THE EFFECT OF LOCALIZED IRRIGATION ON WATER RESERVES FROM SOIL IN THE SPECIAL CONDITIONS FROM DOBROGEA

EFECTUL IRIGĂRII LOCALIZATE ASUPRA REZERVELOR DE APĂ DIN SOL ÎN CONDIȚIILE SPECIALE DIN DOBROGEA

SEPTAR Leinar, DUMITRU Liana Melania
Research and Development Station for Fruit Growing Constanta, Romania

Abstract. *Irrigated fruit tree growing is a special category of fruit tree growing, which is clearly superior, irrespective of the pedo-climate area in which practice. The main objective to be achieved through irrigation is to maintain the depth where the spread are the roots of trees, optimum water content. Special conditions of Dobrogea, for the supply of adequate water trees, maintaining the water content of soil above the minimum ceiling (over 50% of IUA) on the depth of 1.0 m in optimum can satisfy their requirements. The data obtained showed that since the end of May reserve of ground water from a depth of 0-1.0 m was close to the minimum ceiling. Consequently, it ordered the implementation rules of irrigation with different norm of wet, specific methods of application located water (drip and micro sprinkler). As such, during the study 2003 and 2004 by applying localized irrigation (drip and micro sprinkler) I wanted to keep the reserve of soil water in the upper part of the active interval humidity.*

Key words: drip irrigation, micro sprinkler irrigation, water content of soil

Rezumat. *Pomicultura irigată constituie o categorie specială de pomicultură care este net superioară, indiferent de zona pedoclimatică în care se practică. Obiectivul principal care trebuie realizat prin irigare este de a menține pe adâncimea unde sunt răspândite marea majoritate a rădăcinilor pomilor, un conținut optim de apă. În condițiile speciale din Dobrogea, pentru aprovizionarea corespunzătoare a pomilor cu apă, menținerea conținutului de apă din sol deasupra plafonului minim (peste 50% din IUA) pe adâncimea de 1 m poate satisface în optimum cerințele acestora. Datele obținute au arătat că încă de la sfârşitul lunii mai rezerva de apă din sol de pe adâncimea de 0-100 cm s-a apropiat de valorile plafonului minim. În consecință, s-a dispus aplicarea irigării cu norme diferite de udare, specifice metodelor de aplicare localizată a apei (picurare şi microaspersiune). Ca atare, pe parcursul anilor de studiu 2003 şi 2004, prin aplicarea irigării localizate (picurare şi microaspersiune) am căutat să menținem rezerva de apă utilă din sol în partea superioară a intervalului umidității active.*

Cuvinte cheie: udare prin picurare, microaspersiune, conținut în apă al solului

INTRODUCTION

Water is an indispensable factor in vital activity of plants, without water is not possible to develop characteristic processes of life.

The main objective which is sought by irrigation of trees consists in maintaining the optimal humidity level for each phenophasis (Mureşan D. and collaborators -1992, Iancu M. and Popa C., 1989).

Researches conducted in Dobrogea (Grumeza N. and collaborators, 1979, P. Ionescu, 1986, Popa C., 1987, Septar L., 2003) highlight the importance and effectiveness of irrigation on the main species in the fruit-growing area (peaches and apricots). Experiments were performed on other species of new fruit-growing plantings outlining the requirements to water trees and favourable effects of irrigation.

Localized irrigation consists in wetting with controlled quantities of water, distributed near the plants, mainly in the root growing area.

Providing a fruit-growing plantation with optimum quantities of water in soil is a measure of maximum importance, but which must be applied taking, strict account of trees necessities.

The paper aims to highlight the effect of localized irrigation on water reserve from soil, in the special conditions of Dobrogea.

MATERIAL AND METHOD

Drip irrigation was performed with two types of drippings Tack (b2) and Tipaz (b3), norm of wet was 18 mm, and the dripping flow was 4l /h for the both types of drippers. Drippers were placed on the pipeline at a distance of 1 m between them.

Micro sprinkler irrigation was realized by two types of micro sprinklers, respectively micro sprinkler with a debit of 12l / h (b4) and a micro sprinkler with a debit of 27l / h (b5). Norm of wet was 30 mm for the first type of micro sprinkler and 60 mm for the second type of micro sprinkler. Micro sprinklers were coupled to the pipeline at different distances, respectively 3 m for the first type of micro sprinkler and 6 m for the second type of micro sprinkler.

To determine the water reserves from soil it was used the gravimetric method (Canarache-1964, quoted by Obrejanu and collaborators). Soil sampling was conducted using a soil probe on different depths, from 0.20 to 0.20 m to 1.0 m.

Moisture content of soil was determined as the weighted average on profile, being expressed as a percentage of dry soil weight.

RESULTS AND DISCUSSIONS

The effect of localized irrigation on water reserves from soils was followed over a period of 2 years, 2003 and 2004 respectively. Each year, the water content obtained in irrigated variants was compared to that obtained in non-irrigated variant witness (b1).

The data in fig.1 regarding water content of soil (% of AHI), in non-irrigated witness (b1) shows that in 2003, during the growing season, it represented 77.05% of AHI in the third decade of the April, then decreased until June, second decade (29.41%) when probably because the amount of precipitation fell, increased to 40.52%. In July and August, the water content of soil (% of AHI) ranged between 13.27 ÷ 24.58%, with a maximum recorded in July, II decade.

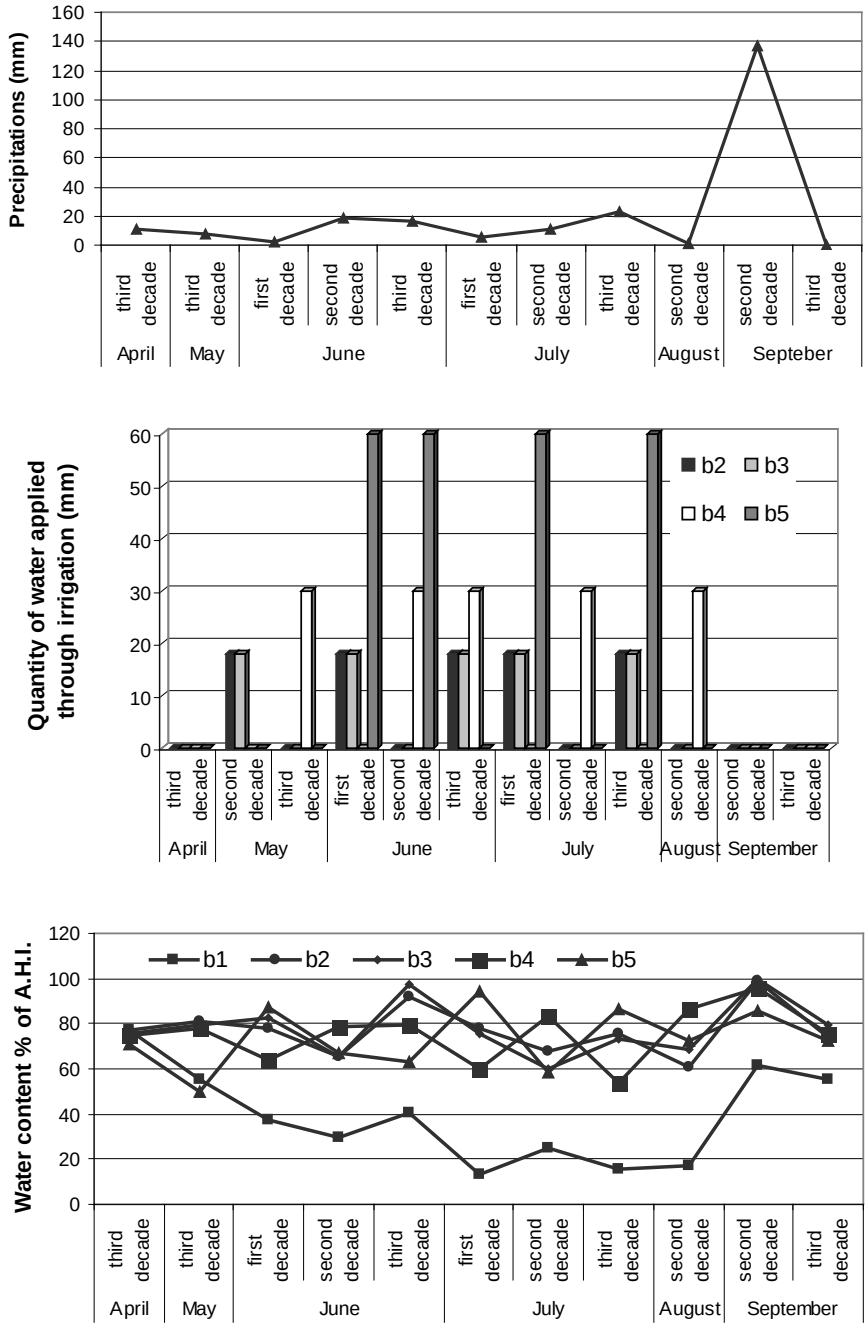

Fig.1. The water content of soil (% of A.H.I.) in irrigated variants compared with non-irrigated variant in 2003

Due to large amount of rainfall recorded in the second decade of the month of September, 136.9 mm respectively, the water content of soil increased to 61.7% of AHI then decreased.

For the drip irrigation variant with the dripper type ”Tack” (b2), following the norm of wet (5x18mm) and rainfall fell during the growing season, the water content in soil ranged between 60.98% (second decade-August 2003) and 98.69% (II decade, September 2003).

In the case of drip irrigation with the dripper “Tipaz” (b3), under the same conditions, the water content of soil ranged between 59.67% (II decade, July 2003) and 99.93% (second decade, September 2003).

For the irrigation variant by micro sprinkler with the micro sprinkler with q = 12 l / h (b4), after applying the norms of wet (5x30 mm) and the amount of precipitation fell during the growing season, the water content in soil oscillated between 59,8% (I decade, July 2003) and 96,14% (II decade, September 2003).

In the case of micro sprinkler irrigation with q=27 l/h (b5), after applying the norms of wet (4x60 mm) and the amount of precipitation fell during the growing season, the minimum value of the water content of soil was in the third decade the month of May, respectively 50.06% and the maximum was 94.31% of AHI and was recorded in the first decade of July 2003.

In the year 2004 (fig. 2), in the witness variant (b1), the water content of soil (% of AHI) was influenced only by the amount of rainfall. This oscillated, in the growing season between 14.15% and (II decade, August 2004) and 64.44% (II decade, July 2004).

Under the influence of the rainfall during the growing season and the quantity of additional water applied by irrigation (54 mm), in the drip irrigation variant with the “Tack” type dripper (b2), the water content of soil ranged between 65.49% (II decade, August 2004) and 99.35% (I decade, June 2004).

As well as, in the drip irrigation variant with the “Tipaz” type dripper (b3), under the same conditions, the water content of soil (% of IUA) recorded a minimum of 62.88% (I decade, May 2004) and a maximum of 100% (I decade, June 2004).

The water content of soil (% of IUA) for the micro sprinkler irrigation with the micro sprinkler with q = 12 l / h (b4), the quantity of rainfall and the amount of additional water applied by this wetting method (90 mm), ranged between 42.2% (III decade, July 2004) and 101.11% (III decade, August 2004).

Dates from fig. 2 shows that in the case of micro sprinkler irrigation with q=27 l/h (b5), the water content of soil (% of IUA), after rainfall recorded during the growing season and wettings (2x60 mm) ranged between a minimum of 60.65% (I decade, May 2004) and a maximum of 99.15% (I decade, June 2004).

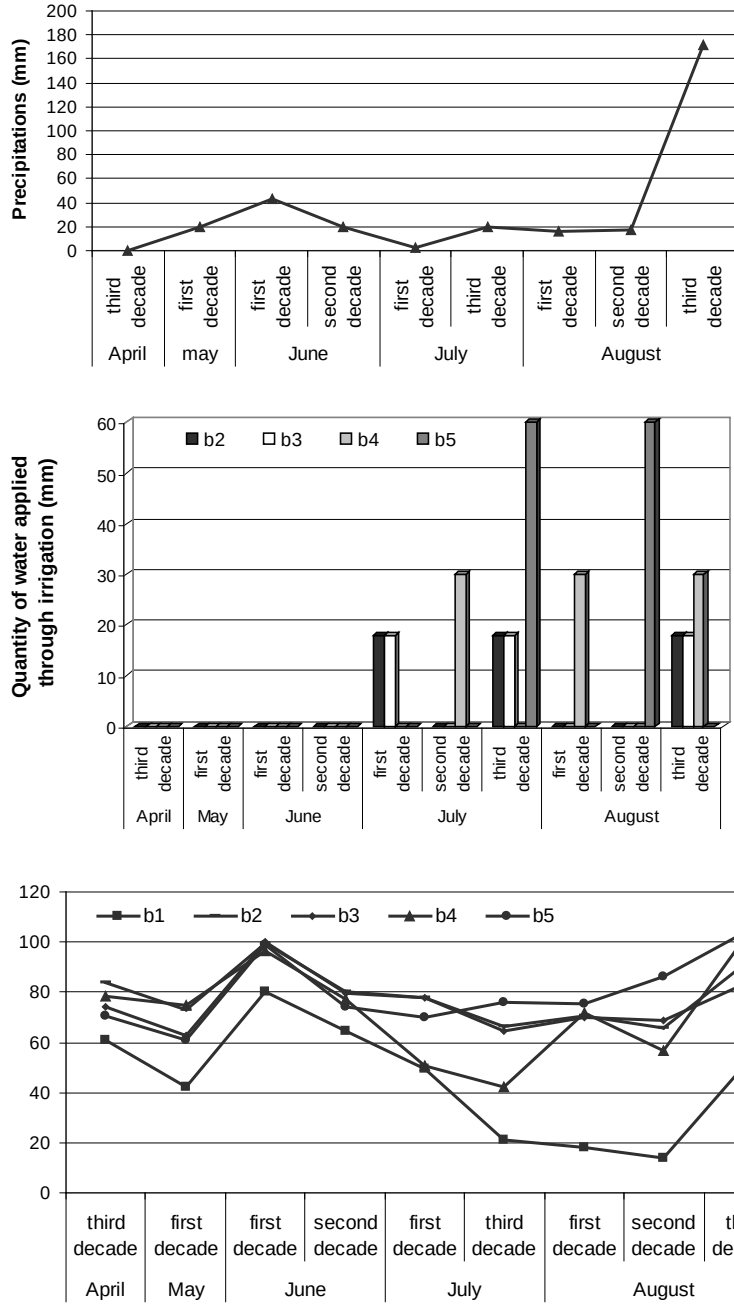

Fig.2. The water content of soil (% of A.H.I.) in irrigated variants compared with non-irrigated variant in 2004

Distribution of rainfall during 2004 has enabled the achievement and maintenance on the depth of 1 m in non-irrigated variant of water content superior to the minimum ceiling of moisture until early July. Decrease of the water content on the depth of 1 m below the ceiling in the first decade of July required first wet on 1 July 2004. However we have to specify that in the irrigation variants, even before the first wet, the values of water content on the depth of 1 m were higher than values recorded in non-irrigated variant, probably due to residual effects of the application of irrigation in the previous year (2003).

During the growing season of 2004, and during 2003, the as a consequence of application of irrigation, the water content of soil was achieved and maintained well above the minimum ceiling of humidity.

CONCLUSIONS

Irrigated fruit tree growing is a special category of fruit tree growing, which is clearly superior, regardless of the area in which pedo climatic practice. Regarding the content of the work was started on the desirability of irrigation, taking into account the specific natural area, characterized by some of its features, such as the precipitation. Researches have aimed to solve the need of irrigation in arid conditions of Dobrogea.

Irrigation of trees is one of the most important technological links. Results obtained by applying a different number of wettings, with wetting rules of 18 mm, 30 mm and 60 mm have highlighted the fact that the water reserve in the soil depth of 1 m, in the two years analyzed, was maintained in the upper humidity range assets (AHI), which provided optimal conditions for the development of fruit trees.

REFERENCES

1. **Grumeza N. and collaborators, 1979** - *Tehnica irigării culturilor hortiviticole.* Editura Ceres, Bucureşti.
2. **Ionescu Pr., Grumeza N., 1986** - *Irigarea localizată a piersicului în condițiile din Dobrogea*. Lucrări Ştiințifice I.C.P.P. Mărăcineni, vol. XI.
3. **Popa C., 1987** - *Influența irigării mărului în condițiile din Dobrogea.* Lucrări Ştiințifice I.C.P.P. Mărăcineni, vol.XII.
4. **Septar Leinar, 2003 -** *Irigarea localizată – un avantaj pentru pomicultura din Dobrogea.* Lucrări Ştiințifice Vol.I (46) Ed.Ion. Ionescu de la Brad, Iaşi.