

## YIELD IN ELDERBERRY CULTIVARS GROWN ON TWO DIFFERENT SOILS IN 1997-2003

Jadwiga Ważbińska, Urszula Puczel  
and Joanna Senderowska

University of Warmia and Mazury in Olsztyn, Horticulture Department  
Prawocheńskiego 21, 10-957 Olsztyn, POLAND  
tel. 089 523 33 55, fax 089 523 33 32

(Received August 16, 2004/Accepted November 18, 2004)

### A B S T R A C T

From 1997 to 2003, four Danish elderberry cultivars and one local wild variety were evaluated at the Experimental Garden of the University of Warmia and Mazury in Olsztyn, Poland. The cultivars evaluated were 'Alleso', 'Korsor', 'Sampo' and 'Samył'. In the autumn of 1995, one-year-old elderberry bushes were planted in a random block design in two different fields, one with Class IV soil, and the other with Class V soil. The varieties with the highest yields were 'Sampo' and 'Samył', which had yields twice as high as 'Korsor' and the wild variety. All varieties had higher yields on the Class IV field than on the Class V field.

**Key words:** elderberry, yielding

### INTRODUCTION

In the lake district of Warmia and Mazuria, air and soil temperatures are lower, precipitation is higher, and the growing season is shorter than in central Poland (Grabowski, 1994; Bac, 1980). This limits the range of fruit varieties which can be profitably cultivated. Varieties are needed which are relatively tolerant to the cold climate and poor soils characteristic of the area. In the future, these varieties may partially replace the varieties traditionally grown in the lake district.

The elderberry (*Sambucus nigra* L.) is a useful and potentially profitable minor fruit species. Almost all parts of the plant have pharmotherapeutical properties. The fruits remove harmful metabolites from the body and have been used to treat colds, migraines and neuralgia. The elderberry is also a good

of anti-oxidants and anti-carcinogens because of its relatively high content of polyphenols and flavonoids (Abuja et al., 1998). In the food industry, elderberry pulp is used as a natural food color. The elderberry is also used for making juice, jelly, jam, marmalade and syrup (Ważbińska et al., 1996).

Recently, environmental pollution has limited the available sources of elderberry raw material which is acceptable to the food and alternative medicine industries. From an economic point of view, it is important to grow high-yielding varieties with high quality fruits. This has prompted the establishment of special ecological farms in many European countries, such as Denmark, Germany and Slovakia. In spite of its many virtues, the elderberry is not widely cultivated in Poland, where most of the crop is harvested from wild bushes.

The aim of this study was to evaluate four Danish elderberry cultivars and one local wild variety in terms of yield when grown in different soils in northeastern Poland.

## MATERIAL AND METHODS

From 1997 to 2003, four Danish elderberry cultivars and one local wild variety were evaluated at the Experimental Garden of the University of Warmia and Mazuria in Olsztyn, Poland. The cultivars evaluated were 'Alleso', 'Korsor', 'Sampo' and 'Samyl'.

Parent saplings of the Danish cultivars were obtained from a nursery in Copenhagen, Denmark. Saplings of the wild variety were collected from bushes growing wild in Kortowo, near Olsztyn. The saplings were rooted in the greenhouse.

In the autumn of 1995, one-year-old elderberry bushes were planted 1.5 x 3.0 meters apart in a random block design in two different fields, one with Class IV soil, and the other with Class V soil. Three replicates of three bushes of each variety were planted in each field. The rows were mechanically cultivated, and a 1.5 meter wide grass strip was sown between the rows.

No mineral fertilizers were applied during the course of the experiment. 13.5 kg of well-composted farm manure was applied under each bush for a total dose of 30 tons/ha.

Every spring, the bushes were trimmed and the oldest stems were removed.

Fruit was collected manually by cutting the clusters off with pruning shears.

## RESULTS

Yields varied widely from variety to variety, from field to field, and from year to year (Tab. 1).

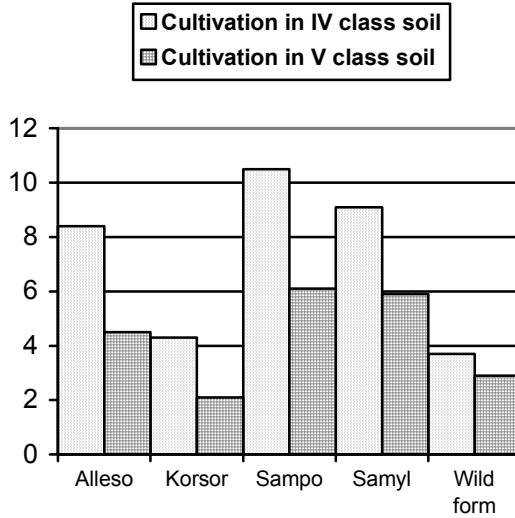
The varieties with the highest yields were 'Sampo' and 'Samyl', which had yields twice as high as 'Korsor' and the wild variety.

Yield in elderberry cultivars grown on two different soils

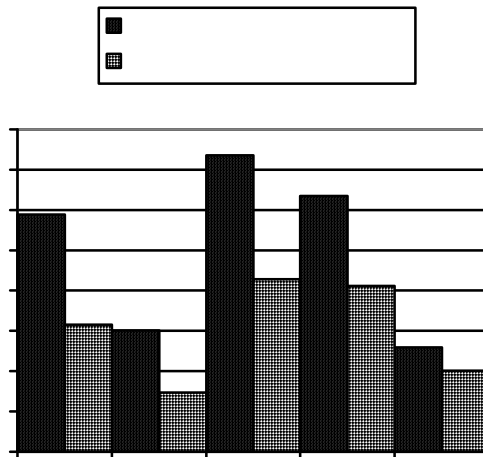
Table 1. Yielding of elderberry cultivated on two fields in 1997-2003

Cultivar	Field	Yield [kg]						
		1997	1998	1999	2000	2001	2002	2003
'Alleso'	Class IV	2.0	6.5	9.2	8.6	7.4	10.1	15.1
	Class V	1.9	2.6	5.2	6.9	3.6	8.1	3.2
'Korsor'	Class IV	5.8	6.5	6.8	4.5	2.9	2.5	1.1
	Class V	1.2	3.1	4.5	2.9	2.0	0.3	0.7
'Sampo'	Class IV	8.8	9.8	8.3	8.7	8.8	16.6	12.6
	Class V	4.4	3.1	5.1	6.0	8.2	12.9	3.1
'Samyl'	Class IV	7.0	8.8	8.1	8.8	9.4	7.2	14.2
	Class V	4.6	5.2	6.5	4.1	7.8	6.1	6.8
Wild variety	Class IV	5.2	2.0	4.0	5.2	4.9	2.8	1.8
	Class V	3.2	1.3	2.0	3.1	4.2	4.8	1.5
LSD <sub>0.05</sub> 1-cultivar or origin 2-field		1 = 0.98 2 = 0.62 1x2 = 1.38	1 = 0.19 2 = 0.12 1x2 = 0.27	1 = 1.23 2 = 0.76 1x2 = 1.74	1 = 0.97 2 = 0.61 1x2 = 1.37	1 = 0.82 2 = 0.52 1x2 = 1.17	1 = 0.77 2 = 0.48 1x2 = 1.15	1 = 1.51 2 = 0.96 1x2 = 2.14

All varieties had higher yields on the Class IV field than on the Class V field. In some cases, the difference was very large. For example, in 2002, 'Korsor' yielded 8.3 times as much on the Class IV field than on the Class V field. The only exception occurred in 2002, when the wild variety yielded 2.8 kg per bush on the Class IV field and 4.8 kg per bush on the Class V field.



**Figure 1.** Yielding of elder cultivated on two fields (kg per bush) – average for 1997-2003



**Figure 2.** Yielding of elder cultivated on two fields (kg per bush) – total for 1997-2003

On the Class IV field, the variety with the highest seven-year average yield per bush was 'Sampo' (10.5 kg) (Fig. 1) and the total yield to 73.6 kg per bush (Fig. 2), and average yield per bush were 'Saml' (9.1 kg), 'Alleso' (8.4 kg), 'Korsor' (4.3 kg), and the wild variety (3.7 kg).

On the Class V field, the variety with the highest seven-year average yield per bush was 'Sampo' (6.1 kg), followed by 'Saml' (5.9 kg), 'Alleso' (4.5 kg), the wild variety (2.9 kg), and 'Korsor' (2.1 kg). It is worth noting that, on the Class V field, 'Korsor' yielded even less than the wild variety.

While yields generally increased as the plants got older, this pattern was not always observed. The major exception was 'Korsor', which had its highest yields in 2003 on both fields, after which yields drastically fell.

## DISCUSSION

The elderberry has been reported to grow best in moist, fertile calcareous soils with a high humus and nitrogen content. However, it can also grow well in sandy soils. The elderberry can grow in both direct sunlight or in the shade, though yields are more abundant in direct sunlight (Grochowski, 1986). In this study, all of the varieties had much higher yields in the richer soil of the Class IV field than in the poorer soil of the Class V field. In previous studies, elderberry bushes grown in poorer Class V soils had lower yields and lower fruit quality (Ważbińska et al., 2000; Ważbińska and Puczel, 2002).

In the literature, the elderberry has been reported to yield anywhere from 1 to over 30 kg per bush, depending on variety (Kaack, 1989, 1997; Kadarova, 1986). In one study, yield ranged from 1.2 to 11.9 kg per bush in the seventh year after planting, and from 1.9 to 32.8 kg per bush in the eighth year after planting (Kadarova, 1986). In another study, the differences in yield were somewhat lower (Porpaczy and Laszlo, 1984).

In this study, yield per bush ranged from 0.3 with 'Korsor' on the Class V field in 2002 to 16.6 kg with 'Sampo' on the Class IV field in 2002. This agrees well with results reported earlier for 'Alleso', 'Korsor', 'Sampo' and 'Saml', in which 'Alleso', 'Sampo' and 'Saml' had high yields, and 'Korsor' and wild varieties had low yields (Kaack, 1997). This also agrees with previous results reported by Ważbińska (1999), who evaluated 'Alleso', 'Korsor', 'Sampo', 'Saml' and wild varieties from Belarus and Poland. In the first year after planting, 'Sampo' and 'Saml' had the highest yields, and the wild varieties from Belarus and from Słoneczny Stok near Olsztyn had the lowest yields.

## CONCLUSIONS

Yields varied widely from variety to variety, from field to field, and from year to year (Tab. 1).

The varieties with the highest yields were ‘Sampo’ and ‘Samyl’, which had yields twice as high as ‘Korsor’ and the wild variety.

All varieties had higher yields on the Class IV field than on the Class V field.

## REFERENCES

- Abuja P.M., Murkovic M., Pfannhauser W. 1998. Antioxidant and prooxidant activities of elderberry (*Sambucus nigra*) extract in low-density lipoprotein oxidation. J. AGRIC. FOOD CHEM. 46(10): 4091-4096.
- Bac S. 1980. Celowość nawodnień na tle klimatu. Konf. NOT nt. „Problemy nawodnień użytków rolnych w Polsce”, Bydgoszcz, pp. 65-94.
- Grabowski J. 1994. Charakterystyka opadów atmosferycznych w RZD w Bałcynach w latach 1972-1990. ACTA ACAD. AGRICULT. TECH. OLST., AGRICULT. 58: 59-67.
- Grochowski W. 1986. Jadalne owoce leśne. PWRiL, Warszawa, pp.144-147.
- Kaack K. 1989. New varieties of elderberry (*Sambucus nigra* L.). DANISH J. PLANT SOIL SCI. 93: 59-65.
- Kaack K. 1997. ‘Sampo’ and ‘Samdal’, Elderberry Cultivars for Juice Concentrates. FRUIT VAR. J. 51(1): 28-31.
- Kadarova S. 1986. Študium ekotypov bazy čiernej. Vedecké Práce Vyskumneho Ustavu Ovocnych a Okrasnych Drevin v Bojniciach, pp. 83-85.
- Porpaczy A., Laszlo M. 1984. Evaluation of elderberry (*Sambucus nigra* L.) clones based on the quality of the fruit. ACTA ALIMENT. 13(2): 109-115.
- Ważbińska J. 1999. Niektóre cechy morfologiczne odmian i ekotypów bzu czarnego (*Sambucus nigra* L.). Mat. VIII Ogólnopol. Zjazdu Nauk. „Hodowla Roślin Ogrodniczych u progu XXI wieku”, AR Lublin, pp. 303-306.
- Ważbińska J., Nesterowicz J., Rafałowski R. 1996. Przetwory z owoców mało znanych. II Ogólnopol. Symp. „Nowe rośliny i technologie w ogrodnictwie”1, Poznań, 17-19 września 1996, pp. 298-301.
- Ważbińska J., Puczel U. 2002. Fruit characteristics of the elderberry (*Sambucus nigra* L.) grown on two different soils. J. FRUIT ORNAM. PLANT RES. 10: 117-128.
- Ważbińska J., Puczel U., Borowska J., Zadernowski R. 2000. Charakterystyka owoców odmian szlachetnych oraz form dziko rosnących bzu czarnego (*Sambucus nigra* L.). ROCZNIKI AKADEMII ROLNICZEJ W POZNANIU CCCXXIII, OGRODNICTWO 31/II: 427-431.

## PLONOWANIE BZU CZARNEGO, UPRAWIANEGO NA DWÓCH STANOWISKACH W LATACH 1997-2003

Jadwiga Ważbińska, Urszula Puczel  
i Joanna Senderowska

### S T R E S Z C Z E N I E

Doświadczenie z bzem czarnym przeprowadzono w latach 1997-2003 w Ogrodzie Doświadczalnym Uniwersytetu Warmińsko-Mazurskiego w Olsztynie. Badaniami objęto 4 odmiany duńskie: 'Alleso', 'Korsor', 'Sampo' i 'Samyl' oraz formę dziko rosnącą pochodzącą z okolic Olsztyna. Doświadczenie zlokalizowano na dwóch stanowiskach, różniących się pomiędzy sobą kompleksami glebowymi: gleba klasy IV i gleba klasy V. We wszystkich latach badań plonowanie bzu czarnego zależało od odmiany i stanowiska uprawy, różne było także w poszczególnych latach owocowania. Zarówno odmiany szlachetne, jak i forma dziko rosnąca dawały wyższy plon na glebie klasy IV. Wystąpiły też wyraźne różnice w plonowaniu pomiędzy odmianami. W ciągu 7 lat badań najwyższy plon uzyskano z odmian 'Sampo' i 'Samyl'. Zdecydowanie najslabiej plonowała odmiana 'Korsor' oraz forma dziko rosnąca, z których uzyskano ponad dwukrotnie mniej owoców z krzewu niż z odmian 'Sampo' i 'Samyl'.

**Słowa kluczowe:** bez czarny (*Sambucus nigra* L.), plonowanie