DROPWORT (*FILIPENDULA VULGARIS* L.) SEEDS GERMINABILITY AS EFFECTED BY THEIR RIPENESS AND ONE-YEAR STORAGE

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Introduction

Dropwort (*Filipendula vulgaris* L., syn. *Filipendula hexapetala* Gilib. Ex Maxim., family *Rosaceae*) is a rhizomatous perennial, 30-80 cm high, naturally occurring in Poland on sunny, semi-dry meadows and neglected lands. This species has a long history of use in folk medicine in many countries of Europe. Above- and underground organs of this plant have been used for ages as a diuretic, antirheumatic and anti-inflammatory agent. The active compounds of these raw materials are flavonoids, phenolic acids and salicylates, tannins, fatty acids, non-alkaloid nitrogen-containing compounds, polysaccharides, traces of coumarin and essential oil (aerial parts) (Popesku at al., 2002; Pavlovic at al., 2007). In herb quercetin, luteolin, rutoside, hyperoside, avicularin, quercitrin and spireoside are present, and in the rhizomes – quercetin, hyperoside, rutoside, avicularin, isoquercitrin, quercitrin and spireoside (Smolarz at al., 1999). The aim of undertaken investigation was to study the influence of ripeness and short-term storage of dropwort seeds on their germination ability.

Materials and methods

The cultivation trials of dropwort were carried out in the years 2007-2008, at the experimental field of the Department of Vegetable and Medicinal Plants of Warsaw University of Life Sciences – SGGW. The seeds used in the experiment were collected at the stage of dough maturity and complete maturity, from main shoots and primary lateral shoots of two-year-old plants. The 1000-grain weight and germinability were assessed directly after harvest and after one-year storage of seeds, according to ISTA (2008). The test was done on filter paper in Petri dish, in the air-conditioning chamber, at 25°C, and light intensity 150 µE × m^{-2} × s^{-1}. First calculation was done after 10 days and second one after 21 days. In the seeds from main shoots phenolic compounds were determined. For that seed sample (1 g) was extracted exhaustively with 100 ml of methanol in Büchi B-811 Extraction System. After evaporation of solvent, the residue was dissolved in 10 ml of methanol. The obtained extract was filtered (Supelco IsoDisc PTFE 25 mm × 0.45 µm) and subjected to HPLC. The analysis was carried out using the Shimadzu chromatograph with SPD-M10A VP DAD detector and Luna C18(2) RP 18 column, 5 µm, 250 mm × 4.6 mm (Phenomenex). The following conditions were applied: mobile phase A – 10% ACN (LabScan) in water, mobile phase B – 55% ACN in water, pH 3, flow rate 1 ml × min^{-1}, temperature 31°C, time of analysis 40 min. Peak identification was confirmed by comparison of retention time and spectral data with adequate parameters of standards from Fluka, Roth, Extrasynthese and Serva.

References

ISTA, 2008. International Seed Testing Association. Radzików.

Khan, M.A. and Ungar, I.A. 1986. Inhibition of germination in Atriplex triangularis seeds by application of phenols and reversal of inhibition by growth regulators. Bot. Gazette. 147(2):148-151.

Pavlovic, M., Petrovic, S., Ristic, M., Maksimovic, Z. and Kovacevic, N. 2007. Essential oil of *Filipendula hexapetala*. Chemistry of Natural Compounds. 43(2):228-229.

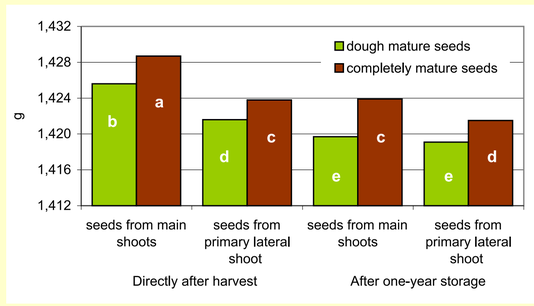
Popescu, M.L., Istudor, V., Parvu, C. and Dinu, M. 2002. Research on *Filipendulae hexapetalae flores* products. Farmacia (Bucharest, Romania). 50(2):34-38.

Smolarz, H.D., Dzido, T.H. and Sokołowska-Woźniak, A. 1999. High-performance liquid chromatographic determination of flavonoids in *Filipendula hexapetala* Gilib. Acta Poloniae Pharmaceutica. 56(2):169-172.

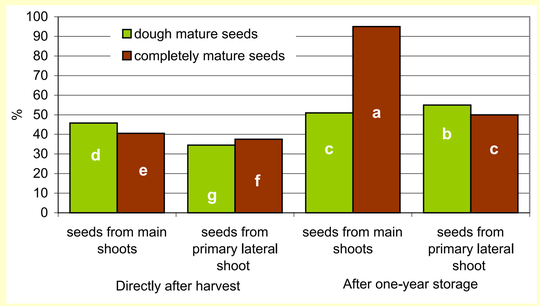
Results

Position of seeds on seed shoots, stage of seed maturity and one-year storage of seeds significantly affected their 1000-grain weight and germinability. The highest 1000-grain weight was characteristic for the seeds collected from main shoots at the stage of complete maturity (Fig. 1). After one-year storage seed weight was significantly lower. Directly after harvest the germinability of seeds originating from main shoots was slightly higher than the germinability of seeds from primary lateral shoots (Fig. 2). After one-year storage the seeds from main shoots collected at the stage of complete maturity were characterised by the highest germinability (95%).

Completely mature seeds stored for one year were characterised by distinctly lower content of (+)-catechin, (-)-epigallocatechin gallate and gallic acid than not stored seeds (Table 1). Taking into consideration that the germinability of these seeds after storage was significantly higher, it seems that the determined phenolic compounds act as inhibitors of seed germination. In case of the seeds collected at the stage of dough maturity their germinability after one-year storage was only slightly higher than directly after harvest, which may result from the inhibitory effect of the above-mentioned catechins.



Values marked with the same letter do not differ significantly at α=0.05



Values marked with the same letter do not differ significantly at α=0.05

mean for shoot		mean for maturity of seeds		mean for storage	
main	1.4244**	dough	1.4215	directly after harvest	1.4249**
primary lateral	1.4215	complete	1.4244**	after one-year storage	1.4210

** p.< 0.01

Fig. 1. The 1000-grain weight [g]

mean for shoot		mean for maturity of seeds		mean for storage	
main	58.06**	dough	46.56	directly after harvest	39.56
primary lateral	44.25	complete	55.75**	after one-year storage	62.75**

** p.< 0.01

Fig. 2. The germinability of seeds [%]

Table 1. Content of phenolic compounds in seeds [mg × $100g^{-1}$]

Compounds	Directly after harvest		After one-year storage	
	Dough mature seeds	Completely mature seeds	Dough mature seeds	Completely mature seeds
(+)-Catechin	62.61 d	113.54 b	149.88 a	78.45 c
(-)-Epigallocatechin gallate	434.58 b	264.91 c	470.90 a	148.64 d
Ellagic acid	135.14 a	64.45 c	70.54 b	51.22 d
Gallic acid	200.60 a	178.27 b	112.76 c	118.57 c

Values in rows marked with the same letter do not differ significantly at α=0.05

(+)-Catechin	Maturity of seeds	Mean	Storage	Mean
	Dough	106.24**	Directly after harvest	88.07
	Complete	95.99	After one-year storage	114.16**
(-)-Epigallocatechin galate	Maturity of seeds	Mean	Storage	Mean
	Dough	452.74**	Directly after harvest	349.74**
	Complete	206.77	After one-year storage	309.77
Ellagic acid	Maturity of seeds	Mean	Storage	Mean
	Dough	102.84**	Directly after harvest	99.79**
	Complete	57.83	After one-year storage	60.88
Gallic acid	Maturity of seeds	Mean	Storage	Mean
	Dough	156.68**	Directly after harvest	189.43**
	Complete	148.42	After one-year storage	115.66

Values in rows marked with the same letter do not differ significantly at α=0.05

Stages of germination of seeds

Inflorescence

Shoot with fruits – achenes
(sowing material)