STUDIES ON DRIP IRRIGATION OF RICE IN BULGARIA

Antonia Ovtcharova, Dimitar Dimitrov, Georgy Georgiev
Higher Institute of Agriculture, Plovdiv, Bulgaria

Introduction

The global warming of the Earth is closely related with the pollution of the air, ozone hole and the thinning of the ozone layer. Dr. A. Taramura (1990) has stated that 17% of the formed methane comes from flooded rice fields. According to him the global methane emission increase is 1% per year.

By flooding it have been created anaerobic microbiological processes, which produce methane from 4,5 g/m^2 to 15,9 g/m^2 (Flaher, 1990). Sprinkler irrigation was considered like an economical way for water. Mc. Cauly (1985) stated that by spray irrigation water saving could be 50%. The good results can be obtained by two applications per week equal to the evapotranspiration. The most important problem is weed control both sprinkler and drip irrigation (Grist D.H.1983).

Materials and methods

The two years trial (1996-1997) on drip irrigation of rice was carried out at the field of the Department of Melioration, Higher Institute of Agriculture, Plovdiv. The aim of the investigation were to study possibility for non conventional irrigation of rice and decreasing the ecological influence. The three rice cultivars, which are the most popular in the conditions of South Bulgaria have been investigated under drip irrigation: Marijana, Krasnodar-424, and Luda Jana AT. The soil is alluvial meadow (clay loam), which had followed mean properties for the layer of 0 - 60 cm: bulk density 1,45 g/cm^3, specific density 2,64 g/cm^3, porosity 45%, field capacity 28% by weight, wilting point 15,04%.

The average soil content of organic water in A-layer is up 2%, PH - 7,7-7,8, carbonates - 7,12%, P_2O_5 - 0,008%, K_2O - 0,016% and nitrogen - 0,003%.

Rice cultuvars were grown in randomized complete block design with plots 10m2 each in four replications. Drip irrigation was done by laterals at discharge 0,70m with emitters spacing of 0,60m, The discharge rate is 4 liter/h.

Investigated indices were: number of the sprouting plants per $1m^2$, number of the plants on the end of the growth period per $1m^2$, height of the plants and grain yield.

Results and Discussion

All cultivars were grown without fertilizers and chemical protection. In the table 1 it can be seen the average height of the rice plants under flooding and drip irrigation.

Table 1

Average height of rice plants in cm during 1996-1997

N	Rice cultivar	Flooding-control	Drip Irrigation	Decrease in % of Flooding
1	Marijana	92.0	92.0	21.0
2	Krasnodar 424	88.0	88.0	28.5
3	Luda Jana AT	97.0	97.0	17.8

Table 2

Number of the sprouting plants per $1m^2$ and number of the plant of ripening stage, average for 1996-1997

N	Rice cultivars	Flooding		Drip irrig.		Decrease in % of floding	
		Sprouting stage	Ripening stage	Sprouting stage	Ripening stage	Sprouting stage	Ripening stage
1	Marijana	366.5	335	305.0	296.0	16.8	11.6
2	Krasnodar 424	378.0	342	336.0	325.5	11.1	4.8
3	Luda Jana AT	347.0	327	322.5	317.0	7.1	3.1

Drip irrigation affects on the height of rice plants. The decrease ranges from 17,8% to 28,5% of the rice by flooding.

Table 2 shows the decrease of the number of the rice plants by drip irrigation in % of flooding. Results indicate that at sprouting stage the decrease ranges from 7,1% to 16,8%, but in the ripening stage this decrease is less - from 3,1% to 11,6%.

The data from table 3 show the rice yield, obtained during 1996-1997 by 100% seeding rate. The decrease of rice yield, obtained by drip irrigation ranges form 48% to 54%. The best cultivar in the conditions of South Bulgaria is Luda Jana AT. Obviously this trial shows that drip irrigation of rice decreases grain yield.

Table 3

Average grain yield of rice in kg/ha during 1996-1997

N	Cultivar	Flooding	Drip irrigation	Decrease in % of flooding
1	Marijana	6615	3064	54
2	Krasnodar - 424	5970	3035	49
3	Luda Jana AT	6645	3417	48

The actual amount of water required by the crop depends on a number of factors. An excessive depth of water by paddy rice will not influence transpiration of water by the plant, for this remains constant regardless of the degree of saturation of the soil. The paddy plant, in fact, takes no more water than dryland crops.

Drip irrigation of rice requires water application every 3 days. For two years period average water amount comes to 8000m^3/ha. Efficient management of irrigation results in higher yields with less water. Water amount for flooding rice totals 25000 m^3/ha during 1996-1997. The best cultivar is Luda Jana AT in the conditions of South Bulgaria.

Conclusion

Use of drip irrigation radically change the way rice is grown. The irrigation was done with emitters discharge of 4 liter/h every 3 days.

The decrease of height of drip irrigated plants indicated that it is 17,8 - 28,5% of flooding rice. Also there is decrease of the number of plants per 1m2 at the sprouting and at ripening stage. The decreased number of plants is related with grain yield of drip irrigated rice. All biometry investigations show less indeces by drip irrigation.

Average water use comes to 8000m3/ha by drip irrigated rice in growth period, comparing with 25000m3/ha by flooding. Flooded rice consistently had higher grain rice yield than drip irrigated rice. But with saved water of 1 ha drip irrigated rice could be irrigated supplimentary corn, which yield will be 2,5t/ha in condition of South Bulgaria. Paddy fields need irrigation works. They consist of bunds, irrigation and drainage canals. Land levelling is important for sufficient control of water on the field since it enables water to be maintained at a constant and shallow depth and to be run on or off the field quickly. This efficiently of water management contributes significantly to increased crop yields. Consicantly, the expences of paddy are much more than by drip irrigated rice.

Finally, economical analyses will be done to establish exactly the effect of drip irrigated rice together with all ecological aspects.

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Summary

Studies on drip irrigation of rice in Bulgaria. Rice is the staple food for 2/3 of the word's population. Basicly the rice is irrigated under flooding and natural rainfall-dry rice. Investigation, related with the ozone hole, the thinning of ozone layer and global warming of the world, have pointed to that 25% of the formed methane comes from flooded rice fields.

The two years trial (1996-1997) on drip irrigation of rice was carried out at the field of the Department of Melioration, Higher Institute of Agriculture, Plovdiv. The aim of the trial was to study possibility for nonconventional irrigation of rice and decreasing the ecological influence.

It was investigated different rice cultivars under drip irrigation in conditions of South Bulgaria. Biometry investigations were made and compared to these by flooded rice.

The yield and crop water requirements of rice by drip irrigation and conventional flooded irrigation have been investigated.

Antonia Ovtcharova
Higher Institute of Agriculture Department of Melioration
12 Mendeleev Str., 4000 Plovdiv
Bulgaria