

PRODUCTIVITY OF HORSERADISH VARIETIES IN CONSIDERATION OF ASSORTED RHIZOMA DISTRIBUTION

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Abstract: *The average yeild of horseradish is 7-8 t/ha besides good cropping technologie although certain populations can reach higher produce. In respect of profitability the root size is very important, because first class rhizomes are more marketable. For that very reason the root size is on important attribute of variety. This paper contains the result of a variety-comparison trial in consideration of rhizome size.*

Keywords: *horseradish, rhizome, quality classes, profitability*

1. INTRODUCTION

The production of horseradish is confined only one region in Hungary, which ranges in Hajdú-Bihar County and includes a few villages to south from Debrecen (Bagamér, Álmosd, Kokad, Újléta, Vámospércs). The cultivated area is about 1000-1200 hectares, the quantity of crop is 7-8000 tons yearly. Since the 90 percent of the quantity grown in Hungary is exported to West Europe, the quality is very important. The Hungarian horseradish - either raw or processed - has a good reputation at the European markets due to its internal values. The pearly white texture and pungency are basic requirements.

The selective breeding of horseradish dates back to 1989, at this time a gene reserve - which is in the care of NYF MMFK - was founded (Géczi, 2001). To my knowledge this breeding work is very significant in European relation too. The number of nationally registered varieties is the highest in Hungary (Bagaméri 93/1, Bagaméri delikát, Danvit, Pózna, Norda, Nyírnemes, Petrence) (Géczi, 1998). In most of the surrounding countries each cultivating area had its characteristic genotype (not registered variety), named after the area (Nürbergi, Spreewaldi, Steirischer stb.) (Becker Dillingen, 1956). In Hungary the Lúcsonyi was grown on the Hungarian plain, the Bártai in the southern part of Transdanubia, and sweet Debreceni in the Hajdú-Bihar area (Haraszty, 2005). According to Dessewffy (1959) the most wide-spread type of horseradish grown in Hungary is the sweet Debreceni and the Nürnberger, which mingle in the cultivation.

The gene reserve of College of Nyíregyháza contains domestic and foreign genotypes and registered varieties - 90 items altogether - too. The goal of hungarian selection breeding work is to generate disease-tolerant and homogenous populations.

2. MATERIALS AND METHODS

The trial was set up at the DE ATC Research Centre of Nyíregyháza. The soil of this area is medium set and sandy loam. The experimental field was 1800 m². The gene reserve – which grounded the experiment - contains lines (genotypes) collected from foreign and Hungarian production areas, nationally registered varieties (Bagaméri 93/1, Bagaméri delikát, Pózna, Danvit, Nyírnemes) and variety candidates (Norda, Petrece).

The planted rootcuttings were 25 cm long and 8-12 mm diametrical. We picked up the soleroots using for propagation in 2005 only from healthy rhizomes, decreasing the number of root diseases this way. The rootcuttings were overwintered in clamp. After gauging we had scraped away the adventitious buds from the middle of the root. The batched rootcuttings were quick forced for 2 weeks. In this period the cuttings grow roots distal to the foot and offshoots distal to the head.

We passed out 90 kg/ha of artificial fertilizer with phosphorus agent and 100 kilos with potassium before the autumn deep-ploughing. The crown distance of the ridges, which were made before the settling and which were 30 cm high, 40 cm wide below, and 30 cm wide on the top, was 100 cm. The cuttings were settled so that there will be a distance of 23 cms between the stocks with a manual t-shape planting iron. We left a dividing space after each variety to avoid the mingling of types when picking up. 50 cuttings a type were planted on 18-19 April, 2005.

Mechanical weed control was applied (3 times hoeing in the vegetation period). Sprout selection (heading) happened between 18 June and 20 July. Simultaneously we had prune down the side-roots from the rhizome and then fertilizing of the stocks with 3 dkg/sqm ammonium nitrate. The rainfall in the vegetation period proved to be sufficient so we did not irrigate. Among agrotechnical tasks the plant protection was the most difficult, which was directed against *Albugo candida* and *Phyllotreta* sp.

We harvested the roots with an 'U' shaped plough towed by a MTZ 82 tractor on 26 October. During processing we applied the German standards to sort the roots. This standard differentiate the following 4 classes (table 1.):

Table 1.: Quality categories

Class	Diameter (mm)	Length (cm)
I.	> 25	Minimum 20 cm
II.	20-25	
III.	15-20	
IV:	10-15	

During the procession we first separated the diseased rhizomes from the healthy ones and established these proportions. We cut out the leaves from the crown of the root and we cracked the sole-roots. We measured the weight of the roots in each class. We also appraised the hairiness of roots, the colour of the epidermis and the flesh as well as the surface of the epidermis.

3. RESULTS AND DISCUSSION

This study discusses the harvest results of the prominent elements of gene reserve in 2006. We have chosen to present the achievement of the best and the worst performed lines and nationally registered varieties. During appraisal process we disregard the state of health of the plants.

Table 2. Percentage distribution of measure classes

Variety, line	I. class. %	II. class. %	III. class. %	IV. class. %
Bagaméri 93/1	76,51	16,41	7,08	0
Bagaméri delikát	97,89	2,11	0	0
Pózna	96,11	3,89	0	0
Norda	100	0	0	0
Danvit	100	0	0	0
Petrence	84,44	13,95	1,61	0
Nyírmemes	82,04	17,96	0	0
Újlétai - B	79,39	18,09	1,51	1,01
CS-2	100	0	0	0
Debreceni fehérhúsú	96,94	3,06	0	0
CS-3	96,61	2,01	1,38	0
Újlétai szeldelt levelű	96,32	3,69	0	0
Lipótszentmiklósi	93,36	5,03	1,60	0
Podbielli	61,10	25,45	13,45	0
Zaluzicei	59,77	28,74	11,49	0
MS-Magonc	58,36	26,44	13,68	1,52
Spreewaldi	52,57	30,88	9,19	7,35
Ruskovói	52,5	22,5	25	0

Significance difference in assortedness appeared between the nationally registered varieties and lines (genotypes). The most widespread variety, Bagaméri 93/1 – which known as 'Hungarian horseradish' in growers circles – did average result and the other widespread variety, Danvit -known as danish horseradish – did prominently well in the experiment. 'Norda' and 'CS-2' lines also grew I. class rhizomes one hundred per cent. The last five lines had mentionable proportion of II. class rhizomes, moreover 'MS magonc' and 'Speewaldi' had IV.class rhizomes too.

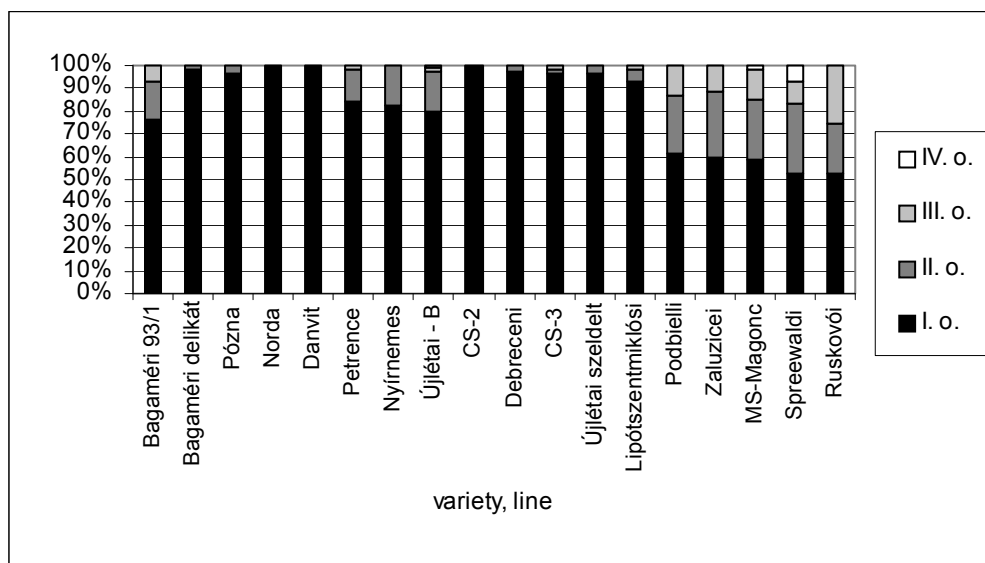


Figure 1. Class distribution of horseradish varieties and lines (Nyíregyháza, 2006)

Table 3. Average rhizome weight in the several size categories

Variety, line	Average rhizóme weight (dkg/pc)			
	I. class	II. class	III. class	IV. class
Bagaméri 93/1 (ÁE)	20,2	10,83	9,33	-
Bagaméri delikát (ÁE)	20,22	10	-	-
Pózna (ÁE)	20,57	12,5	-	-
Norda (ÁE)	21,74	-	-	-
Danvit (ÁE)	21,64	-	-	-
Petrence (ÁE)	26,22	13	9	-
Nyírnemes (ÁE)	19,73	11,88	-	-
Újlétei – B (üzemi populáció)	21,54	12	9	6
CS-2	23,43	-	-	-
Debreceni fehérhúsú	18,1	12	-	-
CS-3	22	10	7	-
Újlétei szeldelt levelű	24,96	11	-	-
Lipótszentmiklósi	17,74	11	7	-
Podbielli	12	8,75	6,17	-
Zaluzicei	12	9,38	7,5	-
MS-Magonc	14,77	10,88	9	5
Speewaldi	13	10,5	8,33	6,67
Ruskovói	13,13	9	7,15	-

Table 3. and Figure 2. shows the average rhizome weight in each classes and variety. The average weight of IV. class rhizomes were between 5-7 dkg, the III. class rhizomes were 6-9 dkg, the II. class rhizomes were between 8-12 dkg. The I. class rhizomes had an average weight between 12-27 dkg, because the size interval is open from above. With regard to the I. class rhizome weight, 'Újlétai szeldeltlevelű' and 'Petrence' lines were the best, with over 25 dkg average rhizome weight. On the other hand 'Zaluzicei' and 'Podbielli' had an average weight under 12 dkg.

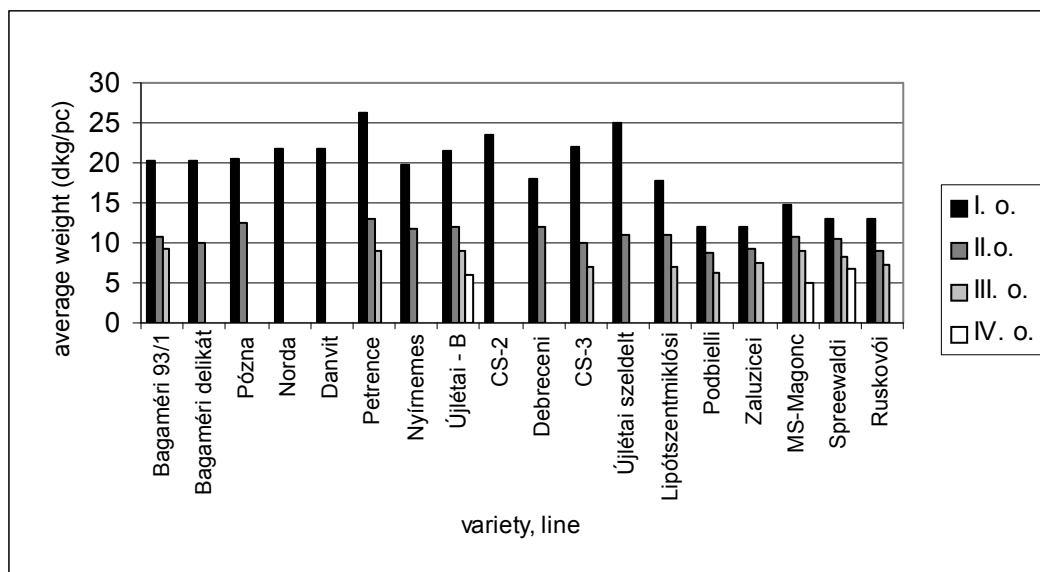


Figure 2. The average rhizome weight in the several size classes

Figure 3. shows the profitability in connection with assortedness and rhizome weight. It shows up very well that. The market prices in 2006 were the following:

I. class	240 HUF/kg	III. class	90 HUF/kg
II. class	190 HUF/kg	IV. class	40 HUF/kg

It's visible that incoming depends on not only the total yield (weight) but on the assortedness of the horseradish rhizomes. 1 kg IV. class sized horseradish costs only 1/6 part of 1kg I. class sized.

Pending 8 tons/ha yield, the grower's incomings can reach 2 million HUF, if the growth is one hundred per cent I. class sized. If there is a high proportion of lower classes the profitability will drastically decrease at the same yield.

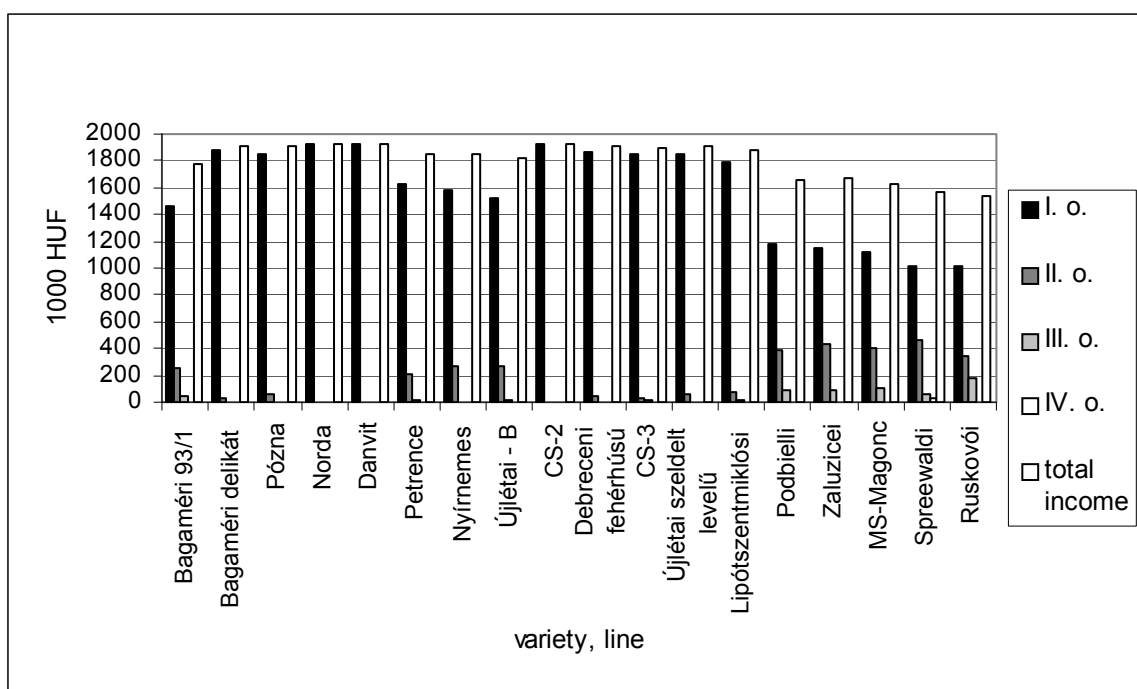


Figure 3. The profitability of horseradish growing in relation to assortedness at the examined varieties and lines

4. CONCLUSIONS

Evaluating the results of the examined lines of our gene reserve, we can establish that there are significant differences between the lines (and varieties) in point of productivity, assortedness, average root weight and in connection with these in point of profitability.

From the point of view of realization the most important attribute of a horseradish variety is the average rhizome size and weight (at the same planting space and ecological circumstances), because the market prices depends on the root size. The best variety is which grows weighty, I.class sized rhizomes in high proportion of total yield at the same planting space. In this regard Danvit, Norda and CS-2 were founded the best genotypes.

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