Quality changes of rice under different irrigations in lysimeters

Marks IBADZADE[1,2] – Árpád SZÉKELY[1] – Tímea SZALÓKI[1] – Károly PENKSZA[2] – Mihály JANCSÓ[1]

1: National Agricultural Research and Innovation Centre, Research Institute of Irrigation and Water Management; Anna liget u. 35, H-5540, Szarvas, Hungary E-mail: jancso.mihaly@ovki.naik.hu
2: Szent István University, Faculty of Agricultural and Environmental Sciences; Páter Károly u. 1. H-2100, Gödöllő, Hungary E-mail: marks.ibadzade@gmail.com

Keywords: rice, effluent water, micro irrigation, lysimeter

Introduction

According to Maclean et al (2012), rice (*Oryza sativa L.*) is one of the most water-intensive crops among agricultural plants. Nowadays, alternative water sources are more and more important for agricultural production. Effluent water from intensive agricultural technologies can be reused as irrigation water if the quality meets the requirements (Kun et al. 2017). Given the importance of water in the life of rice plant, analysis of qualitative changes in rice seeds was carried out using different water types in a lysimeter study: (1) effluent water from an intensive fish farm, (2) effluent water supplemented with gypsum, (3) effluent water mixed with surface water and supplemented with gypsum, (4) surface water from Körös river.

Materials and methods

The experiment was conducted in 2018 on a Hungarian rice variety called M 488 as a continuation of our study, which began in 2017 in Szarvas, Hungary. The experiment was started under aerobic conditions at the NAIK ÖVKI Lysimeter Station, while the traditional flooded control was used in NAIK ÖVKI Galambos Rice Research Station (GRRS) (2018). The moisture content, 1000 kernel weight (TKW) and basic milling quality parameters of rice samples were reviewed here. The experiment was implemented in accordance with the rules of the past experiment (Ibadzade et al 2018).

Results and discussion

Table 1: Thousand kernel weight of paddy and cargo seeds of rice developed with different quality of irrigation, (Szarvas, 2018).

Treatment (1)		TKW of paddy seed (2) (g)	TKW of cargo seed (3) (g)
Effluent (45mm/week) (lysimeter experiment)	Average	22.030	17.186
	SD	0.454	0.586
Effluent+gypsum (45mm/week) (lysimeter experiment)	Average	21.937	17.249
	SD	0.297	0.333
River+effluent+gypsum (45mm/week) (lysimeter experiment)	Average	21.929	17.018
	SD	0.420	0.487
Körös river (45mm/week) (lysimeter experiment)	Average	20.321	15.320
	SD	0.691	0.574
Conventional, flood irrigation (anaerobic)	Average	25.008	19.955
	SD	0.409	0.957

The moisture content of all rice samples had no significant differences: 6.83% for effluent water, 6.45% for effluent water supplemented with gypsum; 6.87% for effluent water

 doi: 10.34116/NTI.2019.AA.27

mixed with surface water and supplemented with gypsum; 7.08% for surface water from Körös river, and 6.89% for conventional irrigation. Based on the data of the IRRI (2013), it can be concluded that the results are generally quite normal. Thereafter, collected data from the measurements of TKW and milling parameters were analysed by IBM SPSS 22 software (Table 1 and 2). Although there was a difference between treatments and the control method, the difference was not statistically significant. As a first year study, we will repeat the experiment in 2019 with the same conditions. During the growing season, any negative reaction of the plants was not registered.

Table 2: Milling quality parameters of cargo and polished seeds of rice developed with different quality of irrigation, (Szarvas, 2018).

Treatment (1)		Cargo (2)	Polished (3)	Polished (whole) (4)	Polished (broken) (5)
		(%)	(%)	(%)	(%)
Effluent (45mm/week) (lysimeter experiment)	Average	78.15	67.15	55.90	10.65
	SD	1.037	1.417	1.969	2.048
Effluent+gypsum (45mm/week) (lysimeter experiment)	Average	79.30	69.9	56.95	12.90
	SD	0.258	1.976	2.478	1.290
River+effluent+gypsum (45mm/week) (lysimeter experiment)	Average	78.90	69.17	57.00	11.65
	SD	0.871	2.132	2.503	1.885
Körös river (45mm/week) (lysimeter experiment)	Average	74.60	68.70	55.40	12.80
	SD	3.716	1.677	3.798	3.885
Conventional, flood irrigation (anaerobic)	Average	79.55	67.62	57.15	10.40
	SD	0.341	1.943	2.242	3.219

Conclusions

Even the absence of significant changes, previous and current experiences show that irrigation of plants by unconventional sources does not hinder the sustainable development of the plants.

Acknowledgement

The Hungarian Ministry of Agriculture supported the project under the "Irrigation Management and Rice Research" program (FM O15500). The research infrastructure for this research was developed by GINOP-2.3.3-15-2016-00042 project. Stipendium Hungaricum supports the studies of Marks Ibadzade.

References

Ibadzade M., Székely Á., Penksza K., Jancsó M. (2018): Effects of water on the milling characteristics of aerobic rice. Alkalmazkodó vízgazdálkodás: lehetőségek és kockázatok. 267-271.

IRRI (2013): Quality kit manual - Postharvest unit. International rice research institute. 21 pp. http://www.knowledgebank.irri.org/images/docs/postharvest-irri-qualitykit-manual.pdf https://doi.org/10.19103/as.2016.0003.18

Kun Á., Bozán Cs., Barta K., Oncsik M.B. (2017): The effects of wastewater irrigation on the yield of energy willow and soil sodicity. Columella, 4(1): 11-14.

Maclean JL, Dawe D, Hardy B, Hettel GP, editors. (2002): Rice almanac. III Edition. International Rice Research Institute. Los Banos (Philippines). 253 pp.