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EVALUATION OF YIELDING OF SEVERAL RHUBARB CULTIVARS IN THE FIRST YEARS OF UTILIZATION OF A PLANTATION

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ABSTRACT

Several rhubarb cultivars were investigated: ‘Koral’, ‘Karpow Lipskiego’, ‘Wczesny Hosera’, ‘Wiśniowy’, ‘Purpurat’ – in the third, fourth and fifth years of the utilization of a plantation. Essential differences in yielding of the investigated cultivars were shown. The largest average marketable yield was obtained from the cultivation of ‘Karpow Lipskiego’, whereas the smallest from the cultivation of ‘Purpurat’. On average, the most petioles were gathered from the plants of cultivars ‘Wiśniowy’ and ‘Wczesny Hosera’, while the fewest from cultivar ‘Purpurat’. ‘Karpow Lipskiego’ was distinguishable by a decidedly greater average mass of petioles in comparison to other cultivars. In consideration of marketable yields, cultivars ‘Karpow Lipskiego’, ‘Wczesny Hosera’ and ‘Koral’ proved to be the most useful for the cultivation with petioles being intended for direct consumption.

Key words: rhubarb, cultivars, yielding of rhubarb

INTRODUCTION

Garden rhubarb (*Rheum rhaponticum* L.) is a perennial vegetable, a plant of temperate and cool climate. The rhubarb plant is resistant to frost. In spring it renews growing immediately after snow melting and the surface thaw of the soil, at the average twenty-four hours' temperature of more than 4°C [11, 13].

In a given year of the plantation utilization, the rhubarb yielding depends on the cultivar features, number of harvests, quantity of leaves broken off at once, the length of the harvest period and fertilization [1, 2, 4, 6, 7].

According to Kmiecik and Wróblewska [7, 14], the crucial criterion of evaluation of the rhubarb cultivars whose petioles are intended for the fresh vegetable market is the earliness of their yielding, as it remarkably determines the profitability of production. Cultivars intended for direct consumption are those, whose yielding is characterized by considerable share of the early yield in the total marketable yield.

The aim of the investigation undertaken in the present work was to evaluate the height, earliness and structure of the yields of five rhubarb cultivars in three succeeding years of the plantation utilization.

MATERIALS AND METHODS

The experiment was conducted in 1996-1998 at the Experimental Station of Agricultural University in Lublin on the rhubarb plantation established in spring, 1994. Before planting the rootstocks in autumn, 1993, organic fertilization with manure (50 $t \cdot ha^{-1}$) as well as mineral fertilization of P – 40, K – 150 $kg \cdot ha^{-1}$ was applied. In the years 1994-1998 the plants were fertilized each time after harvests, with N – 50, P – 30, K – 100 $kg \cdot ha^{-1}$. Five rhubarb cultivars were compared in the experiment: 'Koral', 'Karpow Lipskiego', 'Wczesny Hosera', 'Wiśniowy' and 'Purpurat'. The plants of every cultivar were grown in the spacing of 2.0×1.5 m.

The experimental unit for the research was a single plant. Ten plants out of each cultivar were chosen randomly for the examination. In every year of the experiments the research was done on the same plants as it was assumed that the three-year period of the development of leaf buds may affect the results of yielding [6]. The leaves intended for harvesting were those with petioles more than 20 cm long and of minimal cross-section above 2.0 cm in the middle of their length. Several leaves were broken off one plant at once. With each investigated cultivar the leaves were gathered at the same time and within the same number of harvests (table 1).

Table 1. Number and dates of rhubarb leaves harvests in the years 1996-1998

Years	Dates of harvests				Number of harvests
1996	8.05	20.05	11.06	25.06	4
1997	5.05	17.05	25.05	16.06	4
1998	18.04	12.05	28.05	21.06	4

The yield of rhubarb leaves harvested during the first and second harvest was considered as early. The leaves yields of the studied rhubarb cultivars obtained in separate years of the experiment did not differ significantly and therefore they were analysed using mean values from the years 1996-1998.

The results of the rhubarb yielding were worked out statistically using the analysis of variance. The significance of differences (at 5% level of significance) was evaluated with the help of Tuckey's multiple reliance range.

RESULTS AND DISCUSSION

Table 2 shows average values of the yielding of five rhubarb cultivars in the years 1996-1998. The average yield of leaves obtained from one rhubarb plant was 13.2 kg and the average yield of petioles was 8.2 kg. Irrespective of the cultivar, marketable yields, on average, consisted of 74.1 pieces of petioles with the average mass of a single petiole of 107.9 g.

Table 2. Structure of yields of five rhubarb cultivars (on average in years 1996-1998)

Cultivar	Total leaves yield ($kg \cdot plant^{-1}$)	Marketable yield of petioles ($kg \cdot plant^{-1}$)	Share of petioles yield in total leaves yield (%)	Number of petioles in commercial yield (per plant)	Average mass of petiole (g)
Koral	13.5	8.1	59.9	78.4	103.9
Karpow Lipskiego	15.8	10.3	64.1	71.8	142.6
Wczesny Hosera	13.1	7.8	59.7	81.1	97.2
Wiśniowy	14.0	8.7	62.6	88.3	101.2
Purpurat	9.3	5.9	63.0	51.0	94.7
Average	13.2	8.2	61.9	74.1	107.9
$LSD_{0.05\ cultivar}$	2.99	2.05		15.91	17.89

Significant differences between the investigated cultivars were proved to exist as regards the total and marketable yields. Considerably larger average leaves yield was obtained from plants of the following cultivars: 'Wczesny Hosera' (13.1 $kg \cdot plant^{-1}$), 'Koral' (13.5 $kg \cdot plant^{-1}$), 'Wiśniowy' (14.0 $kg \cdot plant^{-1}$) and 'Karpow Lipskiego' (15.8 $kg \cdot plant^{-1}$) as compared with cultivar 'Purpurat' (9.3 $kg \cdot plant^{-1}$). As regards the marketable yield, the cultivar 'Karpow Lipskiego' appeared to be distinguishable, 10.3 $kg \cdot plant^{-1}$ of petiole yield was obtained from its plants. The smallest marketable yield was obtained from the cultivar 'Purpurat' (5.9 $kg \cdot plant^{-1}$ on average). The average marketable yield of the remaining cultivars was from 7.8 $kg \cdot plant^{-1}$ ('Wczesny Hosera') to 8.7 $kg \cdot plant^{-1}$ ('Wiśniowy'). A high marketable yield from cultivation of the cultivar 'Karpow Lipskiego', as compared to the other cultivars, was also obtained by Kmiecik [7] in the research done in Southern Poland.

In the present paper the yielding of the investigated rhubarb cultivars varied as regards the share of marketable yield in total yield. The largest was distinguished in the cultivar 'Karpow Lipskiego' (61.4%), the smallest in the cultivars 'Wczesny Hosera' (59.7%) and 'Koral'

(59.9%). On the basis of the results and observation, it can be inferred that the share of commercial yield in total yield is determined by the number of leaves gathered from one plant and by the mass of the petiole, which is the feature connected with the cultivar. In the research it was shown that the petioles of the cultivar 'Karpow Lipskiego' (142.6 g on average) are considerably superior to the other cultivars in respect of the average petiole mass. The average petiole mass of those cultivars ranges from 94.7 g ('Purpurat') to 103.9 g ('Koral'). The results of previous research on rhubarb yielding show that the earliness of the yield and the structure considerably depend on the characteristics of cultivar [3, 8, 9, 12].

Other authors had stated before that the quantity of petiole yield depends to a large extent on the number of gathered leaves [6, 10]. The results obtained in the present work correspond to those by Golińska and Majlert [6, 10]. In the conducted research the fewest petioles were gathered from the plants of the cultivar 'Purpurat' (51.0 on average), from the cultivation of which the lowest marketable yield was obtained, as compared with the other cultivars. With better yielding cultivars definitely more petioles were gathered from one plant: from 71.8 per plant ('Karpow Lipskiego') to 88.3 per plant ('Wiśniowy'). The investigated cultivars varied as far as the early yield was concerned (table 3).

Table 3. Structure of early yield of five rhubarb cultivars (in years 1996-1998 on average)

Cultivar	Total early yield of leaves ($kg \cdot plant^{-1}$)	Marketable early yield of petioles ($kg \cdot plant^{-1}$)	Share of early yield in total yield of petioles (%)	Number of petioles in early yield (per plant)	Average mass of petiole in early yield (g)
Koral	7.5	4.5	54.7	36.5	118.6
Karpow Lipskiego	7.7	4.9	49.0	32.6	148.2
Wczesny Hosera	7.7	4.6	58.5	44.1	107.9
Wiśniowy	5.8	3.7	40.9	34.2	101.3
Purpurat	5.1	3.4	57.9	27.0	100.3
Average	6.8	4.2	52.2	34.9	115.3
$LSD_{0.05\ cultivar}$	1.53	1.06		7.70	25.73

A large total early yield was gathered from the plants of cultivars: 'Koral', 'Wczesny Hosera', 'Karpow Lipskiego' from 7.5 to 7.7 $kg \cdot plant^{-1}$. A small early leaves yield was obtained from the plants of 'Purpurat' (5.1 $kg \cdot plant^{-1}$) and 'Wiśniowy' (5.8 $kg \cdot plant^{-1}$). Considerably the largest average marketable yield of petioles was obtained from the production of the cultivar 'Karpow Lipskiego' (4.9 $kg \cdot plant^{-1}$) and the smallest from the cultivars 'Purpurat' (3.4 $kg \cdot plant^{-1}$) and 'Wiśniowy' (3.7 $kg \cdot plant^{-1}$). The value of the average marketable yield of the remaining cultivars amounted to 4.5 $kg \cdot plant^{-1}$ ('Koral') and 4.6 $kg \cdot plant^{-1}$ ('Wczesny Hosera'). Analyzing the share of the early commercial yield in the total marketable yield it was pointed out that the largest share was characteristic of the yielding of the cultivar 'Wczesny Hosera' (58.5%), but also of the weakly yielding 'Purpurat' (57.9%). The smallest share of the early yield in the total marketable yield was characteristic of the yielding of the cultivar 'Wiśniowy' (40.9%). On this basis it can be inferred that are most useful for the cultivation intended for direct consumption, because of the amount of their early yields

'Karpow Lipskiego' and 'Wczesny Hosera'. The petioles of the cultivar 'Karpow Lipskiego' were distinguishable from the early yield in respect of the average mass (148.2 g), and from the plants of the cultivar 'Wczesny Hosera' in the early yield the largest average number of petioles from a single plant was obtained (44.1 per plant). The results of this research confirm those by Wróblewska [14], who proved in cultivar research on rhubarb that the largest early yield is ensured by those rhubarb cultivars from plants of which the largest number of leaves is obtained.

CONCLUSIONS

1. In the years 1996–1998 essential differences in the yielding of five rhubarb cultivars were shown.

   - The highest marketable yield was obtained from the cultivation of 'Karpow Lipskiego' (10.3 kg·plant^{-1}), whereas the smallest from 'Purpurat' (5.9 kg·plant^{-1}).
   - The most petioles, on average, were gathered from the plants of the cultivar 'Wiśniowy' (88.3 per plant) and 'Wczesny Hosera' (81.1 per plant), while the fewest from the cultivar 'Purpurat' (51.0 per plant).
   - The cultivar 'Karpow Lipskiego' was distinguishable by the petioles of decidedly greater average mass (142.6 g) in comparison to the others cultivars (94.7-107.9 g).

2. In respect of the quantity of the early marketable yield the cultivars: 'Karpow Lipskiego' (4.9 kg·plant^{-1} on average), 'Wczesny Hosera' (4.9 kg·plant^{-1}) and 'Koral' (4.5 kg·plant^{-1}) appeared to be most useful for the cultivation with the petioles intended for direct consumption.

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