

YIELDING OF GREEN ASPARAGUS CULTIVATED ON A MEDIUM HEAVY SOIL

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Abstract. Cultivation area of green asparagus increased in the recent years, as high nutritive value of green spears has been recognized. In Poland however the production of white spears prevails and it is still low. Asparagus is cultivated on light soils, but green spears may yield well on heavier, loamy soils as well. The aim of the study conducted in the years 1999–2007 was to assess the yield of green spears of asparagus cultivated on a medium heavy soil of loess origin. Plants of four asparagus cultivars of Dutch origin – 'Backlim', 'Gijnlim', 'Horlim' and 'Thielim' were compared in the experiment in the Lublin region. High total yield, affected by the year of harvest, but not by the cultivar was stated. Each year a significant (except the seventh year) yield increase was noted, only in the fifth year the yield decreased. Marketable yield of cv. 'Gijnlim' was significantly higher than that of the other cultivars. The mean share of marketable yield in the total yield was low, only 56,5% and varied very much with years (from 32.7% to 6.9%). The highest share of marketable yield in the total was stated for cv. 'Gijnlim' (60.4%), significantly lower (55.2–55.7%) for other cultivars. Plants of cv. 'Gijnlim' yielded significantly more spears in total and marketable yield than other cultivars. Marketable spears constituted on average 63% of all harvested shoots (the percentage did not differ between cultivars, but very much between years – from 30% in 2002 to 80% in 2007). The highest share of non marketable yield was stated in the years with a high rainfall deficit in May.

Key words: *Asparagus officinalis*, green spears, total yield, marketable yield

INTRODUCTION

Asparagus (*Asparagus officinalis* L.) is a vegetable and herbaceous perennial with edible young shoots, which are called spears [Nakamura et al. 1996, Shao et al. 1996, Edenharder et al. 1998, Bornet et al. 2002, Wang et al. 2003, Chin and Garrison 2008, Kim et al. 2009]. Relative to a cultivation method spears are white or green in colour, the latter are of higher biological value, contain less fibre and saponins, as a result are

more tender and lack the tendency to bitterness [Makus and Gonzales 1991, Makus 1994, Kailuweit and Krug 1995, Sanchez 1996, Papadopoulou et al. 2003, Pellegrini et al. 2003]. Green spears are most popular in North America, where they constitute almost a 100% of asparagus consumption, they dominate in most of Asia and South America, and of Europe in Italy, Norway, U.K. and Switzerland [Benson 2008]. Asparagus – predominantly white is cultivated on light soils mainly in the western part of Poland, and most of the product is exported, as the local demand for this vegetable is low [Knaflewski 2005, Benson 2008]. Green asparagus is cultivated on heavier, loamy soils [Evenhuis et al. 2001]. Yield of a perennial asparagus is affected by factors determining the condition of assimilating ferns and the root system of overwintering crowns, the amount of reserve compounds in storage organs, mainly roots, number of vegetative buds formed and the speed of spear growth [Haynes 1987, Alam et al. 1998, Drost and Wilson 2002, Wilson et al. 2002, 2008]. Lower volume of the root system, especially fibrous roots of plants cultivated on heavy soils contributes to a decrease of yield and spear diameter as compared to light soils [Reimerink 1973, Drost and Wilson 2002].

Marketable yield is affected by temperature and soil moisture in summer, during the fern growth in the year preceding the harvest, and during the harvest itself [Liebig and Wiebe 1982, Hartmann 1985, McCormick and Geddes 1996, Wilson et al. 2002]. These factors affect the number and weight of the spears to grow the following spring, whereas temperature and soil moisture at harvest affects the compactness, diameter and length of spears.

The aim of the study was to assess the yield of green spears of asparagus cultivated on a medium heavy soil in the condition of south-eastern part of Poland.

MATERIAL AND METHODS

The experiment was conducted in a Felin Experimental Farm of University of Life Sciences in Lublin (N 51°13', E 22°38') on a medium heavy grey-brown podzolic soil of loess origin, formed of a medium silty loam, with 2% of organic matter. Transplants of four asparagus cultivars ('Backlim' F₁, 'Gijnlim' F₁, 'Horlim' F₁ and 'Thielim' F₁) obtained from University of Life Sciences in Poznan, were planted in May 1999, spaced 150 × 30 cm, 20 plants of each cultivar per plot, in a completely randomized blocks design with four replicates. Soil preparation, fertilization and plant protection was carried out as recommended for asparagus. Nitrogen supplementation of 150 kg·ha⁻¹, was carried out in three equal doses, after the harvest till 15th August. The level of main nutrients in the topsoil and the pH during the experiment (tab. 1) were close to the optimum for asparagus, and in the case of P exceeded it.

The spears were cut daily or – when temperature was low – every second day, as their length reached 18 cm. The weight and number of spears in total, marketable and non marketable yield was assessed. Marketable yield consisted of straight spears with good quality heads, of at least 8 mm in diameter (from 2002 – of 3 mm, according to the UE standards), cut to the length of 18 cm (in the years 2000 and 2001 to 22 cm). Harvests were finished in the second or third week of June, as the distinct yield decrease was stated.

Table 1. Soil pH (in H₂O) and main mineral nutrient level (mg·dm⁻³) during asparagus vegetation in the soil at the depth of 0–60 cmTabela 1. Odczyn (pH w H₂O) i zawartość (mg·dm⁻³) najważniejszych składników mineralnych w uprawie szparaga w glebie na głębokości 0–60 cm

Year Rok	pH Odczyn		Content – Zawartość							
	pH w H ₂ O		P		K		Ca		Mg	
	0–30*	30–60	0–30	30–60	0–30	30–60	0–30	30–60	0–30	30–60
1999	6.7	6.9	172	94	170	160	1100	560	70	55
2000	6.8	6.9	167	176	200	165	630	670	77	85
2001	6.8	7.4	155	69	140	112	830	540	76	70
2002	7.0	6.9	161	27	255	85	740	425	64	53
2003	7.1	7.1	170	37	340	185	860	410	75	55
2004	7.0	7.1	150	128	220	145	745	1110	56	71
2005	7.1	7.2	163	118	200	150	810	750	68	73
2006	7.2	7.4	175	106	215	160	890	680	74	76
2007	7.3	6.6	164	32	260	110	720	550	44	68

*at the soil depth of – w warstwie gleby o głębokości (cm)

The results were analyzed statistically with ANOVA, the significance of differences were validated using the Tukey's test, at the significance level $\alpha = 0.05$.

The atmospheric conditions in the years of the experiment varied considerably. In March and April – the months when the vegetation of asparagus starts, the highest mean temperatures enabling the earliest plants' growth were recorded in 2002 and 2004. The mean temperature in May, when the yielding is the most intense, was highest in 2002 and 2003 (by 4.3 and 3.2°C higher than a multiyear mean), at that temperature a rapid loosening of spears' heads occurred and a drastic decrease of marketable yield in 2002 (which was the reason of a decision to harvest shorter – 18 cm long spears, since 2003) and a high share of spears with loose heads in 2003. The temperatures in summer and autumn were favourable for asparagus growth, development and yielding. A considerable water shortage in May 2001 and 2002 (rainfall sums lower by 38.4 and 29.7 mm respectively than a long-term average) negatively affected spears' quality and the amount of marketable yield. The shortage of rainfall during vegetative bud formation in summer 2002–2004 could contribute to a significant yield decrease in 2005 due to much lower number of spears.

RESULTS

Mean total yield of seven years of harvest was 10.98 t·ha⁻¹, and it did not differ among the studied cultivars (tab. 3). The yield increased significantly till the fourth year of harvest, decreased in the fifth, and then increased again (though in the seventh year not significantly).

Tabela 2. Średnie miesięczne różnice temperatury i sumy opadów w stosunku do średniej wieloletniej w latach 2001–2007

Table 2. Average temperature and precipitation difference relative to a multiyear mean in the years 2001–2007

	Month Miesiąc	Mean temperature Średnia temperatury z lat 1951–2000 (°C)	Year – Rok							
			2001	2002	2003	2004	2005	2006	2007	
Temperature difference relative to multiyear mean (°C) Różnica temperatury w stosunku do średniej wieloletniej	March – marzec	1.0	1.2	3.7	0.5	1.7	-1.2	-2.1	5.1	
	April – kwiecień	7.5	1.0	1.1	-1	0.5	1.6	1.3	1.3	
	May – maj	13.0	0.9	4.3	3.2	-1.1	0.1	0.6	1.9	
	June – czerwiec	16.5	-1.2	1.3	0.9	-0.6	-0.5	0.3	1.6	
	July – lipiec	17.9	3.5	3.5	1.9	0.2	1.8	3.9		
	August – sierpień	17.2	2.5	3.3	1.7	1.2	-0.3	0.2		
	September – wrzesień	12.9	-1.1	0	0.6	0	2.0	2.8		
	October – październik	7.9	2.3	-1.1	-2.5	-2.5	0.9	2.2		
			Mean precipitation Średnia suma opa- dów 1951–2000 (mm)							
	Precipitation difference relative to multiyear mean (mm) Różnica sumy opadów w stosunku do średniej wieloletniej	March – marzec	25.8	8.0	-7.4	-19.2	-6.1	22.2	22.2	4.4
April – kwiecień		40.6	24.3	-1.5	0.1	-2.5	-22.0	-10.3	-23.0	
May – maj		58.3	-38.4	-29.7	13.1	-20.3	39.7	1.2	22.2	
June – czerwiec		65.8	-18.2	51	-26.2	-15.9	-9.9	27.9	22.0	
July – lipiec		73.6	113.7	52.6	24.5	16.9	36.1	-66.8		
August – sierpień		71.1	-3.6	-52.4	-44.1	-22.6	29.6	127.2		
September – wrzesień		51.4	74.4	-8.9	-22.4	-37.2	-33.4	-40.4		
October – październik		40.5	-21.2	52.4	10.5	9.6	-31.9	-26.3		

Table 3. Total yield of four asparagus cultivars in the years 2001–2007 (t·ha⁻¹)Tabela 3. Plon ogółem czterech odmian szparaga w latach 2001–2007 (t·ha⁻¹)

Odmiana – Cultivar	2001	2002	2003	2004	2005	2006	2007	Średnia – Mean
Backlim	6.29	8.73	11.11	13.33	8.65	12.51	13.57	10.60a
Gijnlim	7.76	9.74	11.45	13.58	10.33	14.29	13.82	11.57a
Horlim	7.42	8.23	11.48	14.33	9.18	11.86	12.45	10.71a
Thielim	7.75	9.45	11.55	14.06	9.40	12.44	12.76	11.06a
Średnia – Mean	7.31d*	9.04c	11.40b	13.83a	9.39c	12.77ab	13.15a	10.98

*Means followed by the same letter do not differ at P = 0.95 according to Duncan's multiple range t-test

*Średnie oznaczone tą samą literą nie różnią się istotnie między sobą wg testu t-Duncana, przy p = 0,95

Mean marketable yield of 'Gijnlim' was 7.4 t·ha⁻¹ and it was significantly higher (by 12 to 20%) than that of other cultivars, whose yield did not vary significantly (tab. 4). Marketable yield in different years varied to a great extent, from 2.87 t·ha⁻¹ in the sec-

ond year to 9.34 t·ha⁻¹ in the fourth. In the second year it decreased significantly, then it increased up to a maximum in the fourth year, decreased in the fifth, and significantly grew again in the following two years. Marketable yield constituted on average 56.5% of the total yield (fig. 1). That share varied very much among years, from 32.7% in 2002 to 68.9% in 2007. It was highest in the case of ‘Gijnlim’ (60.4%) and significantly lower for other cultivars (55.2–55.7%).

Table 4. Marketable yield of four asparagus cultivars in the years 2001–2007 (t·ha⁻¹)
Tabela 4. Plon handlowy czterech odmian szparaga w latach 2001–2007 (t·ha⁻¹)

Odmiana – Cultivar	2001	2002	2003	2004	2005	2006	2007	Średnia – Mean
Backlim	3.00	2.83	6.22	8.47	5.00	6.92	9.14	5.94b
Gijnlim	4.30	3.62	7.06	9.65	6.99	8.68	9.69	7.14a
Horlim	3.81	2.29	6.40	9.55	5.49	6.52	8.49	6.08b
Thielim	3.71	2.76	6.86	9.71	5.55	7.15	8.78	6.36b
Średnia – Mean	3.70d*	2.87e	6.64b	9.34a	5.76c	7.31b	9.03a	6.38

* Explanations see table 3 – objaśnienia jak w tabeli 3

Table 5. Number of spears in the total yield of four asparagus cultivars in the years 2001–2007 (mln·ha⁻¹)

Tabela 5. Liczba wypustek w plonie ogółem czterech odmian szparaga w latach 2001–2007 (mln·ha⁻¹)

Odmiana – Cultivar	2001	2002	2003	2004	2005	2006	2007	Średnia – Mean
Backlim	0.27	0.50	0.53	0.47	0.32	0.48	0.57	0.45b
Gijnlim	0.39	0.65	0.72	0.62	0.48	0.63	0.71	0.60a
Horlim	0.32	0.50	0.60	0.57	0.37	0.48	0.58	0.49b
Thielim	0.35	0.52	0.61	0.55	0.38	0.47	0.56	0.49b
Średnia – Mean	0.33c*	0.54ab	0.62a	0.55ab	0.39c	0.52b	0.60a	0.51

* Explanations see table 3 – objaśnienia jak w tabeli 3

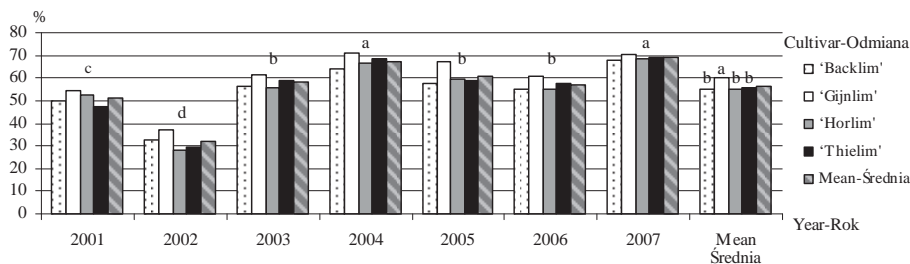


Fig. 1. The percentage of marketable yield in the total of four cultivars of asparagus in the years 2001–2007

Rys. 1. Udział plonu handlowego w ogółem czterech odmian szparaga w latach 2001–2007 (%)

Table 6. Number of spears in the marketable yield of four asparagus cultivars in the years 2001–2007 (mln·ha⁻¹)Tabela 6. Liczba wypustek handlowych czterech odmian szparaga w latach 2001–2007 (mln ha⁻¹)

Odmiana – Cultivar	2001	2002	2003	2004	2005	2006	2007	Średnia – Mean
Backlim	0.13	0.16	0.35	0.34	0.19	0.31	0.44	0.28b
Gijnlim	0.20	0.21	0.47	0.48	0.32	0.44	0.57	0.38a
Horlim	0.16	0.13	0.36	0.41	0.27	0.37	0.46	0.31b
Thielim	0.15	0.14	0.37	0.51	0.26	0.30	0.44	0.31b
Średnia – Mean	0.16d*	0.16d	0.39b	0.43b	0.26c	0.35b	0.48a	0.32

* Explanations see table 3 – objaśnienia jak w tabeli 3

Table 7. Mean weight of a spear in the total yield of four asparagus cultivars in the years 2001–2007 (g)

Tabela 7. Średnia masa pojedynczej wypustki w plonie ogółem czterech odmian szparaga w latach 2001–2007 (g)

Odmiana – Cultivar	2001	2002	2003	2004	2005	2006	2007	Średnia – Mean
Backlim	22.17	17.44	21.13	28.46	26.97	25.91	23.87	23.71a
Gijnlim	20.15	14.97	15.80	21.89	21.58	22.66	19.42	19.50c
Horlim	23.16	16.53	19.01	25.04	24.56	24.85	21.64	22.11b
Thielim	22.40	18.05	18.83	25.40	24.68	26.24	22.67	22.61ab
Średnia – Mean	21.97b*	16.75d	18.69c	25.20a	24.45a	24.92a	21.90b	21.98

* Explanations see table 3 – objaśnienia jak w tabeli 3

Table 8. Mean weight of a spear in the marketable yield of four asparagus cultivars in the years 2001–2007 (g)

Tabela 8. Średnia masa pojedynczej wypustki w plonie ogółem czterech odmian szparaga w latach 2001–2007 (g)

Odmiana – Cultivar	2001	2002	2003	2004	2005	2006	2007	Średnia – Mean
Backlim	22.33	17.31	17.84	25.08	25.784	22.54	20.62	21.64a
Gijnlim	21.90	17.61	15.12	20.23	21.549	19.84	17.02	19.04b
Horlim	22.49	17.16	17.94	23.02	20.13	17.81	18.58	19.59ab
Thielim	24.24	19.47	18.68	23.40	21.631	23.88	20.05	21.62a
Średnia – Mean	22.74a*	17.89c	17.39c	22.93a	22.27a	21.02ab	19.07bc	20.47

* Explanations see table 3 – objaśnienia jak w tabeli 3

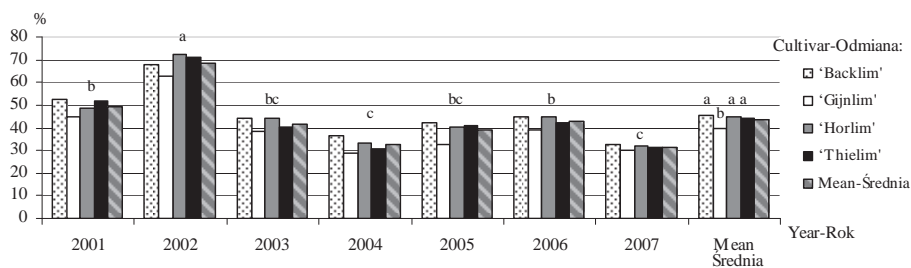


Fig. 2. The percentage of non-marketable yield in the total of four cultivars of asparagus in the years 2001–2007

Rys 2. Udział plonu niehandlowego w ogółem czterech odmian szparaga w latach 2001–2007 (%)

'Gijnlim' yielded the highest of all cultivars number of spears in the total and marketable yield – 0.60 and 0.38 mln·ha⁻¹ respectively (tab. 5, 6). The total spear number was the lowest in the first and fifth year, it increased significantly in the second, sixth and seventh year. Marketable spears constituted on average 63% of all harvested (the percentage was close for all the cultivars but differed very much among years – from 30% in 2002 to 80% in 2007). The fewest were collected in the first and second year, significantly more in two following years, after the decrease in the fifth their number grew significantly in the sixth and seventh year.

The mean spear weight in the total yield of 'Gijnlim' (19.5 g) was significantly lower as compared to other cultivars, that of 'Horlim' and 'Thielim' did not differ, and of 'Backlim' (23.7 g) was significantly higher than that of 'Horlim' (tab. 7). The weight of spear differed considerably among years, it was lowest in the second, significantly increased in the third, in the following two years did not change, and significantly decreased (by 12% on average) in the seventh.

The mean weight of a marketable spear was 20.5 g, the lowest in the second and third year, significantly increased in the fourth, and decreased from the fifth year, but the yearly changes were not significant (tab. 8). In the seventh year it was significantly lower than in the fourth and fifth. For 'Backlim' and 'Thielim' (21.6 g) it was highest, significantly lower for 'Gijnlim' (19.0 g), and 'Horlim' (19.6 g) did not differ significantly from other cultivars.

DISCUSSION

The spear yield of asparagus is influenced by the age and the yielding potential of plants, determined by growth conditions in the year preceding the harvest, affecting the storage of reserves and new vegetative buds formation [Haynes 1987, Knaflewski 1994a, Alam et al 1998, Guo et al. 2001, Wilson et al. 2002, 2008]. In the present study the total yield of all the cultivars was close, and the difference among them did not surpass 9%. In the experiment in Wielkopolska Region yield difference among these cultivars was much higher – from 35 to 56% to the advantage of 'Gijnlim' [Knaflewski

et al. 1998, 2000, Knaflewski and Krzesiński 2004]. In the present study the total yield increased till the fourth year, decreased in the fifth, increased in the sixth, and did not change significantly in the seventh year. The decrease of yield in 2005 may be attributed to the shortage of water in the soil in 2002–2004, limiting new vegetative bud formation and reducing fern growth. In the study of Knaflewski et al. [2000] the yielding pattern was different – the yield increased till the third year, after the decrease in the fourth it increased in the following two years and decreased in the seventh. In other experiments the yield decrease occurred already in the sixth year [Knaflewski et al. 1998, 2000, Knaflewski and Krzesiński 2002].

Asparagus yield in the experiment may be considered quite high. The mean total yield of 'Gijnlim' (not differing from other cultivars) of seven years of harvest – about $12 \text{ t}\cdot\text{ha}^{-1}$, was close to that obtained by Knaflewski et al. [2001]. The marketable yield of 'Gijnlim' was significantly higher than that of other cultivars. In the study of Knaflewski et al. [1998] the yield of 'Gijnlim' was significantly higher than 'Thielim', but not different from 'Horlim'. Pignon et al. [1994] proved lower productivity of 'Backlim' cultivar in green spear production, but in the study of Perko [1996] its yield was high. Knaflewski and Krzesiński [2002] obtained a 25% lower yield of that cultivar as compared to 'Gijnlim'. In the study of Poll [1998] on a heavy soil the marketable yield of 'Gijnlim' and 'Horlim' was 9.5 and $7.7 \text{ t}\cdot\text{ha}^{-1}$ respectively. In many other studies 'Gijnlim' was among best yielding cultivars [Urugami et al. 1996, Krarup 1996, Mullen et al. 1996, 2002, Nichols and Fisher 1999, Evenhuis et al. 2001, Jinsong 2002, Krarup and Contreras 2002b, Temperini et al. 2008]. A 58.1% share of marketable yield in the total was close to the results of Knaflewski et al. [1998] and Krarup and Contreras [2002a], higher than obtained by Nichols and Fisher [1999], but much lower than in some other studies [Knaflewski et al. 2000, 2001, 2008, Knaflewski and Krzesiński 2002], where for 'Gijnlim' it reached 70.9–88.7%, and 92.3% in a Chinese experiment [Jinsong 2002]. Marketable yield of asparagus spears is affected by a cultivar, temperature and water conditions during harvest and in summer in a year preceding the harvest [Hartmann 1985, Liebig and Wiebe 1982, Knaflewski 1995, McCormick and Geddes 1996, Knaflewski et al. 2001, 2008, Krarup and Contreras 2002b]. High temperature promotes loosening of spear heads, shortage of water in the soil may be a reason of spear deformation and the decrease of the number of new vegetative buds formed. The highest share of marketable yield in the total was stated in 2004, with evenly distributed, though scarce rainfall in May and a low temperature during the harvest period, and in 2007 with high, evenly distributed rainfall in May and the beginning of June.

The mean spear weight of a total yield was 22 g (20.5 g of a marketable yield), that of 'Gijnlim' – 19.5 g (19 g of a marketable yield) was lowest of all cultivars. In a study of Knaflewski et al. [2000] the mean spear weight of 'Gijnlim' in a seven year harvest period, was higher – about 30 g, but in other experiments [Knaflewski et al. 1999, Knaflewski and Krzesiński 2004] much lower, only 13 g in case of 'Gijnlim' and 20 g – 'Backlim'. In this study a mean weight of a marketable 'Gijnlim' spear (19 g) was significantly lower than that of 'Backlim' and 'Thielim' (21.6 g). In a study of Knaflewski et al. [1998] this weight did not vary for 'Gijnlim' (20.2 g), 'Horlim' (20.8 g) and 'Thielim' (20.7 g). In other studies the weight of a marketable 'Gijnlim' spear reached 28.3 and 30.8 g [Knaflewski et al. 2001, 2008]. In the experiment of Poll [1998] spear

weight of this cultivar was much lower as compared to 'Horlim'. In the American study a marketable spear weight of 'Gijnlim' (of 23 cm in length) was 24.4–25.1 g [Mullen et al. 1996, 2002], and in the Italian only from 11.3 to 19.4 g [Temperini et al. 2008]. In a study of Knaflewski et al. [2000] there was a 34% decrease of a spear weight in the seventh year of harvest, in this work this decrease was 12.1%.

Plant age is one of the factors affecting the number of shoots, which according to Krzesiński et al. [2008] increases till the 8th year. Shortage of soil water in summer during the shoot assimilation effects in yield decrease and smaller spear diameter in the following year [Hartmann 1981, Sterret et al. 1990, Drost and Wilcox-Lee 1997a, 1997b, Drost 1999]. The significant decrease in the number of spears in 2005, and considerable, but non-significant, in 2004 was preceded by a shortage of rainfall in the season of new bud formation (in 2003 the rainfall below average in June, August and September, and in 2004 in May, June, August and September). Marketable spears share in the total spear number was 63% – from just 30% (31,8% on a weight basis) in 2002, to 80% (68,9% on a weight basis) in 2007. The number of spears formed by asparagus plants (especially in the total yield) was higher than in the studies of Knaflewski et al. [2000, 2008], but with lower mean spear weight. Also in foreign works fewer 'Gijnlim' spears from a unit area were harvested [Krarup 1996, Mullen et al. 1996, 2002, Urugami et al. 1996].

CONCLUSIONS

1. Irrespective of the cultivar the total yield of green spears of asparagus cultivated on a medium heavy grey-brown podzolic soil was high, as compared to the results obtained by other authors. The number of spears of cv. 'Gijnlim' was the highest, and the mean spear weight was the lowest.

2. The total yield increased to the seventh year, however at that time in one year yield decreased.

3. The highest marketable yield was obtained of 'Gijnlim' cultivar, with most numerous spears, but of lower diameter than those of 'Backlim' and 'Thielim'.

4. The mean percentage of marketable yield in the total was low, the highest in case of 'Gijnlim'.

5. Temperature level and rainfall distribution in May affected the percentage of marketable yield in the total. High temperature and low rainfall in 2002 had a negative effect, whereas low temperature and evenly distributed, though quite low, as well as high rainfall levels in 2004 and 2007 respectively, positively affected the percentage of marketable yield.

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PLONOWANIE SZPARAGA ZIELONEGO W UPRAWIE NA GLEBIE ŚREDNIEJ

Streszczenie. Powierzchnia uprawy szparaga na zielone wypustki wzrosła w ostatnich latach, a ich wartości odżywcze są coraz bardziej doceniane. W Polsce produkcja tego warzywa jest niewielka, zdominowana przez szparag bielony. Szparag jest uprawiany na glebach lekkich, ale uprawa na zielone wypustki może dawać dobre wyniki także na glebach cięższych, gliniastych. Celem badań przeprowadzonych w latach 1999–2007 była ocena plonowania szparaga uprawianego na zielone wypustki, na glebie średniej pochodzenia lessowego. W doświadczeniu przeprowadzonym w rejonie lubelskim porównano rośliny czterech odmian szparaga pochodzenia holenderskiego – 'Backlim', 'Gijnlim', 'Horlim' i 'Thielim'. Stwierdzono wysoki, niezależny od odmiany, a zależny od roku badań plon ogółem zielonych wypustek. W przebiegu plonowania zanotowano coroczny istotny (z wyjątkiem siódmego roku) wzrost plonu. Jedynie w piątym roku badań wystąpił znaczny jego spadek. Plon handlowy odmiany 'Gijnlim' był istotnie wyższy niż pozostałych odmian. Udział plonu handlowego w plonie ogółem był niski, wynosił średnio tylko 56,5% i był bardzo zróżnicowany (od 32,7% do 68,9 %) w zależności od roku. Największy udział plonu handlowego w plonie ogółem stwierdzono u odmiany 'Gijnlim' (60,4%), istotnie mniejszy (55,2–55,7%) u reszty odmian. Rośliny odmiany 'Gijnlim' wytworzyły istotnie większą liczbę wypustek w plonie ogółem i handlowym niż pozostałe odmiany. Wypustki handlowe stanowiły średnio 63% ogólnej ich liczby (wartość ta była zbliżona dla odmian, ale bardzo zróżnicowana w latach – wynosiła od 30 do 80%). Największy udział plonu niehandlowego stwierdzono w lata o dużym niedoborze opadów w maju.

Słowa kluczowe: *Asparagus officinalis*, zielone wypustki, plon ogółem, plon handlowy

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