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SOME EFFECTS OF TREATED WASTE WATER OF HILLA TEXTILE FACTORY ON FOUR SPECIES OF CULTIVATED PLANTS

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ABSTRACT

The current study included the using of treated waste water of Hilla textile factory in watering of *Raphanus raphanistrum, Lepidium sativum, Vigna radiate* and *Cucumber sativus*. Some chemical properties of this water were studied including pH, Electrical conductivity, Total dissolved Solids, Salinity, Turbidity, total hardness, Calcium, Magnesium, Sulphate, Chloride, Nitrate, Phosphate, Copper, Cadmium, Lead and Zinc. Some morphological variants of their plants including germination ration, plant height, number and area of leaves were studied. Work included study of some biochemical responses like Catalase, Glutathione, Superoxide dismutase, Proline and Chlorophyll content which were varied according to type of species.
Key words : Treated waste water, germination ration, heavy metals, plants

Introduction

Our clean water resource are limited, and the amounts of fresh water are decreasing, so the irrigation need a lot of water, thus the use of treated waste water in irrigation of plants can solve both of consumed of clean water and be a management for waste water (Jaramillo and Resterepo, 2017), so it can provided plants with essential elements like Nitrogen, Carbon and Phosphor (Olieveira *et al.,* 2016) which usually are higher than in ground water and fresh water (Tarantino *et al.,* 2017).

The organizations that related with the safe of human health like WHO and FAW developed several guidelines about the use of treated waste water in agriculture specially the concentrations of some toxic ions (Ayers *et al*., 1985) and it's content of pathogens(WHO, 2006 and Dare *et al.,* 2017).

The type of treated waste water can use to irrigate some crops but not to another (Hussain *et al.,* 2002). The use of treated waste water in agriculture is not a modern concept that it was from many years ago and its used many countries (WHO, 2006 and Alderfasi *et al*., 2009).

In this work we tend to explain possibility use the treated waste water of Hilla Textile factory in the irrigation of four types of crops as a solve to Water crisis in Iraq and it's effect on some of their morphological and biochemical responses.

Experimental Part

The treated waste water of Hilla textile factory (this factory nowadays don't staining or starching the textile but it do some finishing stages on imported string) was brought to lab then each of pH, Electrical conductivity, Total dissolved Solids and Salinity measured by Multi-meter type Hanna, Oakton-U.S.A., Turbidity by Turbidity meter type Haanna/H1, total hardness, Calcium, Magnesium, chloride, Nitrate, Sulphate and Phosphate according to methods described by (APHA, 2005). Copper, Cadmium, Lead and Zinc according to methods described by (APHA, 2003).

This water used in irrigated of seed of each of *Raphanus raphanistrum, Lepidium sativum, Vigna radiate* and *Cucumber sativus* for four weeks, while the control crops were irrigated with D.W. only. Some morphological characters of plants in this experiment were studied like germination ration, plant height,number of leaves and area of leaves by Digital Planimeter-kp-90n. Some biochemical effects including Catalase (Aeibi, 1984), Glutathione (Ellman, 1959), SOD (Marklund and Marklund, 1974), Proline (Bates *et al.*, 1973) and Chlorophyll content (Kalra, 1998).

Results and Discussion

Effluents of industries are one of pollution sources thus, its very important to study their characters before use them in irrigation (Thamizhiniyan *et al.*, 2009).Treated waste water properties of Hilla textile factory as explained in table 1 were alkaline with pH about 9.4, with high phosphate concentration about 4.3mg/lwhich can used by plants to increase their growth (Razaq *et al.,* 2017 and Schulze *et al.*, 2005).

Elevated values of both E.C. and T.D.S. can give idea about the high ions concentration in this water like Chloride which was 520 mg/l, this concentration of

Chloride can lead to saline water then saline soil when irrigated with this water (Hynes, 1974; KHAN *et al.*, 2000and Ashari and Gholami, 2010) which associated with elevated pH specially if their was much of Na ions (Carmona *et al.*, 2010 and Turan *et al.*, 2010).

Their was a different concentration of heavy metals in this water including (Cd, Cu, Pb and Zn) which usually found in such effluents (Das *et al.,*2011) but in this study were very elevated and all out of standards of industrial waste water which prevent used it in irrigation to prevent pollution of soil and their accumulation in plants.

Table 1 : Some characters of Hilla textile treated waste water.

Parameters	Concentration	Parameters	Concentration
pH	9.4	Turbidity(NTU)	8.4
E.C (µs/cm)	2240	Sulphate (mg/l)	261.2
TDS (mg/l)	1580	Nitrate (mg/l)	5
Salinity (mg/l)	1370	Phosphate (mg/l)	4.3
Total Hardness (mg/l)	200	Cd (mg/l)	0.21
Calcium (mg/l)	32.1	Cu (mg/l)	0.072
Magnesium (mg/l)	40.97	Pb(mg/l)	19.6
Chloride (mg/l)	520	Zn (mg/l)	72.8

This characters reflect on the germination rate of seed of studied plants and the *Cucumber sativus* was the more sensitive to this water (Table 2), while the *Lepidium sativum* was able to germinated by this water, this results similar to other studies done on *Brassica spp.*, *Cardium sativum* and other species (Huma, *et al.*, 2012).

Plant height and number of leaves were observed on feeble deferens les with control of the four studied species, which may do to the toxic effect of heavy metals and other ions.(Ghani,2010).In general effluents of textile give same results in other studies like work of Hayyat and his group (Hayyat, *et al.*, 2013).

Table 2: Effects of waste water on (germination ration, plant height, number of leaves and area of leaf).

Species		Germination ration (%)	plant height (cm)	number of leaves	area of leaf (cm^2)
Raphanus raphanistrum	Control	70	13.5	11	19.4
	Treatment	40	11.9	9	15.6
Lepidium sativum	Control	100	7.3	11	2
	Treatment	90	6.8	9	2.4
Vigna radiate	Control	80	10.5	5	3.6
	Treatment	60	8.7	5	3.8
Cucumber sativus	Control	70	12	6	18.5
	Treatment	30	10	5	16.4

Plants differ in their adaptations to same environmental factor, some of this increase specific proline or enzyme, while other decrease it (Table 3). This result can see in clearer in table 2. Salinity can effect on both germination of seed and then morphological and biochemical growth of plant, and this phenomenon's be clear if the effecting period by long (Theriappan *et al.*, 2011). Proline has specific role to protect plant from toxicity of heavy metals (Aslam *et al.*, 2017). In this study each of *Raphanus raphanistrum, Vigna radiate* and *Cucumber sativus* appear decrease in proline content after treated with treated waste water which may due to their sensitively to both salinity and heavy metals.

Oxidative stress can be increased by many environmental factors (Foroozesh *et al.*, 2012), results explained different effects of irrigated water on plants which many due ability of plant to from the enzymes their activity under much stress. Statistical analysis don't appear any significant variation on Chlorophyll content, while *Lepidium sativum* was differ among other in all biochemical variants

Table 3 :Some biochemical responses of studied plants.

Species		Catalase (Unit)	Glutathione (mg/g. F.W)	Superoxide dismutase (Unit)	Proline (mg/g.D.W)	Chlorophyll content (SPAD)
Raphanus raphanistrum	Control	6.1673	14.28	23.85	95.17	34.9
	Treatment	8.1087	90.28	20.27	93.33	42.5
Lepidium sativum	Control	12.504	97.08	29.57	56.72	14.5
	Treatment	9.8791	49.68	27.19	88.94	16.9
Vigna radiate	Control	7.9621	62.080	23.13	28.99	35.1
	Treatment	6.081	67.880	20.03	19.23	29
Cucumber sativus	Control	11.259	22.480	16.93	26.04	38.6
	Treatment	10.538	16.880	18.88	14.22	33

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