IRRIGATION SCHEDULING AT TOMATOES CROP UNDER POLYETILENNE TUNNEL CONDITION

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Abstract

The present study examined the set of measures to ensure the correctly irrigation scheduling for optimal and uniform supply with water of crops, because irrigation sooner than necessary determined excess of soil moisture on short periods of time, oversized irrigation rate, waste of water and energy as well as negative consequences for soil and plant. Delay of irrigation leads to installation of hydric stress in the soil to the final negative consequences on agricultural yield (Domuta, 1995).

The operation is particularly important for field crops and for the shelter, considering that irrigation scheduling represents measures that provided the correctly establishment of application time (Grumeza et al., 1989).

Through this analysis we try to contribute to informing interested parties about the requirements of vegetable plants to water, air and soil, factors from the complex relations of interdependence, and their influence on the development, production and exploitation of vegetables.

Key words: *ecological crop, conventional culture, yield and quality of tomatoes, fruits*

INTRODUCTION

Correctly irrigation scheduling plays important role in the life of plants by optimum and uniform supply of water to the crop, water being the constitution element, biochemical and physiological medium reaction and the carrier of mineral and synthetic substances, having also serves as a heat regulator tissues through the process of transpiration and evaporation. The delay of irrigation leads to installation of hydric stress in the soil, with negative consequences on the final yield.

Most vegetable plants have high requirements to water, being large consumers.

MATERIAL AND METHOD

Direct methods are based on soil moisture control using gravimetric methods, strain, electrometrical, etc.

Indirect methods are based on the link between water consumption of the plant (determined directly) and reference evapotranspiration (ET_0).

Reference evapotranspiration can be calculated using a variety of methods using climatic elements or may be measured using evaporimeters or lysimeters (Grumeza et al., 1989).

Another necessary element for irrigation scheduling using indirect methods is the daily water consumption. It was determined by the balance method, supported by soil moisture control. Decadal determination of soil humidity was made on 0-50 cm depth.

In the experience of determining irrigation regime and water consumption at tomato crop under polyetilenne tunnel conditions, soil sampling was done from 10 to 10 days, and maintaining of water reserve between easily available water content and field capacity to ensure an optimum irrigation scheduling for plants.

At the beginning and end of each month the soil samples were taken from a depth of 0-150 cm, thus ensuring the optimum conditions required for the calculation of the real optimum consumption (ETR_{opt}) of crop. The calculation of the soil water balance is shown in Table 1.

Table 1

Soil water balance (0-150 cm) and average of daily water consumption of tomato crops under polyetilenne tunnel condition, Husasău de Tinca, 2014

Variant	Interval		No. days	Initial reserve	Irrigations	Total in soil	Final reserve	Total water consumption	Daily water consumption m^3/ha
	From	To							
Unmulched	15.03	29.04	45	4610	580	5190	4170	1020	22.7
	01.05	30.05	30	4305	710	5015	3983	1032	34.4
	01.06	30.06	30	3980	945	4925	3600	1325	44.2
	01.07	31.07	31	3460	1250	4710	3065	1645	53.06
	01.08	31.08	31	3070	1025	4095	2880	1215	39.2
	01.09	14.09	14	3220	315	3535	3365	170	12.14
Mulched	15.03	29.04	45	4752	578	5330	4315	1015	22.6
	01.05	30.05	30	4130	720	4850	3826	1024	34.1
	01.06	30.06	30	3820	924	4744	3450	1294	43.1
	01.07	31.07	31	3412	1236	4648	3221	1427	46.03
	01.08	31.08	31	3240	1046	4286	3215	1071	34.6
	01.09	14.09	14	2862	318	3180	3020	160	11.5

The coefficient Kc, crop coefficient, as is known in the international literature, is determined as the ratio between daily water consumption of culture and daily reference evapotranspiration, in this case daily Piché evaporation.

RESULTS AND DISSCUSIONS

Daily average values specific to each month of the growing period is generally higher in unmulched variant (Table 2, Fig. 1).

Table 2

Optimum water consumption of tomatoes crop in mulched and unmulched variants under polyetilenne tunnel condition, Husasău de Tinca, 2014

Year	Variant	Month													
		March		April		May		June		July		August		September	
		m^3/ha/zi	%	m^3/ha/zi	%	m^3/ha/zi	%	m^3/ha/zi	%	m^3/ha/zi	%	m^3/ha/zi	%	m^3/ha/zi	%
2014	Unmulched tomatoes	22,7	100	22,7	100	34.4	100	44.2	100	53.06	100	39.2	100	12.14	100
	Mulched tomatoes	22.6	99.5	22.6	99.5	34.1	99.12	43.1	97.51	46.03	86.78	34.6	88.26	11.5	94.72

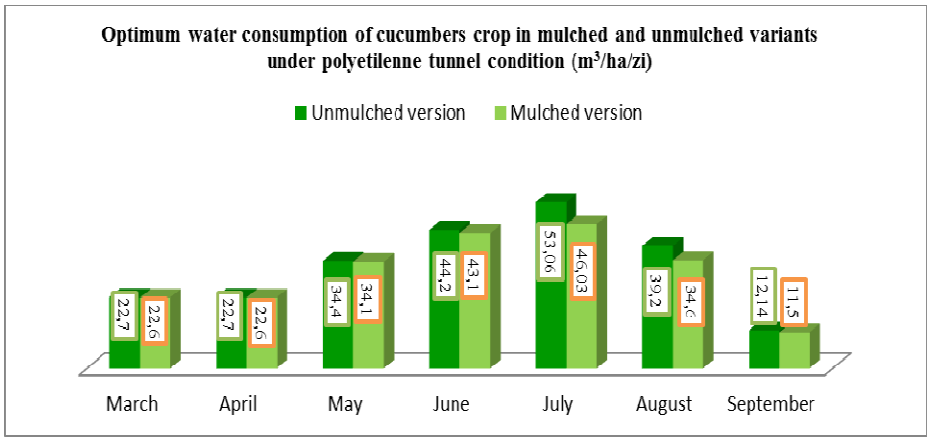

Fig. 1. Optimum water consumption of tomatoes crop under polyetilenne tunnel condition

Both variants without mulch and mulched version, the higher value of the daily average water consumption were registered in July, being 53.06 m^3 /ha/day in variant without mulch, respectively 46.03 m^3/ ha/day in mulched variant.

Daily average values are specific to each month of the vegetation period, in generally are lower in mulched variant.

Table 3

The crop coefficients (Kc) for transformation of the Piché evaporation into the optimum water consumption of the tomatoes crop under polyetilenne tunnel condition in mulched and unmulched variants, Husasău de Tinca, 2014

Husasău de Tinca	Culture	Month						
		March	April	May	June	july	August	September
2014	Unmulched tomatoes	0.59	0.46	0.61	0.82	0.82	0.62	0.33
	Mulched tomatoes	0.59	0.45	0.60	0.80	0.71	0.54	0.31

The data presented showed that the coefficient "Kc" values are sub unitary in all months of vegetation period, both variants mulched and unmulched crop, and values registered at tomatoes with mulch are lower than values registered at tomatoes without mulch (Table 3) .

By multiplying the Piché evaporation in that day with coefficient "Kc" for that month, it is obtaining the water consumption of the crop on the calculation day. Subtracting this value from the value of water reserve at the beginning of the day will results the value of soil water reserve registered at the end of the day. If the water reserve is under easily available water content, then irrigation is needed.

Establishment in this way the timing of irrigation application, is simple, and compared to theoretical calculations has the advantage that it uses measured elements - Piché evaporation - under polyetilenne tunnel condition; gives extra rigor of irrigation at tomatoes crop under polyetilenne tunnel condition and provides significant water efficiency. And compared to gravimetric determination of soil moisture, using of Piché evaporimeter for establishing of irrigation moment has advantages because does not require soil sampling, weighing and drying them.

For a correctly irrigation scheduling using Piché evaporimeter are needed accurate data about hydrophysical soil indices (field capacity,

wilting point, easily available water content) an accurate assessment of daily Piché evaporation. The method enables a high degree of automatization, monthly records can be completed on the computer, can be realized computer programs that assured automatic closing of irrigation installations (Domuta C., 2005, 2009).

CONCLUSIONS

The water consumption of tomatoes grown in polyetilenne tunnels was influenced by climatic conditions and crop mulch system. Following our research resulted higher water consumption in variant without mulch, total water consumption was higher than in mulched variant.

Establishment of correct timing of water application and optimum irrigation determined higher yields gain in mulched variant compared with unmulched variants.

The research results highlighted that the establishment of correctly irrigation scheduling provides the highest yields of tomato under polyetilenne tunnel conditions and deviations from optimum moment of irrigation scheduling determines statistically significant yield losses.

Irrigation scheduling based on Piché evaporimeter required daily measurements of evaporation Piché, which had the highest value in July. For transformation of daily evaporation Piché into optimum water consumption of tomatoes were calculated coefficients "Kc" as the ratio between the optimum daily water consumption and evaporation Piché. Their values are specific to each month of the vegetation period. On average over the studied period in mulched variant, values of coefficient "Kc" is lower than the values determined in the variant without mulch.

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