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Flower Yield and Quality of *Lilium aziatische* Irrigated with Different Types of Water

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Abstract

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The effect of three water types with different salinity levels; the effluent from Al-Baq'a treatment plant 'EF' (2.02 dS/m), and extra treated wastewater after Ultra Filtration membrane 'UF' (1.91 dS/m), and Mixed water (50 % after Reverse Osmosis membrane 'RO' with 50 % of UF; 1.15 dS/m) on the performance , flower production and quality of three cultivars of *Lilium aziatische* cv. "Elite, Prato, and Pollyanna" planted in soil under the plastic house conditions was investigated during the year 2005.

Water type had a significant effect on lily flower yield and quality produced. In general, the three lily cultivars produced the highest flower yields kg/m^2 when irrigated with the UF water type compared to the EF and Mix water treatments. The significantly highest flower yield was recorded for the Elite followed by Prato cultivar irrigated with the UF water type. While the lowest flower yields were recorded for the three cultivars irrigated with the Mix water treatment. We can notice that this increase in flower yield weight is a reflection of longer and thicker stalks and more buds per stalk produced by Elite and Prato irrigated with UF compared to the other water types. The results strongly indicate that the lower the percentage of buds droped per stalk the higher the number of flower buds remained on stalk in relation to water type used for irrigation

Key words: lily; effluent; ultra-filtration; reverse osmosis

Introduction

Membranes of extra water treatments such as Ultra Filtration and Reverse Osmosis reduce the adverse chemical impact on soil and plant (Tamimi, A. 2004) through their effects in improving the ultimate quality of water expanding the opportunity reuse of the low water quality "reclaimed wastewater" in more safe way for agriculture when it is available as of main water resource. This would reduce risks

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expected from the heavy metals impact emphasized by Water Corporattion (2003), Amin (2001) and Kretchmer et al. (2002), creating new option of water for irrigation which consequently will positively serve in keeping our fragile national water balance saving fresh water for more valuable uses such as drink, industry, or tourism. Reclaimed wastewater used in irrigating mainly field crops (Middle East Water Shortage, 2000), citrus trees in Florida (Parson et al., 1997) and highway landscapes in Egypt (Heliopolis, 2001).

Cut flower (non-edible) crops offer a better agricultural option and give new dimensions on reclaimed water use since they can be used on profitable and sustainable bases. Among these, cut flower lily is of the most important flower crops in the world. Lilies have been reported to be low salt tolerant less than 2.0 dS/m (Kotuby et al., 2000; Yiasoumi et al., 2003).

The objective of this study is to monitor and evaluate performance of three Lilium aziatische cv. "Elite, Prato, and Pollyanna" irrigated with three types of reclaimed (the effluent EF) and/or extra treated water after Ultra Filtration (UF) and Reverse Osmosis (RO) membranes planted in soil under the plastic house conditions.

Materials and Methods

The research was conducted for one season 2005 by the cooperation between the National Center for Agricultural Researches and Technology Transfer "NCARTT" Jordan and funded by the USAID.

Bulbs of *Lilium aziatische* "Elite, Prato, and Pollyanna" purchased from the Netherlands by a flower burse Agent in Jordan. The bulbs were planted in soil under a plastic house of 360 m^2 area at Al-Baq'a site north of Amman at the end of July 2005. Experimental plots (raised beds) of 1 x 2 m area and 64/m^2 plants planting density was used 128 bulbs/experimental plot.

All bulb plants were watered uniformly with three water types: W1: the Effluent of Al-Baq'a WW treatment plant EF (2.02 dS/m); W2: after Ultra-Filtration membrane UF (1.91 dS/m); W3: mixed water (50 % after Reverse Osmosis membrane RO with 50 % of UF, 1.15 dS/m) by drip irrigation network, passed through sand, screen, and disc filters.

One irrigation level (frequency) treatment was applied every day at level of 100% of the Class A evaporation pan readings. Water types and lily plants were distributed in a split plot with randomized complete block design (RCBD) with four replications. All the plants were irrigated and sprayed with a fungicide as a protective measure immediately after planting; Insect and fungal disease control program was followed during the experiment time in cooperation with specialists of NCARTT. All plants received 1.6 kg mono ammonium phosphate during the first week after emergence, after that fertilizing program performed by adding 40 gm NPK +TE/plot/week for the EF and UF irrigated plants, and 80 gm NPK+TE/plot/wee for the plants irrigated with the Mix water type. Flower stalk harvesting at the end of experiment took place in the suitable stage of flower development at the soil surface according to Wilkins (1980).

Assessing plant performance proceeded on the parameters of harvested flower stalks weight (kg/m^2), average flower stalk length and diameter, average number of flower buds per stalk, and percentage buds drop of a stalk.

All the results were tabulated and statistically analyzed, mean comparisons perform according to the least significant difference (LSD) at 5% level of significance.

Results and Discussion

Water type had a significant effect on lily flower yield and quality produced (Figure 1 and Table 1). In general, the three lily cultivars produced the highest flower yields kg/m^2 when irrigated with the UF water type compared to the EF and Mix water treatments (Figure 1). The significantly highest flower yield was recorded for the Elite followed by Prato cultivar irrigated with the UF water type. While the

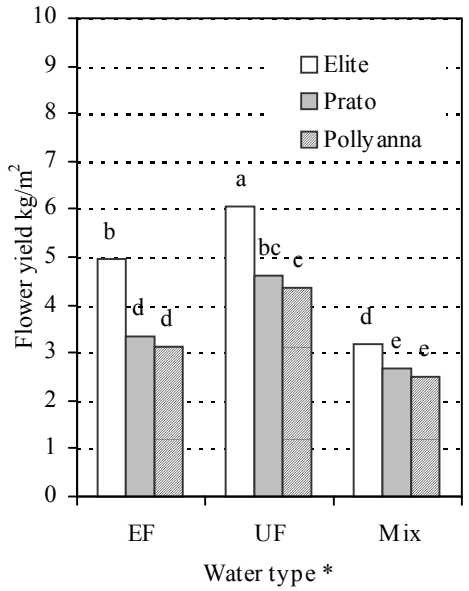

Fig. 1. Flower yield response of three lily cultivars irrigated with three water types planted in soil, season 2005

(*):Water types: EF = effluent from treatment plant; UF = after Ultra Filtration membrane; Mix = (50 % after Reverse Osmosis membrane 'RO' with 50 % of UF).

Table 1

Flower quality parameters of three lily cultivars irrigated with three types of water planted in soil, season 2005

W.T.(1)	Cultivar	Flower stalk length, cm	Flower stalk diameter, cm	No. buds/ stalk
EF	Elite	106.0 b(2)	0.85 bc	5.7 c
	Prato	104.9 b	0.84 bc	6.8 b
	Pollyana	99.3 c	0.85 bc	6.6 b
UF	Elite	110.1 a	1.04 a	7.8 a
	Prato	107.7 ab	0.99 a	7.6 a
	Pollyana	105.1 b	0.96 a	6.7 b
Mix	Elite	94.5 d	0.79 bc	3.5 e
	Prato	94.7 d	0.77 c	4.1 d
	Pollyana	91.7 d	0.78 bc	4.0 d
	LSD	3.82	0.081	0.53

(1):Water types: EF = effluent from treatment plant; UF = after Ultra Filtration membrane; Mix = (50 % after Reverse Osmosis membrane 'RO' with 50 % of UF).
(2): Mean separation for each factor within columns by LSD test, 5% level.

lowest flower yields were recorded for the three cultivars irrigated with the Mix water treatment. We can notice that this increase in flower yield weight is a reflection of longer and thicker stalks and more buds per stalk produced by Elite and Prato irrigated with UF compared to the other water types (Table 1).

The lowest flower quality parameters were recorded for the three cultivars when irrigated with the Mix water treatment. However lily plants irrigated with EF water type showed an intermediate flower quality parameters compared to the

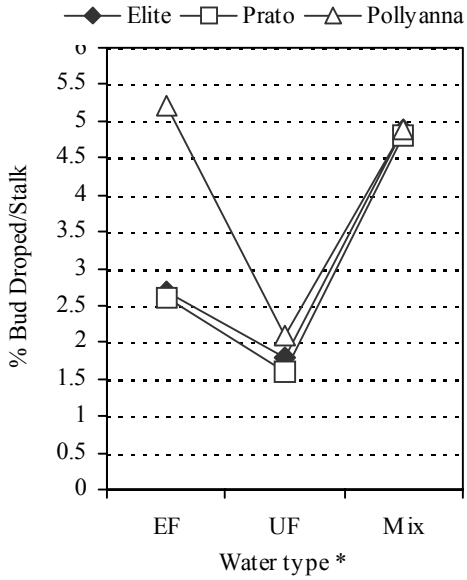

Fig. 2. Percentage bud droped per stalk of three lily cultivars irrigated with three water types planted in soil, season 2005

(*):Water types: EF = effluent from treatment plant; UF = after Ultra Filtration membrane; Mix = (50 % after Reverse Osmosis membrane 'RO' with 50 % of UF).

UF or Mix water treatments (Table 1). However, Elite and Prato cultivars showed lower percentages of droped flower buds when irrigated with EF water type compared to Pollyanna cultivar (Figure 2). The three lily cultivars showed the same trend of lowest percentage of bud droped when irrigated with the UF water treatment. The highest percentage was recorded for the three cultivars irrigated with the Mix water treatment.

Conclusion

These results are strongly reflected on the number of flower buds produced per stalk, indicating that the lower the percentage of buds droped per stalk the higher the number of flower buds remained on stalk in relation to water type used for irrigation. Although, the Mixed water irrigated plants received higher fertilizing levels, it seems not enough to give flower yield and quality as those irrigated with other water treatments EF or UF.

References

Amin, J. S., 2001. [Ngo-list] Waste as resource. http://lists.isb.sdnpk.org/pipermail/ngo-list/2001-december/001526.html

Heliopolis, 2001. Egypt Goes Green. http://www.heliopolisegypt.com/012001/earth.htm

Kotuby-Amacher, J., R. Koeing and B. Kitchen, 2000. Salinity and Plant Tolerance. Utah State University Extension. http://www.extension.usu.edu/publica/agpubs/agso03.pdf.

Kretschmer, N., L. Ribbe and H. Gaese, 2002. Wastewater Reuse for Agriculture. http://www.tt.fh-koeln.de/publications/ittpub301202_4.pdf

Middle East Water Shortage, 2000. http://weather.nmsu.edu/hydrology/wastewater/wastewater.htm

Parsons, L., A. Wheaton and J. Jackson, 1997. Reclaiming Waste Water for Irrigation in Florida. http://www.agweb.okstate.edu/agbase/agbex99-19.htm

Tamimi, A., 2004. Agricultural Demand Management. Membrane Filtration Process (Desalination). The University of Arizona.

Water Corporation, 2003. Treated Wastewater Re-Use. Bulletin No.2. www. watercorporation.com.au

Wilkins, H. F.,1980. Easter Lilies. In: Introduction to Floriculture. Larson, R.A. Academic Press. Harcourt Brace Jovanovich.

Yiasoumi, B., L. Evans and L. Rogers, 2003. Salinity Tolerance, Ornamentals in Media. http://www.ricecrc.org/reader/ac2-salinity-table07.htm

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