RESULTS REGARDING THE INFLUENCE OF IRRIGATION ON THE ROOTSTOCK SEEDLINGS IN THE FIRST FIELD OF THE FRUIT TREE NURSERY

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Abstract
Water is essential for plants, being a basic component of living cells and tissues. Only in the presence of water can the processes of assimilation, disassimilation and gas exchanges take place. Once in the plant, the water keeps the cell walls stretched and thus gives the cells and tissues turgidity, which ensures the mechanical balance of the various organs. Together with the dissolved substances, the water determines the pressure of the cells and tissues, ensuring the intercellular exchanges. As a participant in plant metabolism, water is involved in the fundamental processes of the living world, photosynthesis, respiration, transpiration. In fruit tree nursery, as in all crops, the growing process depends largely on the climate and soil conditions they have at their disposal. Of these, along with heat, light, air and minerals, water plays a very important role. This paper is a research regarding the influence of irrigation in the fruit tree nursery, under the effect of different watering rules.

Key words: irrigation, rootstock seedlings, fruit tree nursery

INTRODUCTION

The evolution of fruit growing would not have been possible without the continuous improvement of the quality and methods of production of seedlings. As planting material, the fruit growers used seedlings from the spontaneous fruit flora. The high genetic variability of trees from these sources has allowed fruit growers to make a selection, for centuries, of the most valuable specimens (Venig Aurora, 2006). They were propagated by vegetative means, the only method by which the valuable biological and agro-productive properties were passed on to offspring, from these specimens were obtained local varieties, varieties that have long provided the necessary fruit on domestic and foreign markets (Drăgănescu, 2002). As the market demanded more and more fruit, researches were intensified for the creation of new, more productive varieties and rootstocks with high quality fruit and for the continuous improvement of cultivation technologies (Schmid, 2019). In the development and modernization of fruit growing, the main link was the production of planting material (Drăgănescu, 1998).

Raising the production of trees in nurseries is largely determined by the quality of rootstocks. The authenticity of rootstocks is a very valuable trait (Fazakas, 2000).

In order to obtain high quality planting material in large quantities per hectare, it is necessary to plant rootstocks in quality with 100% authenticity and purity, one year old, with healthy roots, with tender tissues, without mechanical damage, without wounds caused by frost and parasites, with a minimum length of 25 cm (Hoza, 2000). The rootstocks have multiple influences on the varieties regardless of the species we are referring to. Among these we list: determines the vigor of tree growth, influences the age of fruit set, influences resistance to diseases and pests, influences resistance to unfavorable pedo-climatic conditions (frost, drought, soils with excess calcium and moisture, sandy soils, etc.) (Klock, 2019). Due to the tendency to intensify fruit crops in order to increase the economic efficiency of orchards, and in the case of plums, the rootstock is one of the decisive factors (Cichi, 2006). That is why there was a special concern in our country in this field, which ended with the approval of a large number of rootstocks. (Branişte, Stănică, 2011)

Plum rootstocks are demanding of water, their culture being extended to larger areas in areas with a richer rainfall regime (Chira, 2010). From the large amount of water absorbed from the soil by the roots, for the synthesis of organic substances, the rootstock uses only a small part, the rest being eliminated by the phenomenon of perspiration (Mazilu, Duţu, 2014). In the case of planting rootstocks on wet and poor soils in which the soil solution has a lower concentration of fertilizers, the transpiration coefficient is higher than in the case of rootstocks planted on more fertile soils (Spira, 2013). By ensuring sufficient amounts of water in the soil, the transpiration coefficient decreases so that the water is used more economically by the rootstock (Maurer & co., 2016).

The operation of irrigation facilities covers a number of aspects related to water planning and distribution, rootstock care as well as the maintenance of the irrigation system (Ghena, 2004). It is a complex of measures whose correct application depends to a large extent on the success of irrigation. Failure leads to a decrease in the efficiency of the investments that were made for this purpose (Grumeza, Ionescu, 1970). Thus, the administration of uncontrolled watering of rootstocks, without taking into account their requirements, can have harmful effects not only on the production in that year, but also on their quality (Domuţa, Sabău, 1998).

MATERIAL AND METHOD

The main working methods were the experiment and the observation, to which are added the measurements performed on the plum rootstocks in the nursery, during certain periods of vegetation. The method of research is the drip irrigation on the rootstock seedlings in the nursery. The placement of the experimental variants in the field when establishing the watering norm was done randomly in four repetitions with 50 trees in the variant and 200 trees in the repetition. Through the research methods used, was studied the influence of two factors:

- Factor A- plum variety with two variants A1 = Stanley, A2 = Cacanska Lepotica

- Factor B- watering norm with 4 variants B1 = 0 mm, B2 = 10 mm, B3 = 20 mm, B4 = 30 mm

RESULTS AND DISCUSSION

Regarding the unilateral effect of irrigation, the percentage of seedlings caught showed an amplitude of variation of 9.80%, with average values between 88.70% in the case of the non-irrigated variant and 98.50% in the case of application of the watering norm of 30 mm, in the conditions of a reduced variability of 4.56% between the four irrigation treatments. At the level of the whole experience in this year's climatic conditions, the irrigation showed a significant effect on the capture of the seedlings related to increases between 2.58 and 9.80%. The increase of watering norms from 10 to 20 mm and from 20 to 30 mm, respectively, also had a significant influence on the attachment of rootstocks, materialized by increases of 3.47-3.75%.

Table 1

The average percentage of planting seedlings under the effect of different watering rules applied in the first field

Watering rule	Average percentage		Relative values (%)	Difference/ Meaning
10 mm – 0 mm	91,28	88,70	102,91	2,58**
20 mm – 0 mm	94,75	88,70	106,82	6,05***
30 mm – 0 mm	98,50	88,70	111,05	9,80***
20 mm – 10 mm	94,75	91,28	103,80	3,47***
30 mm – 10 mm	98,50	91,28	107,91	7,22***
30 mm – 20 mm	98,50	94,75	103,96	3,75***

$LSD_{5\%}$=1,46 $LSD_{1\%}$=1,98 $LSD_{0,1\%}$=2,65

Regarding the interaction between varieties and irrigation (Table 2) it is found that in both varieties irrigation and respectively the progressive increase of watering norms showed significant positive influences on the capture of seedlings, with higher effects on the Stanley variety.

Table 2

The effect of variety and irrigation on the percentage of seedlings planted in the first field

Variety	Watering rule					
	0 mm	**10 mm**	**20 mm**	**30 mm**	$\bar{x} \pm s_{\bar{x}}$	$S_{\%}$
Stanley	u 86,25 b	z 90,25 b	y 95,00 a	x 98,75 a	92,56±0,68	5,37
Cacanska Lepotica	z 91,15 a	z 92,30 a	y 94,50 a	x 98,25 a	94,05±0,48	4,60
$\bar{x} \pm s_{\bar{x}}$	88,70±0,85	91,28±0,58	94,75±0,56	98,50±0,39	93,31±0,42	
$S_{\%}$	6,07	3,99	3,77	2,91	5,68	

Variety - $LSD_{5\%}$=1,89 $LSD_{1\%}$=2,55 $LSD_{0,1\%}$=3,39 (a,b)

Irrigation - $LSD_{5\%}$=2,06 $LSD_{1\%}$=2,79 $LSD_{0,1\%}$=3,74 (x, y,z,u)

Based on the exponential regression, it is observed that in the case of the Cacanska Lepotica variety, the percentage of seedlings catching showed an average growth rate of 0.237% for each mm of watering, with the limits from 0.115% / mm to 0.375% mm. The respective estimates have an accuracy of 94.64%, in the conditions of a catch percentage of approximately 91% in the absence of irrigation. For the Stanley variety, the effect of irrigation on the seedlings was more pronounced, showing an average growth rate equivalent to 0.417% / mm, amid variations of 0.375% / mm between the last two watering norms and 0.475% / mm between the norms of 10 and 20 mm. The predictability of the logarithmic regression between the watering rate and the percentage of seedlings for the Stanley variety is 99.73%, based on an initial value of 86.31% in the absence of irrigation.

Table 3

The effect of irrigation on the planting rate of seedlings of different varieties in the first field

Watering rule x Stanley	Average percentage		Relative values (%)	Difference/ Meaning
10 mm – 0 mm	90.25	86.25	104.64	4.00***
20 mm – 0 mm	95.00	86.25	110.14	8.75***
30 mm – 0 mm	98.75	86.25	114.49	12.50***
20 mm – 10 mm	95.00	90.25	105.26	4.75***
30 mm – 10 mm	98.75	90.25	109.42	8.50***
30 mm – 20 mm	98.75	95.00	103.95	3.75***
Watering rule x Cacanska Lepotica	Average percentage		Relative values (%)	Difference/ Meaning
10 mm – 0 mm	92.30	91.15	101.26	1.15
20 mm – 0 mm	94.50	91.15	103.68	3.35**
30 mm – 0 mm	98.25	91.15	107.79	7.10***
20 mm – 10 mm	94.50	92.30	102.38	2.20*
30 mm – 10 mm	98.25	92.30	106.45	5.95***
30 mm – 20 mm	98.25	94.50	103.97	3.75***

$LSD_{5\%}$=2,06 $LSD_{1\%}$=2,79 $LSD_{0,1\%}$=3,74

Regarding the effect of irrigation on the percentage of seedlings of each variety (Table 3) it is observed that at Stanley the values were between 86.25% for the non-irrigated variant and 98.75% in case of application of the watering norm of 30 mm. Compared to the non-irrigated version, the other watering norms had significant effects of 4-12.5%. It is also found that the increase in watering rate by 10 mm was associated with a significant increase in seedling attachment of 3.75-4.75%

In the case of rootstocks for Cacanska Lepotica variety, the variability between the effects of irrigation was lower associated with an amplitude of 7.10%, between 91.15 in the absence of watering and 98.25% for the norm of 30 mm. The 10 mm watering norm showed a small and insignificant influence on the attachment of the seedlings, instead the other two watering norms generated significant increases in the attachment percentage. The supplementation of 10 mm irrigation resulted in a significant increase of 2.2-3.75% in the percentage of attachment to the seedlings of the Cacanska Lepotica variety.

CONCLUSIONS

Against the background of the research climatic conditions characterized by a low level of precipitation in spring, irrigation showed the highest contribution to the variability of the percentage of rootstock in the first field (44.70%), significantly higher than the effect of the variety (13.27%) and fertilization (3.67%).

The Cacanska Lepotica variety showed a significantly higher attachment of the seedlings to the non-irrigated variant and under the effect of the 10 mm watering norm. The seedlings of the two varieties capitalized on a similar level of irrigation in the case of watering norms of 20 and 30 mm.

For the Stanley variety, compared to the non-irrigated variant, the other watering norms had significant effects of 4-12.5% on catching the seedlings. The progressive increase of the watering norm by 10 mm was associated with a significant increase in seedling attachment of 3.75-4.75%.

In the case of Cacanska Lepotica rootstocks, only 20-30 mm irrigation showed a significant influence on seedling capture. The supplementation of irrigation with 10 mm determined a significant increase by 2.2-3.75% of the percentage of rootstocks.

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