

RESEARCH ON ESTABLISHING ECHNOLOGICAL PARAMETERS WITH HIGH EFFICIENCY IN JERUSALEM ARTICHOKE CULTURE

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ABSTRACT

In the period 2018-2020. within RDSFCSS Dabuleni, from Romania, 4 planting epochs were studied and 2 harvest epochs. Determinations were made on the number of tubers/plant, the average weight of a tuber and the production per unit area. Regardless of the planting epoch both the number of tubers/plant and the average weight of a tuber was higher in the plants harvested after 29 weeks after planting. The highest production of tubers was obtained by planting Jerusalem artichoke between April 15-25 and harvested after 29 weeks. In this variant. the production was 66.02 t / ha. corresponding to a number of 45.9 tubers / plant. with an average weight of 47.8 g / tuber.

INTRODUCTION

Jerusalem artichoke (*Helianthus tuberosus*) is the plant with the highest inulin content and is used as food for diabetics. helping to lower blood sugar and stabilize it. lowers cholesterol. regulates blood pressure. prevents heart disease. stimulates immunity. Jerusalem artichoke has very high adaptability to the extremes of unfavorable factors. at extremely high temperatures (35⁰–45⁰C the plants and -30⁰- 45⁰C the tubers). The plant adapts to water deficit conditions throughout the growing period (Conde et al., 1991). Acute water stress in the first stage of development can even have a beneficial effect on yield in some cases. with Jerusalem artichoke plants lowering the leaf surface index and increasing the specific weight of the leaves as a strategy to acclimatize water stress. Although water stress can have a significant impact on final yield. it does not appear to change the ripening time of the crop (Mecella et al., 1996).

The date of planting Jerusalem artichoke tubers varies depending on the region. climatic conditions and variety used.

In the northern hemisphere, planting usually takes place in spring February-April (Mimiola, 1988). and harvesting is usually done

130 days after planting. In the southern hemisphere, planting dates are contrary to those in the northern hemisphere, with planting taking place in September and October (Parameswaran, 1994).

Paungbut Darunee et al. 2012 determined the effect of planting data during low temperature on inulin yield and content in tropical regions of Australia. Planting Jerusalem artichoke in periods of lower temperature (10-16⁰C) reduced total dry weight and inulin content, while inulin content increased when planted in warmer periods (21-31⁰C).

In Europe, Jerusalem artichokes are planted from mid-March to mid-April. It is planted in France in mid-April (Ben Chekroun et al., 1996), in Germany between April 9-12 (Schittenhelm, 1999) and Denmark on March 24 (Zubr and Pedersen, 1993).

Early-maturing varieties tended to produce more in Denmark than late-maturing varieties because the translocation of photosynthetic products from the aerial parts of the plants to the tubers is often disturbed by late frost in the growing season (Zubr and Pedersen, 1993). Therefore late spring planting can lead to significant decreases in yield and tuber size.

According to Mario Baldini et al., 2006 (Italy), when the plant is fully harvested (vegetative mass and tubers) at pre-flowering the best results are obtained both in terms of production and in terms of sugar and inulin yield.

Declining fuel reserves and the need to mitigate the worst consequences of global climate change have stimulated unprecedented interest in alternative fuels and energy sources, including biofuels. Also, due to climate change, a reorientation of cultivated species is required in order to diversify the range and introduce into the culture of new species that capitalize on the pedoclimatic conditions that are constantly changing (Mirela Paraschivu et al., 2021).

MATERIAL AND METHOD

In the period 2018-2020, within Research-Development Station for Field Crops on Sandys Soils Dabuleni, from Romania, 4 planting epochs were studied: epoch I - planted between March 25-April 5; epoch II - planted between 05-15; epoch III - planted between April 15-25; epoch IV - Planted between April 25 and May 5 and 2 harvest epochs: epoch I - harvested tubers 26 weeks after planting and epoch II - harvested tubers 29 weeks after planting.

In each variant three rows were planted using the distance of 0.7 m between rows and 40 cm between plants per row. The land preparation works consisted of plowing at a depth of 28-30 cm. fertilization with complex fertilizer 15-15-15 at the level of fertilization of N 80 P₂O₅ 80 K₂O 80. The planting of the tubers in the field was done manually during the established period according to the variants studied. To control monocotyledonous weeds. was sprayed with Fusilade Forte 1 l/ha. Fazole fertilization was done with ammonium nitrate at the level of N70 fertilization. The need for water was ensured by repeated irrigation with norms of 350 m³ of water/ha.

Determinations were made on the number of tubers/plant. the average weight of a tuber and the production per unit area. The *Rustic* variety was used.

RESULTS AND DISCUSSIONS

At the same time of planting, the number of tubers harvested was influenced by the period from planting to harvest in all variants (Table 1).

Table 1

The influence of the harvest epoch at the same planting epoch on the number of tubers/plant and the weight of the tuber

| The planting epoch | Harvest epoch | Number of tubers/plant | Difference tubers/plant | Weight of the tuber (g) | Difference (g/tuber) |
|--------------------|---------------|------------------------|-------------------------|-------------------------|----------------------|
| 25.III – 05.IV | At 26 weeks | 38.8 | Mt | 18.2 | Mt. |
| | At 29 weeks | 43.6 | +4.8 | 23.6 | +5.4* |
| 05.IV – 15.IV | At 26 weeks | 43.7 | Mt | 22.2 | Mt. |
| | At 29 weeks | 55.7 | +12.0 | 34.4 | +12.2**** |
| 15.IV - 25.IV | At 26 weeks | 46.1 | Mt | 31.6 | Mt. |
| | At 29 weeks | 45.9 | -0.2 | 47.8 | +16.3**** |
| 25.IV - 05.V | At 26 weeks | 36.3 | Mt | 30.8 | Mt. |
| | At 29 weeks | 36.3 | 0 | 38.4 | +7.6** |
| LSD 5% | | 12.4 tuber/plant | | 4.06 g/tuber | |
| LSD 1% | | 18.64 tuber/plant | | 6.15 g/tuber | |
| LSD 0.1% | | 27.97 tuber/plant | | 9.89 g/tuber | |

At the first planting epoch, the number of tubers/plant was 38.8 tubers at the harvest after 26 weeks of planting and 43.6 tubers when harvested at 29 weeks.

In the plants planted in the second epoch, 43.7 tubers/plant were registered at harvest 26 weeks after planting and 55.7 tubers/plant when harvested at 29 weeks, this being the highest number of

tubers/plant. The number of tubers/plant was very close in value at the third planting season, being 46.1 tubers/ plant after 26 weeks and 45.9 tubers/ plant at harvest after 29 weeks.

Regardless of the planting epoch on, the average weight of a Jerusalem artichoke tuber was higher when harvested 29 weeks after planting. Thus, at the first planting epoch, the average weight of a tuber was 18.2 g/tuber when harvested at 26 weeks after planting and 23.6 g/tuber when harvested at 29 weeks, resulting in a tuber weight gain of 5.4 g / tuber, statistically significant. At the second planting epoch, Jerusalem artichoke tubers weighed an average of 22.2 g at the harvest 26 weeks after planting and 34.4 g/tuber at harvest after 29 weeks, the difference between the two variants being 12,2 g/tuber very statistically significant.

During the third planting epoch, the weight of a tuber was 31.6 g/tuber and 47.8g/ tuber, respectively, with a difference of 16.3 g/ tuber ensured from a statistical point of view as very significant, and at the fourth planting epoch the average weight of a tuber was 30.8 g/tuber when harvested 26 weeks after planting and 38.4g/ tuber when harvested at 29 days, resulting in an increase in tuber weight of 8.9 g/tuber, distinctly significant.

The weight increases of the tubers were between 25-55%, respectively between 5.4-16.3 g / tuber. The highest weight gain was at the tubers from the third harvest epoch, followed by those from the fourth era. These variants were harvested at the latest, respectively between November 5-21.

After Kayss S.J. et al., 2007, tuber weight tends to increase when environmental conditions are not conducive to vegetative growth and flowering, and Gunnarsson et al., 2014, state that the weight of Jerusalem artichoke tubers was 3-4 times higher in December compared to September. In general, tuber production, tuber size and shape are affected by soil type. While light sandy soils produce large tubers, heavy soils produce small tubers (Ruf T. et al., 2019).

The analysis of the influence of the planting epoch on the production of Jerusalem artichoke tubers shows that, at the first planting epoch, the average production was 31.68 t/ha, at the second planting epoch a production of 47.57 t/ha was achieved, respectively an increase of 15.89 t/ha, very statistically significant, in the third era the production was 55.31 t/ha, the production increase of 23.63 t/ha being very significant from a statistical point of view, and at the 4th

planting epoch the production marked a decrease, these being 43.51 t/ha with a production increase of 11.83 t/ha distinctly statistically significant (Table 2).

Table 2

The influence of the planting epoch on the production of tubers

| The planting epoch | The production | | Difference (t/ha) | Significance |
|--------------------|----------------|-----|-------------------|--------------|
| | t/ha | % | | |
| 25.III – 05.IV | 31.68 | 100 | Mt. | Mt. |
| 05.IV – 15.IV | 47.57 | 150 | +15.89 | xxx |
| 15.IV - 25.IV | 55.31 | 175 | +23.63 | xxx |
| 25.IV - 05.V | 43.51 | 137 | +11.83 | xx |

LSD 5% = 6.39 t/ha

LSD 1% = 9.68 t/ha

LSD 0,1% = 15.55 t/ha

Compared to the first planting epoch considered as a control, in all other epochs production increases between 37-75% were achieved. Harvest time had a great influence on the production of Jerusalem artichoke tubers due to the number of tubers / plant, but especially due to their weight (Table 3).

Table 3

The influence of the harvest epoch on the production of tubers

| Harvest epoch | The production | | Difference (t/ha) | Significance |
|---------------|----------------|-----|-------------------|--------------|
| | t/ha | % | | |
| At 26 weeks | 35.80 | 100 | Mt. | Mt. |
| At 29 weeks | 53.23 | 149 | +17.43 | xx |

LSD 5% = 7.91 t/ha

LSD 1% = 11.76 t/ha

LSD 0,1% = 17.64 t/ha

When the tubers were harvested 26 weeks after planting, the average production was 35.80 t/ha. Harvested at 29 weeks after planting, the weight of a tuber increased, which led to an increase in production reaching 53.23 t/ha, the increase in production being 17.43 t/ha (49%), significantly distinctly statistically.

If we analyze the influence of the harvest epoch on the production of Jerusalem artichoke at the same planting epoch, it is found that the later harvest determines the increase of production, regardless of the planting epoch (Table 4). At planting in the first epoch, the production of Jerusalem artichoke tubers was 26.72 t/ha in the variant in which it was harvested 26 weeks after planting and 36.65 t/ha in the variant in which the harvest was done at 29 weeks,

resulting in a production increase of 37% (9.93 t/ha), not statistically assured.

Table 4

The influence of the harvest epoch on the production of tubers at the same planting epoch

| The planting epoch | Harvest epoch | The production | | Difference (t/ha) | Significance |
|--------------------|---------------|----------------|-----|-------------------|--------------|
| | | t/ha | % | | |
| 25.III – 05.IV | At 26 weeks | 26.72 | 100 | Mt. | Mt. |
| | At 29 weeks | 36.65 | 137 | +9.93 | |
| 05.IV – 15.IV | At 26 weeks | 35.46 | 100 | Mt. | Mt. |
| | At 29 weeks | 59.69 | 168 | +24.23 | xx |
| 15.IV – 25.IV | At 26 weeks | 44.60 | 100 | Mt. | Mt. |
| | At 29 weeks | 66.02 | 148 | +21.42 | x |
| 25.IV - 05.V | At 26 weeks | 36.43 | 100 | Mt. | Mt. |
| | At 29 weeks | 50.59 | 139 | +14.16 | |

At the planting in the second epoch, the production of tubers was 35.46 t/ha in the variant in which it was harvested 26 weeks after planting and 59.69 t/ha in the variant in which the harvesting was done at 29 weeks, resulting in an increase in production of 24.23 t/ha, statistically significant difference.

In the third planting variant, the tuber productions were 44.60 t/ha at harvest after 26 weeks and 66.02 t/ha at harvest after 29 weeks after planting, the production increase being 21.42 t/ha, respectively 48%, statistically significant.

The productions decreased at the 4th planting epoch, being 36.43 t / ha at 26 weeks after planting and 50.59 t/ha at 29 weeks after planting, and the difference in production between the two harvesting epochs was 14.16 t/ha, not statistically insured.

CONCLUSIONS

Regarding the influence of the planting season of jerusalem artichoke, the number of tubers / plant is small when planted too early (march 25 - april 5) and late (april 25 - may 5) and high when planted between april 5-25.

The period covered by jerusalem artichoke plants from 26 weeks from planting to 29 weeks favored the weight gain of the tubers, regardless of the planting season, the growth being higher in the last planting seasons, when the vegetative growth stopped.

The highest production of tubers was obtained by planting jerusalem artichoke between april 15-25 and harvested after 29 weeks. in this variant, the production was 66.02 t / ha, corresponding

to a number of 45.9 tubers / plant, with an average weight of 47.8 g / tuber.

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