

## IRRIGATION SCHEDULING AT CUCUMBERS CROP UNDER POLYETILENNE TUNNEL CONDITION

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### Abstract

*Irrigation scheduling is a very important operation for vegetables crop in the field crops and in protected areas, because through this operation in this paper was realized an irrigation scheduling that provided the correctly establishment of application time (Grumeza et al., 1989) and to ensure optimal and uniform supply of water to the cucumber crop under polyetilenne tunnel condition*

*Irrigation earlier than necessary, determined moisture excess on short periods of time, oversized irrigation rate, waste water and energy as well as negative consequences for the plant and soil. Delay of irrigation leads to installation of hydric stress in the soil to the final negative consequences on agricultural yield (Domuta, 1995).*

*Factors contributing to the establishment of irrigation system are: the biology of this species, vegetation period, establishing period of crops, critical stages for water supply: consumption or monthly potential evapotranspiration during the vegetation season; assessing the quantity of water needed to supply the active layer soil during the vegetation period and monthly, hydro properties of soil on active layer depth (Domuta C. 2003).*

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

### INTRODUCTION

Water in plants life has a special role because the physiological and biochemical processes take place only in this presence. Water is the element of the constitution, the physiological and biochemical circumstance reaction, carrier of minerals and the synthesis substances and serves as a thermal regulator of tissue through transpiration and evapotranspiration. Most vegetable plants have requirements of irrigation being a major consumer. A cucumber needs more irrigation because of ecophysiological particularities; it is included in vegetables group with higher consumption of water and reduced possibilities of absorption.

### MATERIAL AND METHOD

The main elements of the irrigation system are: irrigation rate, the number of watering, time and duration of irrigation, irrigation scheduling.

In the experience regarding to determining irrigation scheduling and water consumption at cucumbers crops under polyethylene tunnel condition, 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 cucumbers crops under polyethylene tunnel condition, mulched and unmulched versions, Husasău de Tinca, 2011

Variant	Interval		No. days	Initial reserve	Irrigations	Total in soil	Final reserve	Total water consumption	Daily water consumption $m^3/ha$
	From	To							
Unmulched	24.06	31.07	38	3970	1450	5420	4010	1410	37,1
	01.08	31.08	31	4010	1090	5100	3370	1730	55,9
	01.09	30.09	30	3370	800	4170	3210	960	32,0
	14.06	30.09	99	3970	3340	7310	3210	4100	41,4
Mulched	24.06	31.07	38	4010	1450	5460	4100	1360	35,8
	01.08	31.08	31	4100	1090	5190	3540	1650	53,2
	01.09	30.09	30	3540	800	4340	3390	950	31,7
	14.06	30.09	99	4010	3340	7350	3390	3960	40,0

Daily water consumption of vegetable plants is estimated in the peak months on average about 50-60  $m^3/ha$  depending on the species.

Irrigation scheduling by direct methods it is based on soil moisture control using gravimetric, tensiometer and electrometric methods, etc.

Irrigation scheduling by indirect methods are based on the link between water consumption of plants (directly determined) and reference evapotranspiration ( $ET_0$ ). The reference evapotranspiration can be calculated through a variety of methods using climatic elements or can be measured using evaporimeters or lysimeters (Grumeza et al., 1989).

Another necessary element for irrigation scheduling using indirect methods is daily water consumption. It was determined by soil water balance method, based on the control of soil moisture.

## RESULTS AND DISSCUSIONS

Table 1 illustrates the daily average values that are specific to each month of vegetation period and is generally lower in mulched variant (Table 1, Fig. 1).

*Table 1*  
Optimum water consumption of cucumbers crop in mulched and unmulched variants under polyetilenne tunnel condition, Husasáu de Tinca, 2011

Year	Variant	Month							
		June		July		August		September	
		m <sup>3</sup> /ha/zi	%						
2009	Unmulched cucumbers	37.1	100	37.1	100	55.9	100	32.4	100
	Mulched cucumbers	35.8	96.5	35.8	96.5	53.2	95.2	31.7	97.8

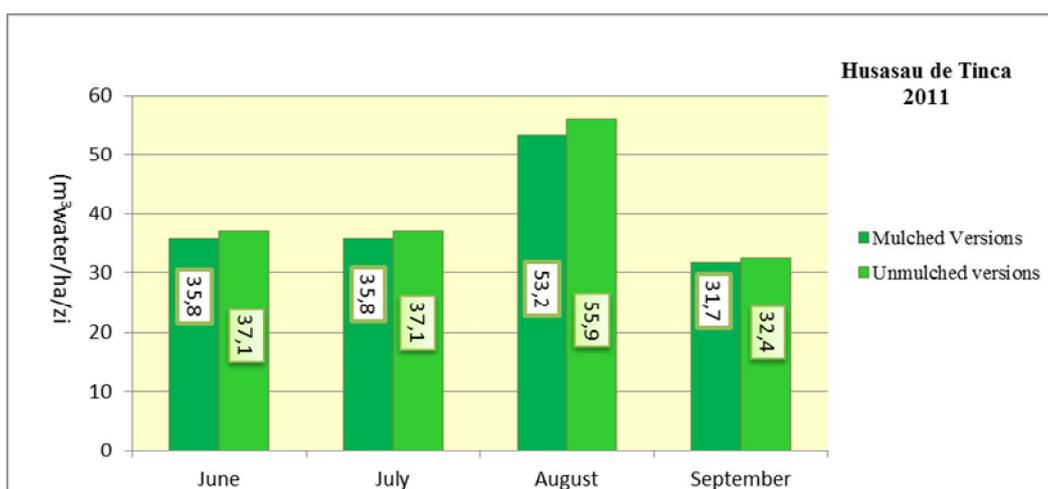


Fig. 1. Optimum water consumption of cucumbers crop in mulched and unmulched variants under polyetilenne tunnel condition

Both variants without mulch and mulched version, the higher value of the daily average water consumption were registered in August.

Decadal determination of soil moisture on 0-50 cm depth assured the maintaining of water reserve between easily available water content and field capacity ensuring to plants an optimum water supply and obtaining an optimum values for water consumption of unmulched and mulched cucumbers.

For an accurate irrigation scheduling and moment of water application was determined coefficient “Kc” through the reporting of daily water consumption of crop to daily reference evapotranspiration, in this case daily Piché evaporation.

The data presented in table 2 showed that the coefficient “Kc” values are sub unitary in all months of vegetation period except September at unmulched cucumbers and values registered at cucumbers with mulch are lower than values registered at cucumbers without mulch.

*Table 2*

The crop coefficients (Kc) for transformation of the Piché evaporation into the optimum water consumption of the cucumbers crop under polyetilenne tunnel condition in mulched and unmulched variants, Husasău de Tinca, 2011

Year	Variant	Month			
		June	July	August	September
20	Unmulched cucumbers	0.58	0.47	0.98	1.06
	Mulched cucumbers	0.56	0.45	0.94	0.94

By multiplying the Piché evaporation in that day with coefficient “Kc” for that month, from the table above, 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 cucumbers 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, dates regarding to “Kc” coefficients resulting from performing our research. 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 cucumbers, are differentiated on vegetation stages and an insufficient consumption leading to stunted growth, development of a higher number of male flowers, fruit deformation and appearance of their bitter taste. The water consumption of cucumbers is justified because they are plants with lower resistance to drought and if are not helped with irrigation the latest flower and growth of young fruits are compromised.

The water consumption of cucumbers crop under polyethylene tunnel condition was influenced by climatic conditions and mulched crop system. In the year with highest average daily temperature was registered highest water consumption and in the version without mulch the total water consumption was higher than in the variant with mulch.

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 cucumbers 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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