RESEARCH ON WATER CONSUMPTION FOR ONION GROWING IN PRE-MOUNTAINOUS REGION OF THE APUSENI MOUNTAINS

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Abstract. *Water consumption in onion growing was determined for different types of irrigation: 50% of AHC (Active Humidity Coefficient), 70% of AHC and no irrigation just organic fertilization or organic and mineral fertilization. Research was carried out in 2008 and 2009 using the direct method of determining the amount of water in the soil (the water balance).*

Keywords: irrigation, water consumption, fertilization, variety.

INTRODUCTION

The pre-mountainous region with its specific soil factors and climate factors can be a suitable region to grow onion in open field with proper irrigation. Research in this domain could turn out to be good support for cultivators. An optimal irrigation scheme for this crop in the pre-mountainous region could be drawn up by determining the water consumption for onion and knowing the optimal timing for irrigation. Water consumption costs could be reduced to a minimum so that superior production in terms of quality and quantity can be obtained.

MATERIAL AND METHOD

Meteorological data were collected with the help of Watson_W9691 meteorological station. Research is aimed at determining the influence of water consumption on bed irrigation in onion growing – Stuttgart and Piroska varieties – for different irrigation versions: 50% of AHC, 70% of AHC and no irrigation just two versions of fertilization: organic fertilization on the one hand and organic and mineral fertilization on the other hand.

Over the years experiments have been conducted with the help of water balance in the soil method in order to evaluate and determine the water consumption and the influence of organic fertilizers and mixed (organic and mineral) fertilizers, for each experimental version.

Knowledge regarding the water consumption of a certain crop is of the utmost importance in establishing crop irrigation norms.

By calculating the soil water balance in case of irrigation, without phreatic input, we obtain:

$R_i + P + M = ETR + R_f$, hence : $ETR = R_i + P + M - R_f$, where:

ETR – total water consumption of the crop (m^3/ha);

Ri – initial water reservoir in the soil(m^3/ha);

P – precipitation (m^3/ha);

M – irrigation norm during vegetation period (m^3/ha);

Rf – final water reservoir in the soil (m^3/ha);

The gravimetric method (classical) was used in order to determine soil humidity. This consists of drying the soil samples taken form the field in an oven and determining the amount of water by weighing.

In this experiment soil samples were taken from different depths: 0-20 cm, 20-40 cm, and 40-60 cm throughout the entire vegetation period, from three control spots. Soil humidity was calculated as arithmetic average of the two repetitions. (Botzan, 1972)

The following formula was used to calculate humidity:

U%=(lost water / dry soil weight) • 100

RESULTS AND DISCUSSION

The irrigation schemes for experimental year 2008 (Fig. 1) and for 2009 (Fig. 2) were drawn up based on irrigation performed in the experimental field (50% of AHC, 70% of AHC respectively), in onion growing. The graphs in the figures indicate both the additional amount of water for irrigation and the precipitation fallen during vegetation period. By analysing the data shown in figures 1 and 2 we can see there are differences from one year to another, which can be explained by taking into account the differences in climate conditions in the two experimental years as well as those regarding precipitation and irrigation (50% of AHC and 70% of AHC) and last but not least the total amount of water necessary for the vegetation periods of the two years.

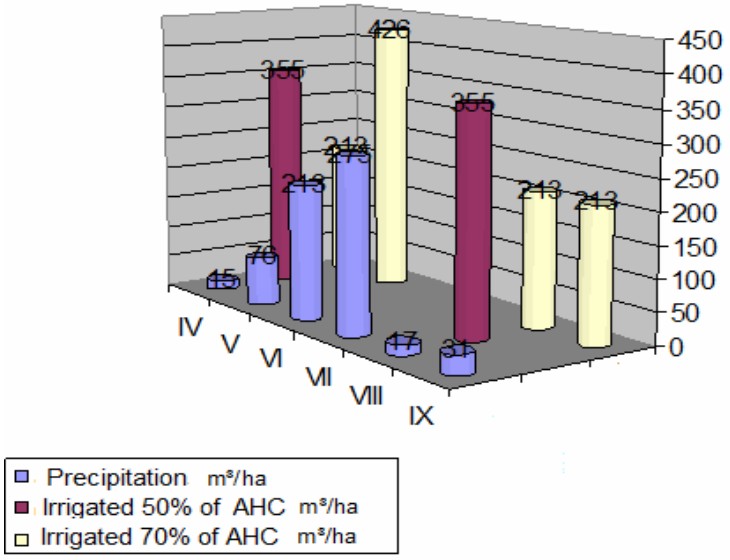

Fig. 1. Precipitation and irrigation norms applied to onion crops in 2008

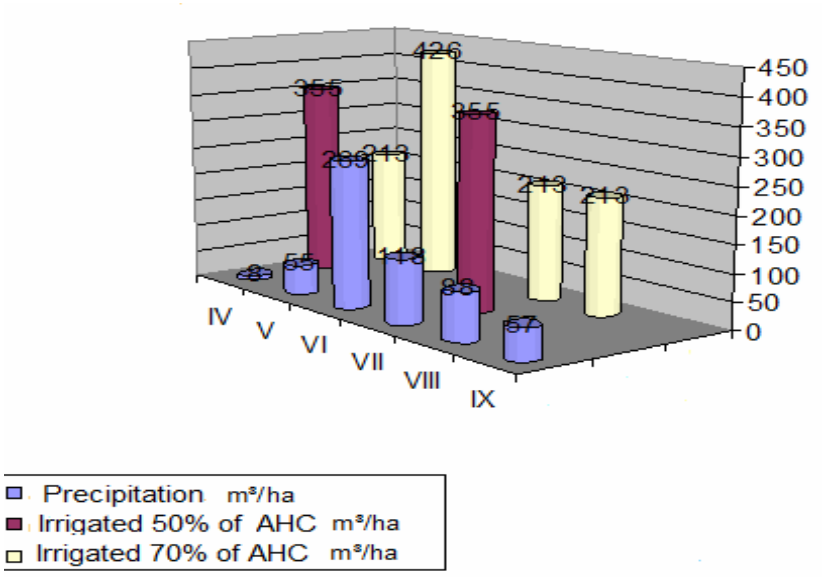

Fig. 2. Precipitation and irrigation norms applied to onion crops in 2009

Table 1 shows the average total consumption and the average daily consumption in the two experimental years for each fertilization version. A slightly elevated level of water consumption can be seen for mixed fertilizers version (organic and mineral fertilizers).

Table 1

The average total water consumption and the average daily water consumption according to years and fertilization version in onion growing

Version	Total consumption (m^3/ha)	Daily consumption (m^3/ha)
Organic fertilizers	6853.16	43.13
Mixed (organic and mineral) fertilizers	6892.11	43.39

Table 2 shows the average total consumption and the average daily consumption for the two onion varieties in the experimental years according to irrigation versions. The consumption grows progressively for each irrigation version: not irrigated, irrigated 50% of AHC and 70% of AHC.

Table 2

The average total water consumption and the average daily water consumption according to years and irrigation version in onion growing

Version	Total consumption (m^3/ha)	Daily consumption (m^3/ha)
Not irrigated	6316.64	39.76
Irrigated 50% of AHC	6923.88	43.59
Irrigated 70% of AHC	7377.39	46.42

Table 3 shows the average total consumption and the average daily consumption in the two experimental years according to onion varieties. There can be noticed a difference of 70.27 m cubi of water between the two onion varieties, in favour of Piroska variety.

Table 3

The average total water consumption and the average daily water consumption according to years and onion variety

Version	Total consumption (m^3/ha)	Daily consumption (m^3/ha)
Variety 1 (Stuttgart)	6837.50	43.04
Variety 2 (Piroska)	6907.77	43.48

CONCLUSIONS

Despite different soil conditions and climate conditions during vegetation period in the two experimental years, we can observe an elevated level of water consumption which increases progressively according to irrigation version: from not irrigated version to irrigated 50% of AHC and irrigated 70% of AHC. Water consumption increases progressively due to the use of irrigation water.

The average total water consumption and the average daily water consumption in the two experimental years increases when mixed (organic and mineral) fertilizers are used as compared to organic fertilizers version. There are also slight differences with regard to water consumption depending on the onion variety that is grown.

The levels of daily water consumption were the highest in the months of June and July of each experimental year as these two months represent the period of time when onion plants consume more water due to the growth process. Therefore, with onion crops in the field in pre-mountainous region it is important to intervene by making small adjustments in terms of irrigation during vegetation period, although there are large amounts of precipitation in this region at this time of year.

REFERENCES

1. Botzan M. (1972). Water Balance in Irrigated Soils. Academic Publishing House, Bucharest