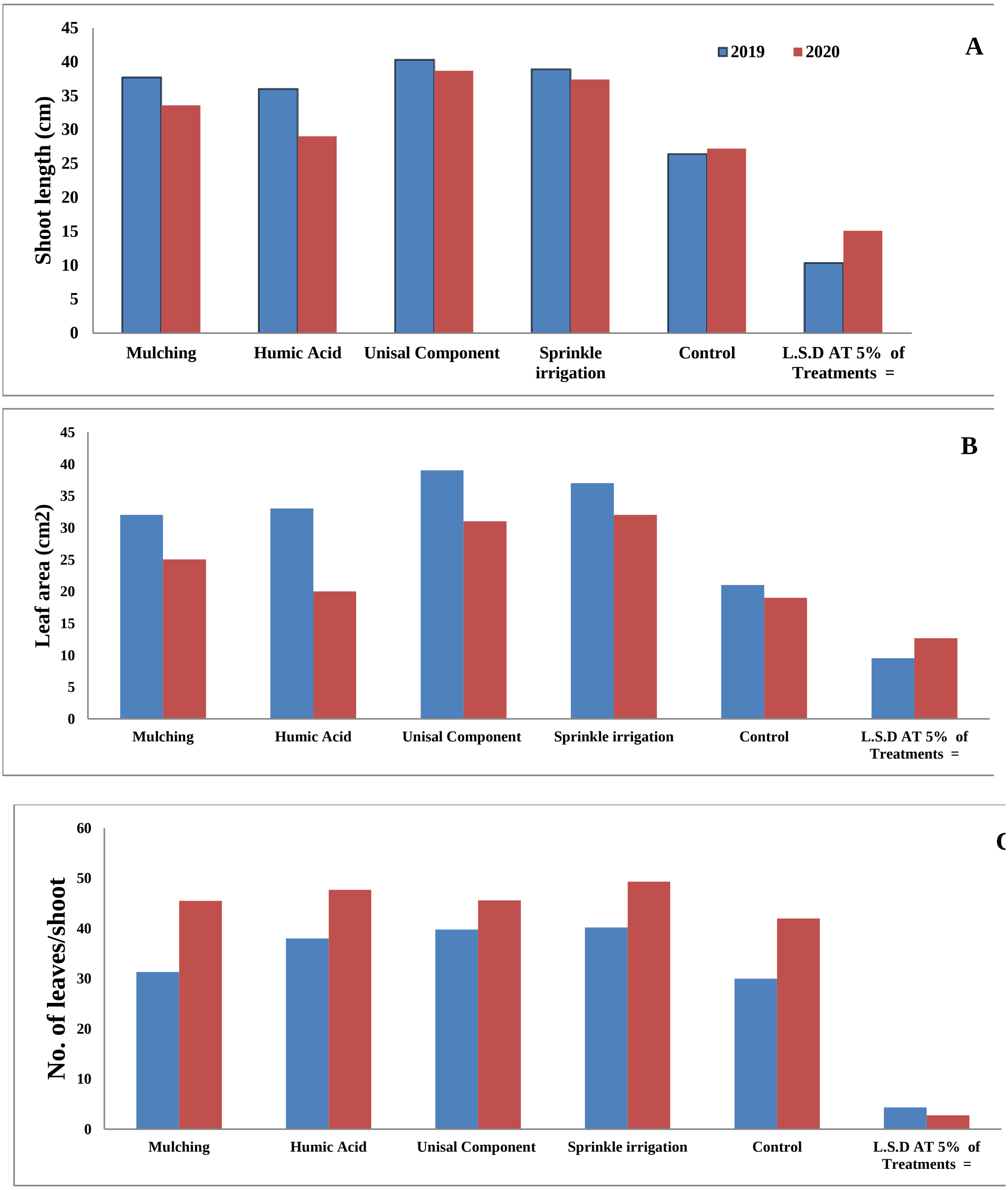

Figure 1: Effect of some against-salinity treatments as soil application on vegetative growth of cv *Florida prince* peach during 2019/2020 season.
Shoot length (cm), B): Leaf area (cm^2) and No. of leaves/shoot.

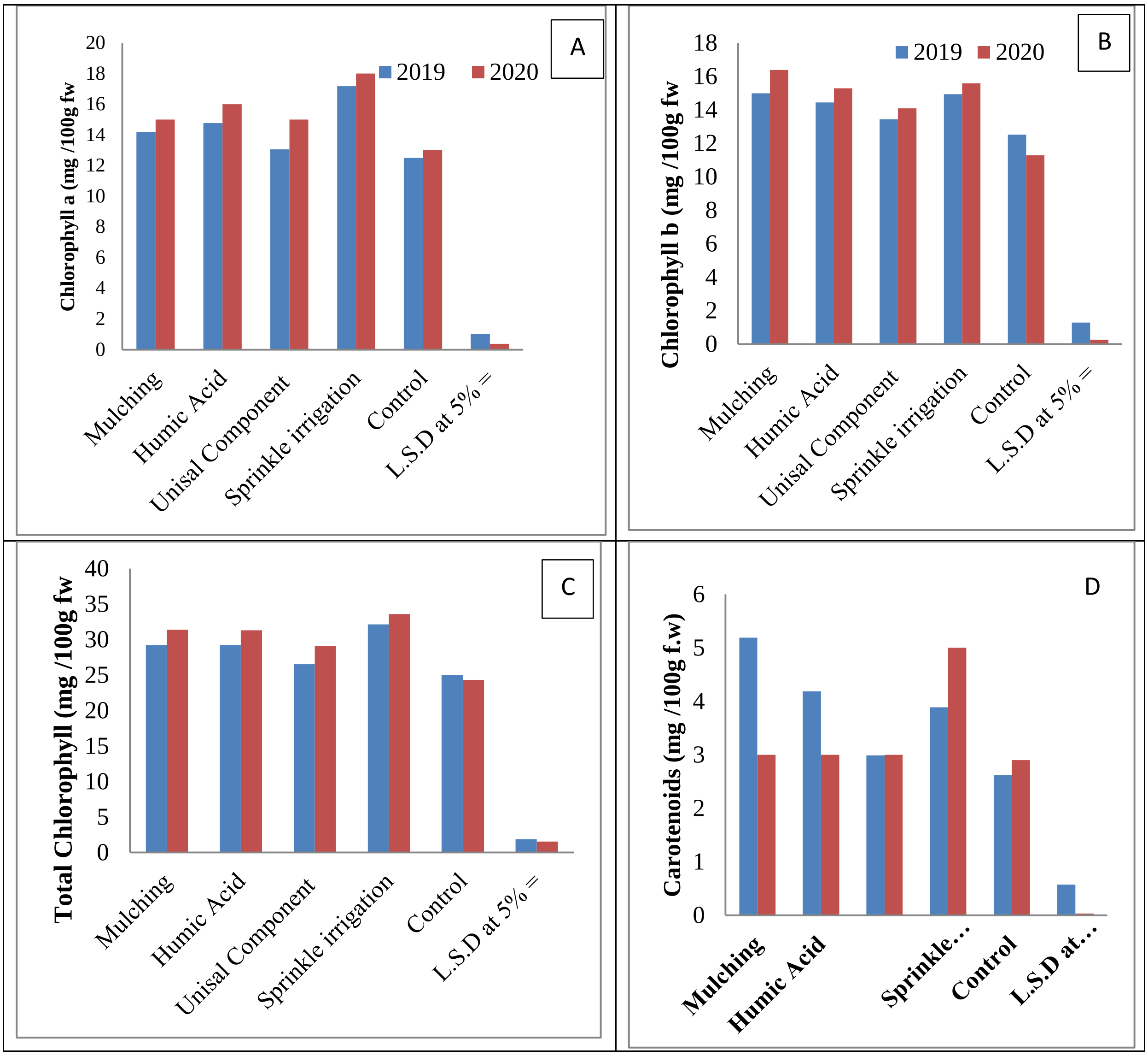

Figure 2: Effect of some against-salinity treatments as soil application on Photosynthetic pigments of Florida prince peach CV during 2019/2020 season.
A): Chlorophyll a (mg /100g fw), B): Chlorophyll b (mg /100g fw, C) Total Chlorophyll (mg /100g fw) and D): Carotenoids (mg /100g f.w).

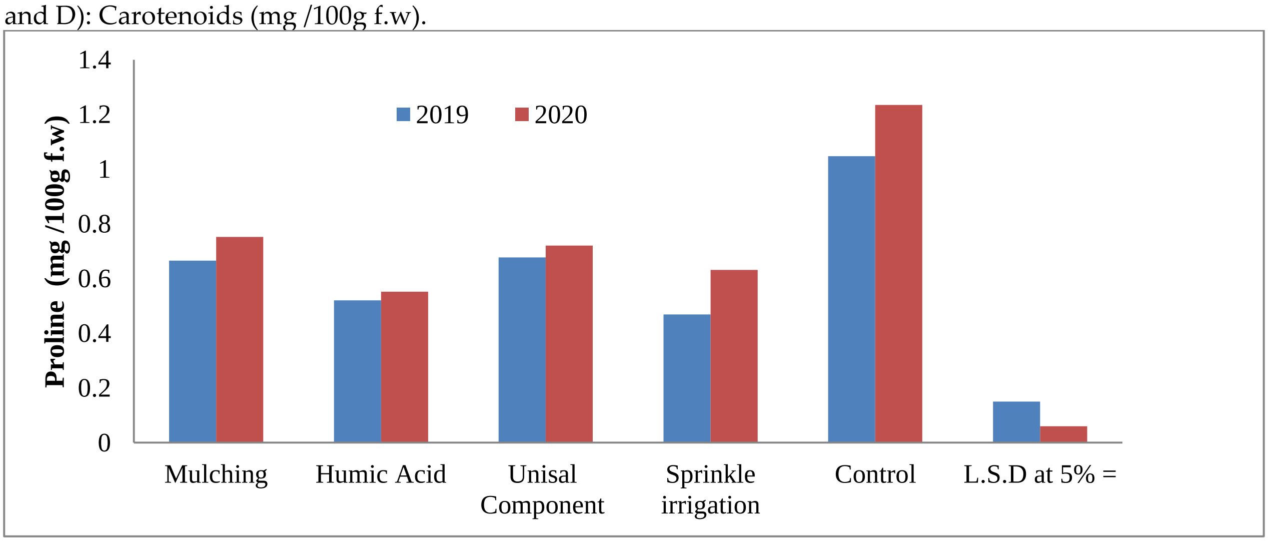

Figure 3: Effect of some against-salinity treatments as soil application on proline of Florida prince peach CV during 2019/2020 season.

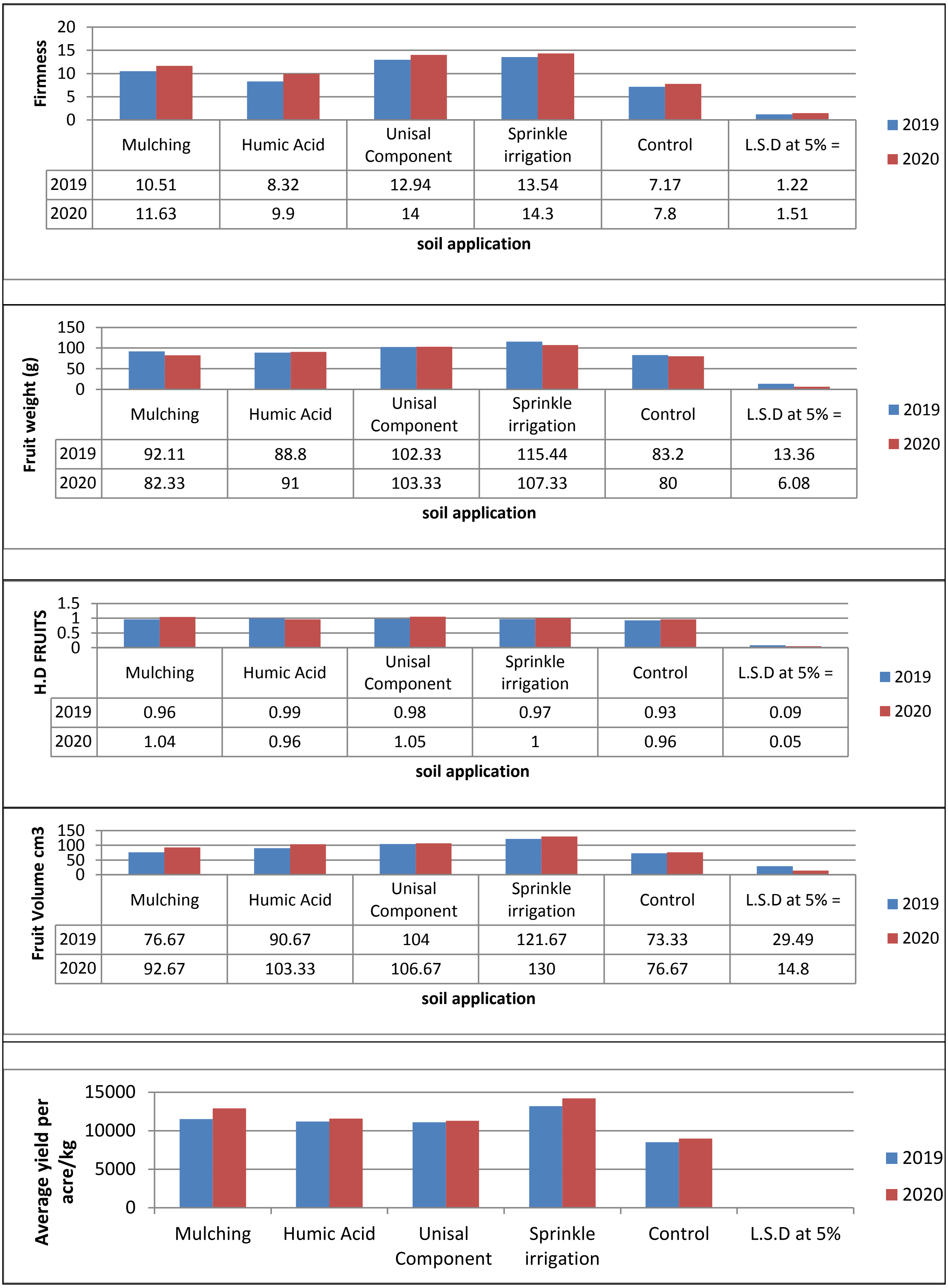

Figure 4: Effect of some against-salinity treatments as soil application on fruits Physical characteristics of *Florida prince* peach CV during 2019/2020 season.

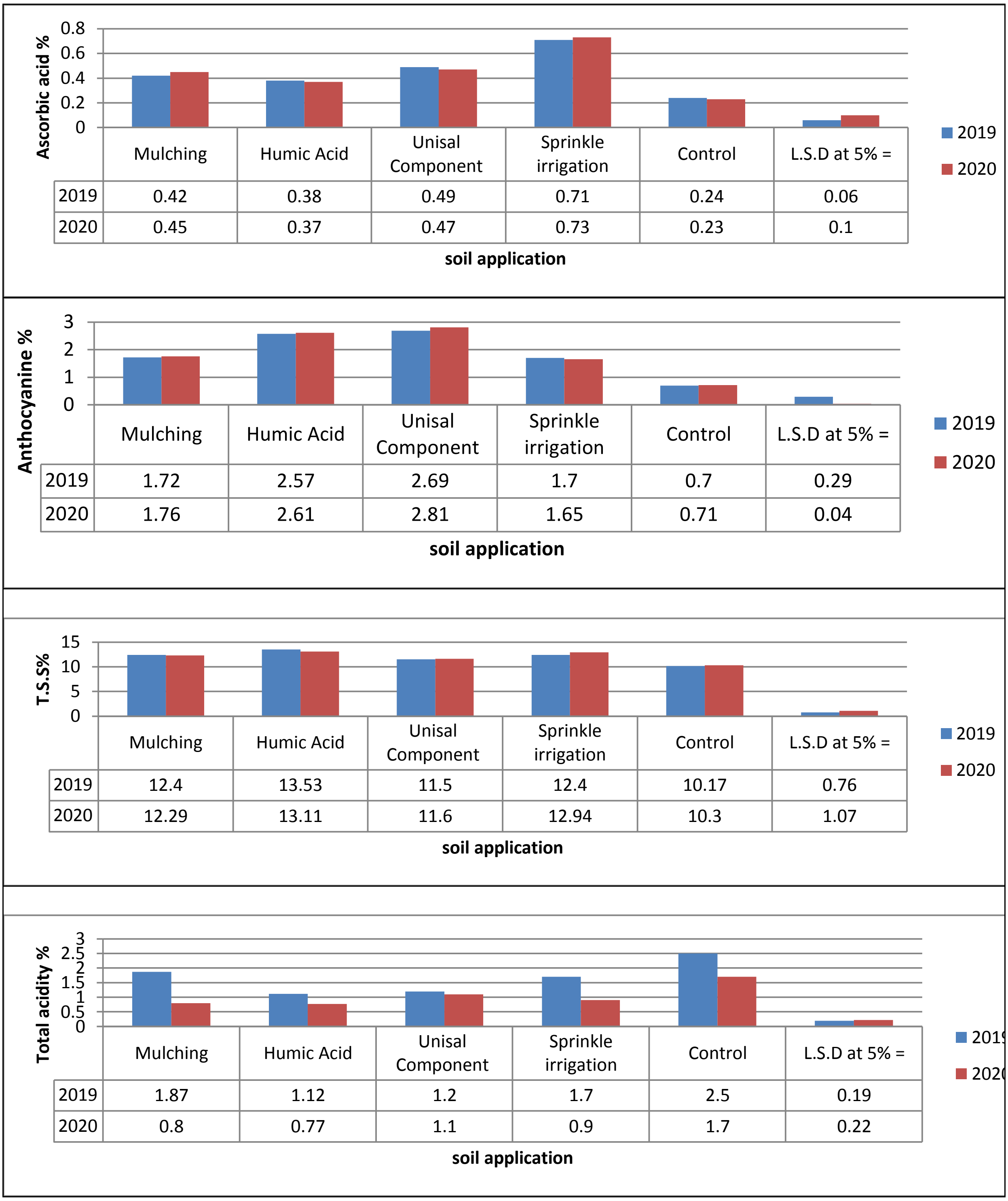

Figure 5: Effect of some against-salinity treatments as soil application on fruits chemical characteristics of *Florida prince* peach cv. during 2019/2020 season.

التخفيف من الاثار الضارة للاجهاد الملحي لصنف الخوخ فلوريدا برنس

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الملخص العربي

الاجهاد الملحي يؤدي الى ضعف في التنو والانتاجية وجودة الاشجار المثمرة , وهذه المشكلة الفسيولوجية تؤدي الى انخفاض جودة الثمار للمحصول المنزرع. أدت تطبيقات التربة لأنظمة الري بالرش المنخفض ، وحمض الهيوميك ، يوني سال ، والتغطية تحت ظروف الملوحة إلى زيادة النمو الخضري بشكل ملحوظ مثل طول الساق في بداية دورة النمو ، وطول الساق ، وعدد الأوراق ، ومساحة الأوراق في الفروع فمقارنة بالاشجار غير المعاملة .أدت المعاملة بمركب يوني سال بمعدل 6 لتر للفدان واستخدام الري الضبابي اعلى سطح التربة الى زيادة معنوية في الكلوروفيل بينما قللت من محتوى الاوراق من البرولين مقارنة بالكنترول والمعاملات الاخري. أدت تطبيقات التربة إلى زيادة معنوية في البوتاسيوم والكالسيوم والمغنيسيوم والحديد والزنك بينما تسبب في انخفاض محتوى الكلوريد مقارنة بمجموعة التحكممقارنة بالاشجار غير المعاملة .القيم القصوى لوزن الثمرة (جم) ، حجم الثمرة (سم) ، حجم الثمار ، T.S.S٪ ، حمض الأسكوربيك ، نسبة T.S / الحموضة ، والأنثوسيانين ، بينما أدت هذه المعاملات إلى انخفاض في نسبة الحموضة الكلية ،باستخدام مركب اليوني سال والري الضبابي مقارنة بالاشجار غير المعاملة والمعاملات الأخرى.عند المقارنة بالاشجار الغير معاملة والمعاملات الأخرى ، تم الحصول على أعلى محصول عند استخدام كل من Uni-sal بمعدل 6 لتر / فدان ونظام مياه الرش. أخيرًا ، يمكن التوصية بأن تطبيقات التربة تعمل على تحسين النمو ؛ الإنتاجية وجودة الثمار لصنف الخوخ فلوريدا برنس تحت ظروف التغيرات المناخية والاجهاد البيئي.

الكلمات الاسترشادية: الملوحة والمحصول والتطبيقات الارضية , الخوخ , تقدير العناصر بالماسح الالكتروني.