J. Agr. Sci. Tech. (2012) Vol. 14: 1357-1364

The Effect of Treated Municipal Wastewater Irrigation in Non-Agricultural Soil on Cotton Plant

M. Alikhasi[1], M. Kouchakzadeh[1*], and E. Baniani[2]

ABSTRACT

Shortage of irrigation water is a crucial problem especially in arid and semiarid regions; therefore, application of wastewater in agriculture in such regions seems to be an indispensable solution. A field experiment was conducted in non-agricultural soil to investigate the effect of Treated Municipal Wastewater (TMW) on the yield and fiber quality of cotton (*Gossypium hirsutum* L.) crop. The treatments consisted of surface irrigation by different mixtures and as well, through different intervals of freshwater plus TMW. Two additional treatments, namely, irrigation with freshwater and with TMW were considered as control. The experimental design was a randomized complete block one with eight treatments and three replications. The results indicated that cotton yield, number of bolls per m^2, Leaf Area Index (LAI) and plant height were significantly higher when the crop irrigated with TMW rather than with freshwater. The crop yields in TMW *vs.* freshwater treatments were about 2,200 and 780 kg lint ha^{-1}, respectively. There were no significant differences observed between interval and mixture treatments when the same percentages of freshwater and TMW applied. Also there was no significant detrimental effect observed on the characteristics of cotton fiber quality when the crop irrigated with TMW.

Keywords: Cotton, Crop yield, Effluent, Fiber quality, Reuse.

INTRODUCTION

The increasing need for water in the arid and semiarid areas of the world has resulted in the emergence of wastewater application in agriculture. According to the World Bank (1996), Middle East and North Africa are the driest regions in the world with only 1% of the world's freshwater resources. Wastewater is the only potential water source which will increase as the population grows and the demand for freshwater increases.

Concurrently, the rising population and continuing urbanization have generated increasing amounts of municipal wastewater. Application of treated wastewater in irrigation of plants and crops is gradually becoming a common practice worldwide (Angelakis *et al.,* 1999), although this practice is traditionally still affected by problems of public acceptance (Pollice *et al.,* 2004; Menegaki *et al.,* 2007).

With the current emphasis on environmental health and water pollution issues, there is an increasing awareness of the need to use wastewaters safely and beneficially. TMW use in agriculture is beneficial for a number of reasons: (a) water shortage can be partly resolved; (b) large volumes of wastewater can be disposed off during an entire year; (c) high-quality water resources can be devoted to potable uses; (d) economic benefits, attributed primarily to the nutrient content of the wastewater are probable and possible (e) the availability of

[1] Department of Irrigation and Drainage, Tarbiat Modares University, Tehran, Islamic Republic of Iran.
[*] Corresponding author; e-mail address: kouchakm@modares.ac.ir
[2] Head of Agronomy Research Department, Cotton Research Institute, Varamin, Islamic Republic of Iran.

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]

this additional water near population centers will increase the choice of crops grown by farmers and (f) the water is an important source of nutrients, added to poor fertility soils for crop production (Oron *et al.,* 1995; Pescod, 1992; Biswas *et al.,* 1999; Yadav *et al.,* 2002; Jiménez-Cisneros, 1995).

Several reports have documented the effects of effluent application on cotton yield and fiber quality (Bieloral *et al.,* 1984; Day and McFayden, 1984; Oron and DeMalach, 1987; Papadopoulos and Stylianon, 1988; Alves *et al.,* 2006), but the effect of using a mixture of effluent and freshwater at regular intervals on cotton yield, plant characteristics and fiber quality has not been reported yet.

The objectives of this research were (i) to investigate the effect of surface irrigation on the yield and quality of cotton, using TMW (ii) to observe the effect of TMW on yield of cotton in non-agricultural soil (iii) to compare the effect of TMW, a mixture of effluent and freshwater as well as other alternative irrigation schemes on the yield and quality of cotton (iv) to survey the effect of TMW on fiber quality of cotton in non-agricultural soil.

MATERIALS AND METHODS

Location, Soil and Climate

An experiment was conducted to find out the response of cotton (*Gossypium hirsutum* L., var. *'Mehr'*) yield and fiber quality irrigated with TMW *vs.* with freshwater. *'Mehr'* variety cultivar shows good adaptation, is of low growth with 80 to 95 centimeter of height, and compared with other commercial varieties is earlier ripening with 120 day growth period of fairly small leaf surface. This research was carried out at Shahrake Ghods Sewage Treatment Plant located in West Tehran, Iran, on a fairly uniform caly loam non-agricultural soil with no salinity or drainage problem (Table 1) at 35.73° E, 51.37° N, with an elevation of 1,200 meters above sea level, the average annual rainfall of 150 mm, hot and dry summer (mean minimum and maximum temperatures of 21 and 31°C) with mean RH of 25 and mean crop evapotranspiration rates of 2.3, 4.0, 7.0, 7.7,6.3 and 4.3 mm day^{-1} from April to September. The term "non-agricultural soil" where appearing in the text is intended to mean a soil not cultivated before.

Table 1. Physico-chemical characteristics of soil collected from 0-30 cm layer of to experimental field.

Characteristic	value
Sand (%)	40
Silt (%)	31
Clay (%)	29
pH	7.2
Electrical conductivity (dS m^{-1})	0.7
Ca (mg kg^{-1})	4.9
Mg (mg kg^{-1})	2.4
Na (mg kg^{-1})	0.6
Sodium adsorption ratio	0.22
K* (mg kg^{-1})	98
P* (mg kg^{-1})	2.6
Total nitrogen (%)	0.02
Organic matter (%)	0.2

* Available to Plant.

Treatments, Experimental Design and Irrigation Application

The experimental design was a randomized complete block one with eight treatments and three replications (Figure 1). Table 2, describes the irrigation treatments and introduces the abbreviation forms. All treatments were irrigated weakly according to penman-monteth equation (Allen *et al.,* 1998).

The plants were surface irrigated with the level of water applied to each plot the same. During the growing period 819 mm of water was used. The experimental plots were irrigated with freshwater 20 days after sowing which conforms to two-leaf stage of plants, the treatments being applied

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]

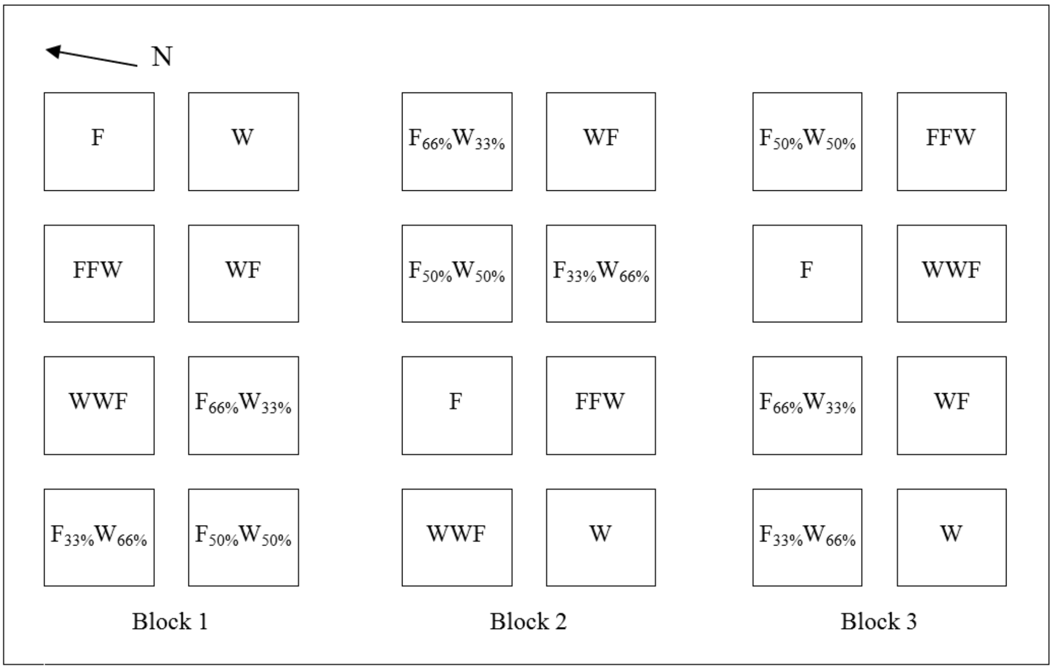

Figure 1. Schematics of the experimental layout.

following this stage. Table 3 presents the water application schedule throughout the growing period. The experimental plots were 3×3 m and 2 m apart. The row spacing was 60 cm and on the row plant spacing 20 cm. Sowing was done in the middle of May. During the growing season, plants were provided with all the necessary cultivation cares. Urea fertilizer containing 46% nitrogen at a total quantity of 280 kg per hectare was applied twice during the growing season (19 July and 16 August). Crop was harvested by hand with two pickings starting with the first of October and November. The data were taken from the three middle rows to avoid any side errors.

Characteristics of Wastewater and Freshwater

Shahrake Ghods Sewage Treatment Plant is located in west of Tehran, Iran and treats sewage generated by approximately 120,000 inhabitants of the city residents. An activated sludge process provides the secondary treatment of this plant. Pipes were used to deliver TMW and freshwater to the experimental fields. Raw municipal wastewater, TMW and freshwater characteristics were laboratory monitored twice a month during the growing season (Table 4). Fecal coliform levels in TMW, presented in Table 4, were noticeably high;

Table 2. Description of irrigation treatments.

Treatments	Type of irrigation*
F	Irrigated with freshwater
W	Irrigated with TMW
WF	Irrigated with freshwater and TMW alternatively and continued in the same manner.
WWF	Irrigated twice with TMW, once with freshwater and continued in the same manner.
FFW	Irrigated twice with freshwater, once with TMW and continued in the same manner.
$W_{50\%}$ $F_{50\%}$	Irrigated with a mixture of TMW and freshwater in the proportion of: 1:1 and continued in the same manner.
$W_{33\%}F_{66\%}$	Irrigated with a mixture of TMW and freshwater in the proportion of: 1:2 and continued in the same manner.
$W_{66\%}F_{33\%}$	Irrigated with a mixture of TMW and freshwater in the proportion of: 2:1 and continued in the same manner.

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]

Table 3. The schedule of water applied and quantities.

Date	Water applied (mm)	Date	Water applied (mm)	Date	Water applied (mm)
18-May-07	10*	6-July-07	42	23-Aug-07	51.1
25-May-07	15*	12-July-07	45.5	30-Aug-07	50.4
1-June-07	20*	19-July-07	49	6-Sep-07	47.6
8-June-07	30	26-July-07	56	13-Sep-07	45.5
15-June-07	35	2-Aug-07	56	20-Sep-07	45.5
22-June-07	35	9-Aug-07	56	29-Sep-07	38.5
29-June-07	38.5	16-Aug-07	52.5	Total = 819.1 mm	

* Only freshwater applied.

Table 4.Characteristics of RMW, TMW and freshwater used for irrigation.

Characteristics	RMW	TMW	Freshwater
No. of samples	8	8	8
pH	7.8±0.04	7.52±0.08	7.2±0.1
EC (dS m^{-1})	2.5±0.5	1.32±0.2	0.8±0.05
K (mg L^{-1})	38.4±3.32	21.3±1.34	1.43±0.12
P (mg L^{-1})	10.01±2.7	3.61±0.51	0.64±0.06
NH_4-N (mg L^{-1})	34.7±6.7	1.97±0.75	0.34±0.02
NO_3-N (mg L^{-1})	0.92±0.54	18.2±1.71	2.38±0.32
BOD_5	126.4±48.2	5.8±1.0	NA
COD	202.8±56.8	26.5±12.9	NA
Mean fecal coliforms (MPN 100 ml^{-1})	$6\times10^6\pm2\times10^4$	8124±715	NA
Total Suspended Solids (mg L^{-1})	176.5±38.9	5.8±1.0	1.3±0.5

Note: The data are the mean and standard deviation for eight samples taken at different times during the irrigation period.

but fecal coliform levels did not exceed the WHO standard for irrigation of such industrial crops as cotton (WHO, 1989).

Data Collection and Analysis

At the end of the growing season, 10 plants from each plot were taken to assess the plant height, dry matter production, distance between internodes, number of bolls per m^2, as well as, bolls weight. In order to find out the LAI and dry leaf weight, one plant was selected from each plot. Total leaf area and fresh weights were immediately recorded, and dry weights, oven-dried at 70ºC until constant weights achieved were determined. Furthermore, seed cotton, lint yield, lint percentage and fiber quality were evaluated and recorded. Characteristics of fiber length, length uniformity, elongation, strength and micronaire (measure of fiber fineness and maturity) were taken through HVI (High-Volume Instrumentation) instrument, ART model. To bring samples to a standard level, they were placed for 24 hours in a room with moisture and temperature of 65±2% and 22±2ºC, respectively.

Soil samples were collected in October 2007 for analysis. The samples were air-dried, passed through a 2 mm sieve and their chemical properties determined. Soil pH was determined through a pH meter (McNeal, 1982). EC was determined through a conductivity meter. Total N was estimated using Kjeldahl procedure (Bremner and Mulvaney, 1982). Concentrations of soluble Ca and Mg were found out using EDTA titration method, while Na and K measured

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]

applying aflame photometer (Richards, 1954). Phosphorus was determined using OLSEN extraction (0.5 M $NaHCO_3$) (Olsen and Sommers, 1982) procedure.

Data Analysis

The analyses were performed using SAS statistical analysis (SAS 1987). Separation of means was performed using LSD at $P< 0.05$.

RESULTS AND DISCUSION

Plant Characteristics

Results show that crop irrigation with TMW significantly affected the entire plant characteristics at $P< 0.05$ as presented in Table 5. Subjecting plants to WWF (52.8 cm) and $W_{33\%}F_{66\%}$ (42.2 cm) treatments results in the highest and the lowest plant height, respectively. TMW significantly affected the internodes distance and LAI at $P< 0.05$. Results show that plant height and LAI are directly correlated (R^2= 0.81). Irrigating with TMW significantly increased the LAI at $P< 0.05$. The greatest LAI was gained in W treatment (0.77) and the lowest one in F treatment (0.44). The more LAI, the more plant photosynthetic activity, as a result of which the cotton yield, dry matter and leaf weight were increased. Boquet *et al.* (2004) reported that taller plants and higher average internodes were achieved on upland cotton in the USA, when the crop was adequately fertilized. Therefore, the increase in plant height and internodes in TMW treatments (Table 5) could be interpreted as a result of TMW nutrient content (Table 4).

One of the most important parameters in cotton yield is the number of bolls per plant and per square meter. As shown in Table 5, irrigation with TMW had a significant effect on the number of bolls per m^2. The number of bolls became greater with the level of TMW increased. Same results were achieved by other researchers (Oron and DeMalach 1987; Bieloral *et al.,* 1984). The cotton yield and the number of bolls per m^2 were directly related (R^2= 0.96). Also the number of bolls per m^2 in mixture treatments ($W_{50\%}F_{50\%}$, $W_{66\%}F_{33\%}$, and $W_{33\%}F_{66\%}$) was greater than the ones in interval treatments (WF, WWF, and FFW), but this difference was not significant at $P< 0.05$. TMW significantly affected the boll weight at $P< 0.05$, which contradicts the results reported by Oron and DeMalach (1987), and Bieloral *et al.* (1984).

Yield Response

The seed cotton and lint yields are presented in Figure 2. The highest yield was obtained for W treatment (2,200 kg ha^{-1}). As shown in Figure 2, the increase in TMW application resulted in a higher cotton yield. This increase is resulted due to nutrient content of TMW. With regard to the deficiency of nutrient elements in initial soil (Table 1), applying urea is not sufficient to compensate for N requirement in F treatments; consequently, nutrient element needs of F treatment has not been completely supplied. Quantity of nutrient

Table 5. Average plant characteristics of *'Mehr'* variety employed in the experimental treatments.

Parameter	F	W	WWF	$W_{66\%}F_{33\%}$	WF	$W_{50\%}F_{50\%}$	FFW	$W_{33\%}F_{66\%}$
Plant height (cm)	42.4^b	52.2^a	52.8^a	49.0^{ab}	49.5^{ab}	50.1^a	42.6^b	42.2^b
Internodes distance (cm)	3.0^d	3.6^a	3.5^{ab}	3.4^{a-c}	3.3^{a-d}	3.2^{b-d}	3.1^{cd}	3.1^{cd}
Bolls m^{-2}	21^e	51^a	36^{bc}	38^b	33^{cd}	34^{b-d}	31^d	32^d
Boll weight (g)	3.8^c	4.5^{ab}	4.5^{ab}	4.9^a	4.8^a	4.2^{bc}	4.6^{ab}	4.5^{ab}
Leaf area index	0.40^c	0.77^a	0.60^b	0.47^c	0.51^{bc}	0.50^{bc}	0.47^c	0.49^c
Dry matter (g)	16.9^d	35.6^a	25.0^b	19.5^{b-d}	23.2^{b-d}	24.5^{bc}	17.1^{cd}	23.6^{b-d}
Dry leaf weight (g)	7.7^b	12.2^a	9.8^{ab}	7.5^b	8.1^b	9.4^{ab}	7.6^b	8.5^b

Different letters within a row indicate significant differences at $P< 0.05$.

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]

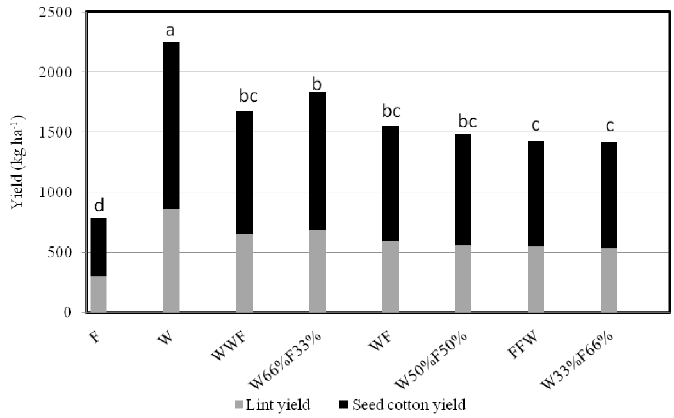

Figure 2. Seed cotton and lint yields in the TMW and freshwater irrigated treatments. Values in any column followed by the same letter do not differ at $P< 0.05$.

elements in TMW is more than that in freshwater (Table 4), and applying TMW is a type of fertigation which results in increases in cotton yield. As shown in Figure 2 there are no significant effects observed between interval and mixture treatment when the same percentages of freshwater and TMW applied.

Fiber Quality

The fiber quality characteristics in various treatments are presented in Table 6. The results indicate that using TMW has no significant effect on fiber quality parameters. These results are in conformity with those obtained by other researchers (Bieloral *et al.*, 1984; Alves *et al.,* 2006).

The average fiber quality characteristics and world standard description of *'Mehr'* variety of cotton as in agricultural *vs.* non-agricultural soils are presented in Table 7. According to this table the lint percentage measured and recorded in this research was 2.2% more than the average one reported by

Table 6. The fiber quality characteristic averages in various treatments.

Parameter	F	W	WF	$W_{50\%}F_{50\%}$	WWF	$W_{66\%}F_{33\%}$	FFW	$W_{33\%}F_{66\%}$
Lint (%)	38.0	38.4	38.5	37.6	39.2	37.4	38.5	37.6
Length 25% (mm)	27.6	28.7	28.0	28.1	27.9	27.9	27.5	28.9
Elongation (%)	6.7	6.5	6.4	6.5	6.2	6.3	6.5	6.5
Micronaire (μg in^{-1})	4.6	4.6	4.6	4.8	4.6	4.6	4.8	4.8
Uniformity (%)	79.6	78.8	80.0	79.6	80.9	77.9	82.3	81.0
Strength (Gg m^{-1})	24.1	25.2	23.7	24.2	23.2	23.6	23.2	24.4

Table 7. Average fiber quality characteristics and quality description of *'Mehr'* variety in agricultural *vs.* non-agricultural soil.

Parameter	*'Mehr'* variety in non-agricultural soil [a]	*'Mehr'* variety in agricultural soil [b]
Lint (%)	0.6±38.2	36.0
Elongation (%)	0.2 (Average)[c]±6.5	8.16 (Very high)
Micronaire (μg in^{-1})	0.1 (Base range)±4.7	3.83 (Premium range)
Uniformity (%)	1.4 (Average)±80.0	84.0 (High)
Strength (Gg m^{-1})	0.7 (Weak)±24.0	22.0 (Weak)

[a] The data present the mean and standard deviation for eight treatments.
[b] The data present the average of *'Mehr'* variety characteristics in agricultural soil (Hosseininejad, 2001).

[Downloaded from jast.modares.ac.ir on 2024-04-27]
[DOR: 20.1001.1.16807073.2012.14.6.7.7]

Cotton Research Institute of Iran on agricultural soil. But other such fiber quality characteristics as fiber elongation, micronaire and uniformity were decreased by use of *'Mehr'* variety in theresearch. Although cultivation of *'Mehr'* variety in non-agricultural soil increases the fiber strength but this increase does not change its category classification, it being still classified as 'weak'. In total, cultivation of cotton on non-agricultural soil increased lint percentage but lowered fiber quality.

CONCLUSIONS

More population growth demands more food supply. Considering the fact that almost all the agriculturally suitable land is cultivated, there is need to extend cultivation to non-agricultural lands and soils. In this research it was shown that the use of treated sewage and economy of fertilizer use with expected and desired yield can be achieved. Irrigation by TMW had a significant positive effect on cotton yield, plant height, internodes distance, number of bolls per m^2, boll weight, LAI, dry matter as well as dry leaf weight. Results indicated, the more use of TMW, the more yield gained. There were no significant differences observed in cotton yield whether in interval or mixture treatments. TMW treatment exerted no significant effect on fiber quality parameters, but cultivation of cotton in non-agricultural soil increased lint percentage and while reducing and reduced other characteristics related to fiber quality.

REFERENCES

1. Allen, R. G., Pereira, L. S., Raes, D. and Smith, M. 1998. Crop Evapotranspiration-guidelines for Computing Crop Water Requirements. Irrigation and Drainage, Paper 56, FAO, Rome.
2. Alves, W. W., Azevedo, C. V., Rogaciano, C. B., José, D. N. and Napoleăo, E. M. 2006. Effect of Treated Wastewater, Nitrogen and Phosphorus on Quality of the Brown Fiber Cotton. *American Society of Agricultural and Biological Engineers, Annual Meeting*, August, Paris, Pp.62-95.
3. Angelakis, A. N., Marecos Do Monte, M. H. F., Bontoux, L. and Asano, T. 1999. The Status of Wastewater Reuse Practice in the Mediterranean Basin: Need for Guidelines. *Water Res.,* **33:** 2201-2217.
4. Anonymous. 2010. U. S. Cotton Fiber Chart. Available at: www.cottoninc.com.
5. Bieloral, H., Vaisman, I. and Feigin, A. 1984. Drip Irrigation of Cotton with Treated Municipal Effluents. I. Yield Response. *J. Environ. Qual.,* **13(2):** 231-234.
6. Biswas, T. K., Higginson, F. R. and Shannon, I. 1999. Effluent Nutrient Management and Resource Recovery in Intensive Rural Industries for the Protection of Natural Waters. Water *Sci. Technol.,* **40(2):** 19-27.
7. Boquet, D. J., Hutchinson, R. L. and Breitenbeck, G. A. 2004. Longterm Tillage, Cover Crop and Nitrogen Rate Effects on Cotton: Plant Growth and Yield Components. *Agron. J.,* **96:** 1443–1452.
8. Bremner, J. M. and Mulvaney, C. S., 1982. Nitrogen-total. In: "Methods of Soil Analysis", (Ed.): Page, A. L.. American Soc. Agron., Madison, WI, PP.325.
9. Day, A. D. and McFayden, J. A. 1984. Yield and Quality of Cotton Grown with Wastewater. *Biocycle.,* **25(3):** 35-37.
10. Hosseininejad, Z. (2001). Cotton: Mehr Variety. Promulgate Issue, Agriculture Ministry, Research Organization and Agriculture Promulgate.
11. Jiménez-Cisneros, B. 1995. Wastewater Reuse to Increase Soil Productivity. *J. Water Sci. Technol.,* **32(12):** 173-180.
12. McNeal, E. O. 1982. Soil pH and Lime Requirement. Part 2. Chemical and Microbiological Properties. In: "*Methods of Soil Analysis*", (Eds.): Page, A. L., Miller, R. H. and Keeney, D. R.. ASA Inc., SSSA Inc. Publishers, NY, USA, PP. 199–224.
13. Menegaki, A. N., Hanley, N. and Tsagarakis, K. P. 2007. The Social Acceptability and Valuation of Recycled Water in Crete: A Study of Consumers' Attitudes. *Ecol. Econ.,* **62:** 7-18.
14. Olsen, S. R. and Sommers, L. E. 1982. Phosphorus. In: "*Methods of Soil Analysis*", (Eds.): Page, A. L., Miller, R. H. and Keeney, D. R.. American Soc. Agron., Madison, Wisc, PP. 403–430.

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]

15. Oron, G. and DeMalach, Y. 1987. Response of Cotton to Treated Domestic Wastewater Applied through Trickle Irrigation. *Irri. Sci.,* **8(4):** 291-300.
16. Oron, G., Goemans, M., Manor, Y. and Feyen, J. 1995. Poliovirus Distribution in the Soil–plant System under Reuse of Secondary Wastewater. *Water Res.,* **29:** 1069–1078.
17. Papadopoulos, I. and Stylianon, Y. 1988. Trickle Irrigation of Cotton with Treated Sewage Effluent. *J. Environ. Qual.,* **17(4):** 574-580.
18. Pescod, M. B. 1992. Wastewater Treatment and Use in Agriculture. Paper 47, Irrigation and Drainage, FAO, Rome.
19. Pollice, A., Lopez, A., Laera, G., Rubino, P. and Lonigro, A. 2004. Tertiary Filtered Municipal Wastewater as Alternative Water Source in Agriculture: A Field Investigation in Southern Italy. *Sci. Total. Environ.,* **324(1–3):** 201–210.
20. Richards, L. A. 1954. *Diagnosis and Improvement of Saline and Alkaline Soils.* Agric. Handbook, US, PP. 110–118.
21. Statistical Analysis System (SAS). 1987. *SAS Version 8.2*. SAS Institute Inc. Cary, NC 27513-2414, USA.
22. World Bank. 1996. From Scarcity to Security, Averting a Water Crisis in the Middle East and North Africa. The World Bank, Washington, DC.
23. World Health Organization. 1989. Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture. *World Health Organization Technical Report Series*, **778:** 1–74.
24. Yadav, R. K., Goyal, B., Sharma, R. K., Dubey, S. K. and Minhas, P. S. 2002. Post-irrigation Impact of Domestic Sewage Effluent on Composition of Soils, Crops and Ground Water: A Case Study. *Environ. Int.,* **28(6):** 481–486.

تأثیر آبیاری با فاضلاب تصفیه شده در خاک غیر زراعی روی خصوصیات گیاه پنبه

م. علی خاصی، م. کوچک زاده و ع. بانیانی

چکیده

در مناطق خشک و نیمه خشک، محدودیت منابع آب ایجاب می نماید برای آبیاری اراضی کشاورزی، از آب های نامتعارف مانند فاضلاب تصفیه شده نیز استفاده گردد. در این راستا، تحقیقی به منظور بررسی تأثیر آبیاری با فاضلاب تصفیه شده بر عملکرد و کیفیت الیاف پنبه رقم مهر در تصفیه خانه شهرک قدس (غرب) به اجرا در آمد. فاضلاب تصفیه شده از تصفیه خانه شهرک قدس (غرب) تهران، تأمین گردید. آبیاری پنبه به صورت سطحی با مقادیر مختلف اختلاط و نیز کاربرد متناوب فاضلاب تصفیه شده و آب معمولی بعلاوه دو تیمار آبیاری کامل با آب و فاضلاب تصفیه شده صورت گرفت. این تحقیق در قالب طرح بلوک کامل تصادفی با هشت تیمار در سه تکرار انجام شد. اندازه هر یک از کرت ها ۳×۳ متر درنظر گرفته شد. نتایج نشان داد، تعداد غوزه در متر مربع، شاخص سطح برگ و ارتفاع گیاه در تیمارهای آبیاری شده با فاضلاب تصفیه شده به طور معنی داری بیشتر از تیمار آبیاری شده با آب بود. عملکرد در تیمار آبیاری کامل با فاضلاب تصفیه شده و آب به ترتیب ۲۲۰۰ و ۷۸۰ کیلوگرم در هکتار بود. تناوب و اختلاط آب و فاضلاب تصفیه شده تأثیر معنی داری روی عملکرد گیاه پنبه نداشت. همچنین فاضلاب تصفیه شده تأثیر معنی داری بر کیفیت الیاف پنبه نداشت.

[Downloaded from jast.modares.ac.ir on 2024-04-27]

[DOR: 20.1001.1.16807073.2012.14.6.7.7]