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EFFECT OF ANTI-STRESS ON THE GROWTH AND YIELD OF SWEET AND HOT PEPPERS AND ITS CONTENT OF PEROXIDASE AND IAA

Maryam Sami Elias[1] and Rawaa Ghalib Majeed AL- helfy[2]

[1,2]Department of Horticulture and Landscape Gardening, College of Agricultural Engineering Science, University of Baghdad, Iraq

Email : mareamsami@gmail.com

Abstract

A field study was conducted during the fall season of 2016-2017 at the experimental station, horticulture and landscape gardening, College of Agriculture, Aljaderea, Baghdad, to study the effect of three types of anti-stress (super active, terra- sorb and humestar) interfere with soil fertilizer NPK18:18:18, as well as treatment of adding NPK fertilizer and control treatment on Sweet and chili Pepper. The data obtained was statistically analyzed by using the analysis of variance methods. Means were compared by using L.S.D. test at 5% level. The layout of the experiment was Randomized Complete Block. Design (RCBD) with three replicates to become the number of experimental units 15 for each cultivars of pepper. The results showed that the treatment of HNP was significantly superior compared to all the experimental treatments in the number of leaves of sweet pepper reached (193 leaf. plant^{-1}). While the SNP treatment was significantly superior compared to other treatments in the number of leaves per plant of chili pepper and the relative content of the chlorophyll of both cultivars sweet pepper and chili pepper which reached (355 leaf.plant^{-1}, 0.82, 0.89) respectively. The results showed that TNP was significantly superior in leaf area (75.67 and, 47.75 dm^2) for both sweet and sweet varieties. The SNP treatment significantly exceeded compared to other treatments by giving the highest concentration of IAA in both cultivars sweet and chili pepper There are significant differences (19.33 and 26.33) respectively. The results of table showed significant differences between the experiment factors in concentration of peroxidase enzyme in the leaves and fruits of the sweet and chili pepper. The two treatments of the control and the chemical fertilizer NPK were significantly superior compared to other treatments, with the concentration in leaves of sweet pepper (1.35 and 1.24) respectively, Fruits (1.75 and 1.65) respectively. The results of chili pepper were (1.30 and 1.19) in leaves and (1.65 and 1.55) in fruits respectively. While SNP treatment gave the highest number of fruits per plant of sweet and chili pepper which reached 22.8 and 40 fruits per plant, while NPK treatment was superior in fruit weight of both cultivars reached (39.39 and 9.14 gm) respectively, the highest singular plant yield of sweet pepper obtained from SNP treatment which gave (412.8 gm) while the treatment of chili pepper and NPK gave singular plant yield reached (280.4 gm).

Keywords **:** Super active, NPK, terra- sorb, Humestar.

Introduction

Organic agriculture is one of the types of sustainable agriculture as it tends to keep away from all chemical in plant nutrition by recycling the available natural materials such as plant residues, plant extracts, liquid fertilizers extracted from seaweed and animal residues, as well as it is a comprehensive system based on sustaining the natural environment of the plant instead of The use of manufactured materials that led to the emergence of contaminated agricultural products and the negative effects of these products on the environment and human health (Alrubaai, 2009). Pepper crop ranks third among the Solanaceae family crops, with both cultivars sweet and chili fruits. Each 100 gm of fresh fruits contains 4.8% carbohydrates, 1.2% protein and some mineral salts such as potassium, calcium and iron, as well as one kilogram of fresh fruits of sweet peppers provides 20 people with their daily needs from vitamin C, which is one of the most important vitamins that improve the body's immunity to cold and flu as well as contain vitamin A (Dobbss *et al.*, 2010) while the chili pepper is characterized by the inclusion of Capsacine, which is an important material in the treatment of bones pain resulting Rheumatism disease (Fajinmi and Odbode, 2009). So it has become more important to cultivate and use organic fertilizers its production to maintain consumer health and nutritional value of yield (Arancon *et al*., 2004) the levels of organic fertilizer Vermicompost compared to the chemical fertilizer had a significant effect in increase the fresh weight of vegetative group, leaf area, the number of fruits per plant and the fruits yield of pepper crop, the treatment of organic fertilizer 20 tons.ha^{-1} exceeded significantly in leaves number per plant, plant height and fresh weight of vegetative group, number of fruits per plant, total fruits yield (Fajinmi and Odebode, 2009).

Therefore, pepper farming increased under the conditions of protected agriculture to obtain high production because the importance of moisture and temperature in productivity of the crop, which increases the use of anti-stress plant to meet the adverse environmental conditions facing the pepper fields in the fall season in Iraq. Suryanarana and Venketeswarlu, (1978) reported that foliar application of tomato plants with $MgCO_3$ and Al_2SiO_3 leads to significant increases in plant length and number of branches. Abdullah (1996) noted that use of folicot as foliar application on potato plants at a concentration 5% and 10% resulted in a significant increase in plant length and fresh weight of total group. Al-Jauthari and Ali (2011) explained the superiority of the treatment of organic fertilizer compared to control treatment of water use efficiency. Therefore, based on above, this study aimed at avoiding chemical contaminants and stimulating the plant to increase the yield

through use of organic anti-stress and to provide the appropriate environmental conditions for the crop.

Materials and Methods

The experiment was conducted in the fields of the College of Agriculture-University of Baghdad according to the system of protected agriculture (plastic tunnels) in fall season of 2016-2017. The study included use of three types of anti-stress (Super Active, Terra-sorb, humestar) interfere with soil fertilizer NPK18:18:18, as well as treatment of adding NPK fertilizer and control treatment on Sweet and chili Pepper. The layout of the experiment was Randomized Complete Block. Design (RCBD) with three replicates. The seedlings were planted in the plastic tunnels with a length of 4 m and a width of 1.5 m and, the distance between tunnels 1 m and one and three replicates for each cultivar to become the number of experimental units 15 for each cultivars of pepper. Drip irrigation system was used to irrigate the treatments. The statistical analysis of the studied characters was carried out according to the mentioned design using the Genstat program and the results were tested with the least significant differences between the averages at 5% level. The following qualities have been studied:

1. Number of leaves (leaf.plant^{-1}): A group of plants was taken randomly and calculated the number of leaves per plant then extracted the mean.
2. Relative content of chlorophyll (%):

Chlorophyll was estimated according to the method (Makinney, 1941) which modified by (Arnon, 1949). The leaves were taken from the fourth to the sixth leaves of the plant top and crushed with 85% by acetone and placed in the centrifuge at 3000 rpm for five minutes the molar absorptivity coefficient was read on wavelengths (663 and 645 nm) by the spectrophotometer. The following equations were used to calculate the chlorophyll percent:

Chl.A= 12.7X – 2.69Y

Chl.B= 22.9Y - 4.68 X

Chl.T.= 20.2Y + 8.02X

That is X represents the device read at wavelength 663.

Y represents the device read at wavelength 645

1. Leaf area (LA) using digimizer program.
2. Fruits number (fruit.plant^{-1}) = fruits number of experimental unit / plants number of experimental unit.
3. Fruit weight (gm) = yield of experimental unit / plants number of experimental unit.
4. Singular plant yield (gm) = total yield of experimental unit / plants number of experimental unit.
5. Peroxidase enzyme in leaves and fruits

First: evaluate the effectively of peroxidase enzyme in the leaves.

The enzyme was extracted by mixing 5 gm of powdered leaves with 50 ml of sodium chloride solution (0.3 molar which contains boric acid at a concentration of 0.2 molar) by 1: 10 in a glass flask. The mixture was stirred for 15 min using a magnetic mixer and then placed in Centrifuge at speed (5000 rpm) for 30 min where the leachate was used to estimate enzymatic activity.

Second: The used solutions in estimating the enzyme.

1. Guaicaol solution with a concentration of 0.02 molar.
   Prepared by place 1.36 ml of guaicaol in a volumetric flask and then supplemented to 250 ml of distilled water.
2. Hydrogen peroxide solution with a concentration of 0.02 molar.
   Prepare using 0.56 ml of 30% hydrogen peroxide and complete the volume to 250 ml of distilled water (instantly prepared).
3. Tris solution with a concentration of 0.04 molar which contains sodium chloride at a concentration of 1 molar and pH 7.0.

Prepare by dissolve 1.211 gm of Tris-base with 14.61 gm of sodium chloride in a quantity of distilled water and after adjusting the pH to 7.0 by hydrochloric acid with concentration 1 molar, complete the volume to 250 ml of distilled water.

Third: the interaction mix.

Interaction mix prepare by mixing one part of all solutions 9-2-1, 9-2-2 and 9-2-3 with seven parts of the distilled water immediately before use.

Fourth: Estimation of enzymatic activity.

The enzyme activity was estimated by adding 3 mL of the interaction mixture in the spectrometer cell and the device tuned by that sample at 420 nm wavelength. The reaction started by adding one mL of enzymatic extract, then absorption read in the spectrometer. The enzymatic activity calculated by the following equation:

Enzymatic activity (absorption/gm sample) =

$$\frac{\text{spectrometer read}}{\frac{\text{sample weight}}{\text{extraction volume}} \times \text{taken volume for estimation}}$$

(Alsofi, 2001) and modified by (Whitaker ,1972).

Indole acetic acid (IAA) :

Estimating the concentration of Auxine (IAA) in the leaves

The fresh plant leaves were cut by surgical blade into small pieces, then frozen for 48 hours, then 5 gm of leaves placed in 50 ml of ethyl alcohol at 80% concentration for 48 hours at 5 °C. then the extracted filtered using filter paper And put the leachate in Rotary evaporator under discharge at 40 °C until it reached 20% of the original size of the material then completed the size to 60 ml by adding distilled water then added 1 ml to the solution of the (lead acetate) with 40% concentration and drops of potassium oxalate at a concentration of 22% to obtaining a clear solution then put it in centrifuge for 12 minutes at 3000 rpm, then take the leachate and complete the volume to 60 ml of distilled water. Then adjust the pH number to 2.5 using hydrochloric acid and then wash three times in separatory funnel by adding equal volumes of diethyl ether with the neglect of the remaining water phase after this process, then took the phase of binary ether to the rotary evaporator and evaporated at 30 °C to reaching the drought and then re-dissolved the substances by adding 15 ml of absolute methyl alcohol, and transferred to the rotary evaporator to concentrate to about 5 ml at 45 °C and kept it in the freezer (Abbas *et al*.,1995). The quantification of each of the Auxins was performed by the method which described by (Grandy *et al.*, 2002) using High Performance Liquid Chromatography (HPLC) (Lachrom-Merck-Hitachi), which is supplied by Shimadzu company,

type LC-6A, which measures spectroscopy by changing wavelengths SP 6A-UVspectrophotometer, and 20 microliters of the sample were injected into the inverted rotor phase column by injector type Rheodyn-712. The device was treated by a CR-4A computer and standard IAA solutions prepared (0.1-2.5 $mg.L^{-1}$) by injecting different concentrates from the primary solution through a several of dilutions so that the concentrations of less than 0.1 µg can be estimated by extraction solution concentration or increase the size of the model.

Retention time, Peak area, and the height of packs resulting from sample injection were measured and compared with the packs obtained with the standard solution packs under the same conditions.

The concentrations of plant hormones were calculated using the following equation:

Concentration ($\mu g.L^{-1}$) = (sample packs height/height of standard solution packs)× Standard solution concentration × Number of dilution times.

Table 1 : Details of experimental treatments

Treatment code	Details
Control	Control treatment
NPK	NPK 18:18:18 soil fertilizer treatment
HNP	Humestar foliar application with NPK treatment
SNP	Seaweeds (super active) foliar application with NPK treatment Ingredients of super active

Concentration	Element	
16.49 %	N	1
3.96 %	P_2O_2	2
1.45 %	K_2O	3
0.03 %	Al	4
0.06 %	Fe	5
51.5 PPM	B	6
0.05 ppm	Co	7
67.30 ppm	Cu	8
1.35 %	Ca	9
0.17 %	Mg	10
0.04 %	Mn	11
5.16 ppm	Mo	12
21.0 ppm	Zn	13
6.32 %	C organic	14
4.30 %	SO4	15
4.30 %	Cl	16
Neteral	PH	17

TNP	Seaweeds (terra- sorb) foliar application with NPK treatment

Results and Discussion

Table (2) shows that the HNP treatment significantly exceeded compared to all the experimental treatments in the number of leaves per plant of sweet pepper (193 $leaf.plant^{-1}$). While the SNP treatment was superior compared to the other treatments in the number of leaves per plant of the chili pepper and the relative content of the chlorophyll of sweet and chili pepper reached, (355 $leaf.plant^{-1}$, 0.82, 0.89) respectively, while the treatment of TNP gave the highest values of plant leaf area reached (75.67 dm^2 and 47.75 dm^2) of both cultivars respectively.

The superiority of organic fertilizer (humestar) interfere with soil fertilizer NPK in these characters may be due to the organic acids are an important factor in the processing of phosphorus and potassium in the soil and thus increase its absorption, as well as the release of auxin-like compounds in the vicinity of the roots and thus increase the surface area of the plant roots, which leads to increase of nutrients absorption from soil. also have a significant role in processing micronutrients by their clawed and preventing sedimentation (Khalil, 2004, Canellas *et al*., 2011 and Barker and Pilbeam, 2007).

The superiority of the (super active) treatment which interfere with soil fertilizer NPK in the number of leaves per sweet pepper and the relative content of chlorophyll of both cultivars because this nutrient contains a high rate of the major and minor elements. Nitrogen is important in the creation of chlorophyll due to its important role in the synthesis of the rings of Prophyrene as well as containing the magnesium which is center of Chlorophyll and manganese which acts as an enzymatic equivalent of two enzymes of the nitrate reduction (hydroxylamine reductase, nitrite reductase) and copper which enters in formation of (plastocyanin) which is one of the important proteins in the construction of green Plastids as well as the effect of iron in the construction of chlorophyll (Phytoferritin) (Grandy *et al.*, 2002).

The reason of the increase in the vegetative growth indicators when using the terra-sorb extract which interfere with soil fertilizer NPK to contain the seaweeds on the major and minor elements, including Fe, Zn and Cu, and their effects in the photosynthesis and respiration process. Nitrogen and phosphorus enter the nucleic acid (DNA, RNA) structure which is necessary for cell division which reflected in the characters of vegetative growth as well as the role of extracts in increasing the growth and spread of the roots, which leads to increased absorption of important nutrients for

plant growth, which is reflected positively on the indicators of vegetative growth and the total yield, this is in agreement with results of (Ashammari and Saud, 2013).

The results of Table 3 show that the SNP treatment was superior significantly compared to other treatments with the highest concentration of IAA of both pepper cultivars. There were significant differences between the experimental treatments in the concentration of IAA reached (19.33 and 26.33) respectively. The treatments of control and NPK fertilizer were superior in concentration of the peroxidase enzyme in the leaves and fruits of pepper cultivars compared to other treatments, with the concentration of IAA in leaves of sweet pepper (1.35 and 1.24) respectively, while the concentration in same cultivar fruits (1.75 and 1.65) respectively. While in leaves of chili pepper was (1.30 and 1.19) while in the same cultivar fruits reached (1.65 and 1.55) respectively.

The superiority of super active treatment may be due to the role of zinc in the formation of amino acid Tryptophan, which is the main substance in the creation of Indole acetic acid IAA, which is a natural Auxine Stimulates the flowering and increased numbers of flowers and their setting as well as the role of boron in increasing the rate of pollination and fertilization (Barker and Pilbeam, 2007).

As well as the role of boron in increasing the rate of fertilization and fertilization (Barker and Pilbeam, 2007)

The results of Table 4 showed that the treatment of SNP was superior in number of fruits per plant of pepper cultivars which reached 22.8 and 40 fruit.plant^{-1} respectively, while NPK treatment was superior in fruit weight of both pepper cultivars reached (39.39 and 9.14 gm) respectively. While the highest singular plant yield OF sweet pepper (412.8 g) obtained from treatment of SNP, while NPK treatment was superior in single plant yield of chili pepper reached (280.4 g).

The reason for the superiority of SNP treatment may be attributed to the continuous Supplement processing of the nutrients found in the super active Table (1) Nutrient, which led to increased rates of photosynthesis and thus increased carbohydrate production in the leaves, which positively affected on plant's efficiency in producing the largest number of fruits and increasing the weight of fruits and its reflection on total yield (Table 3). The role of these nutrients in stress resistance has also contributed to improving the water condition of plant, thus providing suitable conditions for the melting and transport of nutrients and their accumulation in the plant tissues (Alzobaie, 2000; Albarzanchi, 2007 and Janowiak *et al*., 2009).

Table 2 : Effect of anti-stress Interacted with major NPK elements in some vegetative growth indices of two cultivars of pepper.

Qualities / Transactions	Number of leaves (leaf.plant^{-1})		Relative content of chlorophyll (%)		Leaf area (dcm)^2	
Categories	**Sweet pepper**	**Chili pepper**	**Sweet pepper**	**Chili pepper**	**Sweet pepper**	**Chili pepper**
Control	142.5	168.8	0.77	0.86	55.33	23.28
NPK	101.5	306.1	0.80	0.87	64.87	40.80
SNP	122.7	355	0.82	0.89	67.70	41.17
TNP	123.7	354.7	0.80	0.87	75.67	47.75
HNP	193	288.3	0.79	0.86	73.17	37.69
L.S.D.	7.81	113.7	0.0614	0.0438	5.656	8.17

Table 3 : Effect of anti-stress Interacted with major NPK elements in concentration of Indole acetic acid (IAA) and Peroxidase enzyme in leaves and fruits of two cultivars of pepper.

Qualities / Transactions	IAA		Peroxidase Enzyme in leaves		Peroxidase Enzyme in fruits	
Categories	**Sweet pepper**	**Chili pepper**	**Sweet pepper**	**Chili pepper**	**Sweet pepper**	**chili pepper**
Control	16.67	22	1.35	1.30	1.75	1.65
NPK	16.33	22	1.24	1.19	1.65	1.55
SNP	19.33	26.33	0.35	0.30	0.74	0.68
TNP	15.33	22	0.35	0.30	0.74	0.66
HNP	16.33	22.67	0.35	0.29	0.76	0.66
L.S.D.	2.382	2.319	0.0235	0.0288	0.0342	0.0209

Table 4 : Effect of anti-stress Interacted with major NPK elements in some yield characters of two cultivars of pepper.

Qualities / Transactions	Number of fruits per plant		Fruit weight (gm)		Singular Plant Yield (gm)	
Categories	**Sweet Pepper**	**Chili pepper**	**Sweet pepper**	**Chili pepper**	**Sweet pepper**	**Chili pepper**
Control	18.2	15.6	38.48	6.82	358	104.3
NPK	9.5	30.8	39.39	9.14	212.5	280.4
SNP	22.8	40	36.92	4.17	412.8	163
TNP	22.1	16.7	36.35	6.50	379.8	108.5
HNP	19.4	18.6	37.06	7.03	324.5	130.9
L.S.D.	3.791	7.54	7.40	0.978	100.4	46.36

References

Abbas, M.F.; Jassim, A.F. and Ibrahim, A.O. (1995). Effect of pollen endogenous hormenson fruit of the palm (*Phoenix dactylifera* L.) Hillawi. Basrah J. Agric. Sci., 8(2): 33-41.

Abdallah, S.A.M. (1996). Studies on the application of anti transpirant and water regimes on potatoes grown in calcareous soils. M.Sc. Thesis Faculty of Agriculture (Saba Basha) Alexandria University, Egypt.

Albarzanchi, I.M.G. (2007). Effect of ultraviolet radiation, electric current and tryptophan on the growth, yield and storage capability of the potato Desiree cultivar, Ph.D. thesis. Department of horticulture. college of Agriculture. Baghdad University.pp216

Aljuthari, H.W. and Ali, N.S. (2011). Water efficiency under mineral and bio-organic fertilization of potatoes. Journal of Iraqi Agricultural Sciences. (Special Issue): 149-138.

Alrubaai, I.I.J. (2009). Effect of Plant Extracts and Growth Regulator (NAA) on Germination and Growth of Eggplant. *Solanum meleongena* L. Master Thesis. College of Education. University of Diyala.

Alsufi, M.A.A. (2001). The separation of the Proxidase enzyme and the purification and its description from vegetable milk of the broom plant *Calotropis procera* and the possibility of applied uses. Master Thesis. College of Agriculture, University of Baghdad. pp96

Alzobaie, S.Z.A. (2000). Determination the poise of the nitrogen, phosphorus and potassium for the potato (*Solanum tuberosum* L.) in sedimentary soil. Ph.D thesis. Soil Dept. college of Agriculture. Baghdad University. 78.

Arancon, N.Q.; Edward, A.; Bierman, P.; Metzger, J.D.; Lee, S. and Welch, C. (2004). Effect of vermicomposts on growth and marketable fruits of field – grown tomato pepper and strawberries. Pedobiol. 47(6): 731-735.

Arnon, D.I. (1949). Copper enzymes in isolated chloroplasts Polyphenoloxidase in *Beta vulgaris*. Plant Physiol., 24: 1-15.

Ashammari, A.M.A.; Gh, O. and Saud, Y. (2013). Effect of foliar application with some organic nutrients and method of breeding in the growth and yield of three hybrids of cucumber under protected agriculture conditions. Diyala Journal of Agricultural Sciences. 502: 283-294.

Barker, A.V. and Pilbeam, D.J. (2007). Handbook of Plant Nutrition Books in soils plants and the environment . Library of Congress Cataloging-in-Publication Data, 613.

Canellas, L.P.; Dantas, D.J. and Aguiar, N.O. (2011). Probing the hormonal activity of fractionated molecular humicomponents in tomato auxin mutants. Ann. App. Boil., 159: 202.

Dobbss, L.B.; Canellas, L.B.; Olivaras, F.L.; Aguiar, N.O.; Pereira Peres, L.E.; Azevedo, M.; Spaccini, R.; Piccolo, A. and Fac-Anha, A.R. (2010). Bioactivity of chemically transformed humic matter from vermicompost on plant root growth. J. Agric. Food Chem., 58: 3681-3688.

Fajinmi, A.A. and Odbode, C.A. (2009). Effect of poultry manure on pepper veinal mottle virus (pvmv) yield and agronomic parameters of pepper (*Capsicum annuum*) in Nigeria. EAIS. 1(1): 104-111.

Grandy, A.S.G.A. and Erich, M.S. (2002). Organic amendment and rotation crop effects on the recovery of soil organic matter and aggregation in potato cropping systems. Soil. Sci. Am. J. 66: 1311-1319.

Hassan, A.A. (2005). General principles of plant breeding. college of Agriculture. Cairo University. Egypt.

Janowiak, J.; Ewa, S.F.; Elzbieta, W.; Mieczyslawa, P. and Barbara, M. (2009). Effect of many – year natural and mineral fertilization on yielding and the content of nitrates (V) in potato tubers. J. Central European Agric. Poland 10(1): 109-114.

Khalil, M.A.I. (2004). Vegetable and fruiting plants-Nurseries–tissue culture–classification-Vegetation description-Cultivars. Zagazig University. Almaaref Center– Alexandria, Egypt.

Li, C.; Shi, J.; Zhao, X.L.; Wang, G.; Yu, F.H.; Ren, Y.J. and Fenxi, H. (1994). Separation and determination of three kinds of plant hormones by high performance liquid chromatography. J. Chromatograph., 22: 801-804.

Makinny, G. (1941). Absorption of light by chlorophyll solution. J. Biol. Chem., 140: 315-322.

Suryanarana, V. and Venkateswarlu, A. (1978) Effect of irrigation frequency, antitranspirants and mulching on growth and yield of tomato. Orissa J. Hort. Ix(2): 1-7.

Taha, S.M. (2008). Effect of spraying with Gibberllin and Cycocel and three extracts from seaweeds in some vegetative and flowering characters and yield components of the two cultivars of strawberry (*Fragaria X ananassa* Duch). Ph.D. thesis. College of Agriculture -Salahuddin univ. Ministry of Higher Education and Scientific Research. Iraq. 150.

Whitaker, J.R. (1972). Principles of Enzymology for the Food Sciences. Mercel Dekker, Inc. U.S.A.

Background. During a preliminary study, effects of 0, 20, 40, and 60 mM NaCl salinity were assessed on germination rate in relation to electrolyte leakage (EL) in sweet pepper. Results explored significant rises in ethylene evolution from seeds having more EL. It was, therefore, hypothesized that excessive ethylene biosynthesis in plants due to salinity stress might be a root cause of low crop productivity. As salicylic acid is one of the potent ethylene inhibitors, thus SA was used to combat effects of ethylene produced under salinity stress of 60 mM NaCl on different physiological and morphological characteristics of sweet pepper. Methodology. The effect of 0.05, 0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 mM SA was evaluated on seed germination, growth and yield of sweet pepper cv. Heat stress in late gestation reduces fetal growth and alters endocrine status of the dam. Carryover effects of heat stress during late gestation on postpartum lactation and reproduction are also detectable (Collier et al., 1982). Heat stress in livestock in tropical countries. A major part of our country is characterized as humid tropic and is subjected to extended periods of high ambient temperature and humidity. The primary non-evaporative means of cooling (viz. conduction, convection and radiation) becomes less.Â Antioxidants, both enzymatic (viz. superoxide dismutase, glutathione peroxidase & catalase) and nonenzymatic (vitamins C, E and A, glutathione, pyruvate etc) provide necessary defence against oxidative stress generated due to high ambient temperature. A catalase is one of the crucial antioxidant enzymes that mitigates oxidative stress to a considerable extent by destroying cellular hydrogen peroxide to produce water and oxygen. Deficiency or malfunction of catalase is postulated to be related to the pathogenesis of many age-associated degenerative diseases like diabetes mellitus, hypertension, anemia, vitiligo, Alzheimerâ€™s disease, Parkinsonâ€™s disease, bipolar disorder, cancer, and schizophrenia.Â Volume 2019 |Article ID 9613090 | https://doi.org/10.1155/2019/9613090. Ankita Nandi, Liang-Jun Yan, Chandan Kumar Jana, Nilanjana Das, "Role of Catalase in Oxidative Stress- and Age-Associated Degenerative Diseases", Oxidative Medicine and... Irrigation with high salinity water influences plant growth, production of photosynthetic pigments and total phenols, leading to reduction in crop yield and quality. The objective of this study was to investigate the effects of potassium (K) foliar application in mitigating the negative effects of salt stress on pepper plants. A greenhouse experiment was conducted to investigate the effects of foliar application of potassium (K) on pepper plants grown with different salinity water irrigation (3000 and 6000 ppm as compared to tap water with salinity level of 300 ppm). Irrigation using high salinity water decreased plant height, biomass production, and fruit yield as compared to those of the plants irrigated by tap water.