

Is the seed weight determined by plant size in *Verbascum speciosum*?

Je hmotnosť semien určovaná výškou rastliny pri *Verbascum speciosum*?

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Mean weight of seeds, collected in 1981–1985 from more than 50 mullein plants differing in size (1.05 to 2.50 high) and growing in five localities in Czechoslovakia (SW Slovakia: 4, SW Moravia: 1), varied from 6.5 to 18.5 mg per 100 seeds. Neglecting localities and years of sampling, a scatter diagram was obtained of the relation between seed mass and plant height. Potentiality of having heavier seeds increased with plant height. This trend was more evident when the localities and sampling years have been separated.

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INTRODUCTION

New results on seed weight variation in plant species corrected previous usual ecological impression that seed weights are fairly constant. The variability in individual seed weights can be considerable within and among plants growing under similar conditions. Weight of seeds varied 2- to 17-fold among individuals of a plant species (SALISBURY 1942, JANZEN 1977, PRIMARCK et ANTONOVICS 1981, JORDANO 1984, HENDRIX 1984, THOMPSON 1984, ELIÁŠ 1986). In *Pastinaca sativa*, variation in seed weight among plants was positively correlated with the basal stem diameter of the flowering stalk (HENDRIX 1984).

In *Verbascum speciosum* SCHRADER, a thermophilous mullein of south-eastern-European origin, variation in seed weights was analysed in relation to height of the flowering stalk.

MATERIAL AND METHODS

The mature seeds were collected, in September to November 1981–1985, from four field populations in southwestern Slovakia (Pezinok-Malé Trnie, Horné Orešany, Pezinok-Myslenice and Pezinok-Cajla) and one field population in SW Moravia (Horní Dunajovice). More than 50 fruiting plants, differing in size, in approximately the same phenological state of development were randomly selected in the populations. The height of fruiting stalk was used as a measure of plant size. From each of the plants, three branches with numerous fully matured capsules were collected from middle parts of the dense terminal composed racemes. The branches were stored dry in paper bags in the laboratory until used in the determinations. The mature dark brown seeds released from the capsules were randomly separated into many seed samples before being weighed. Because of the small seed size, mean dry weights were obtained for each seed sample.

Tab. 2. — Variations in mean seed mass in *Verbascum speciosum* among field populations and years of sampling.

Locality	Date of sampling	Plant size [m]	No. of seeds* [nx10 ³]	Range in mean seed mass [mg per 100 s.]
1. Pezinok-Malé Trnie	IX. 1981	ca. 1.90	3.0	9.7–13.5
	IX. 1982	1.65–2.10	2.4	9.1–14.2
	IX. 1983	1.15–2.15	3.3	7.5–11.3
	X-XI. 1985	1.65–2.50	3.0	6.5–15.8
2. Horné Orešany	XI. 1982	1.10–1.50	4.8	9.2–10.65
	IX. 1983	1.25–1.60	1.2	7.2–10.50
	X. 1984	1.50–1.60	1.2	9.2–11.5
	IX. 1985	1.20–2.20	1.5	6.7–12.5
3. Pezinok-Cajla	IX. 1983	0.95–2.00	2.1	6.5–10.6
4. Horní Dunajovice	X. 1985	1.60–1.90	3.0	9.4–18.2

* The data represent total number of seeds used in determination of variation in mean seed mass.

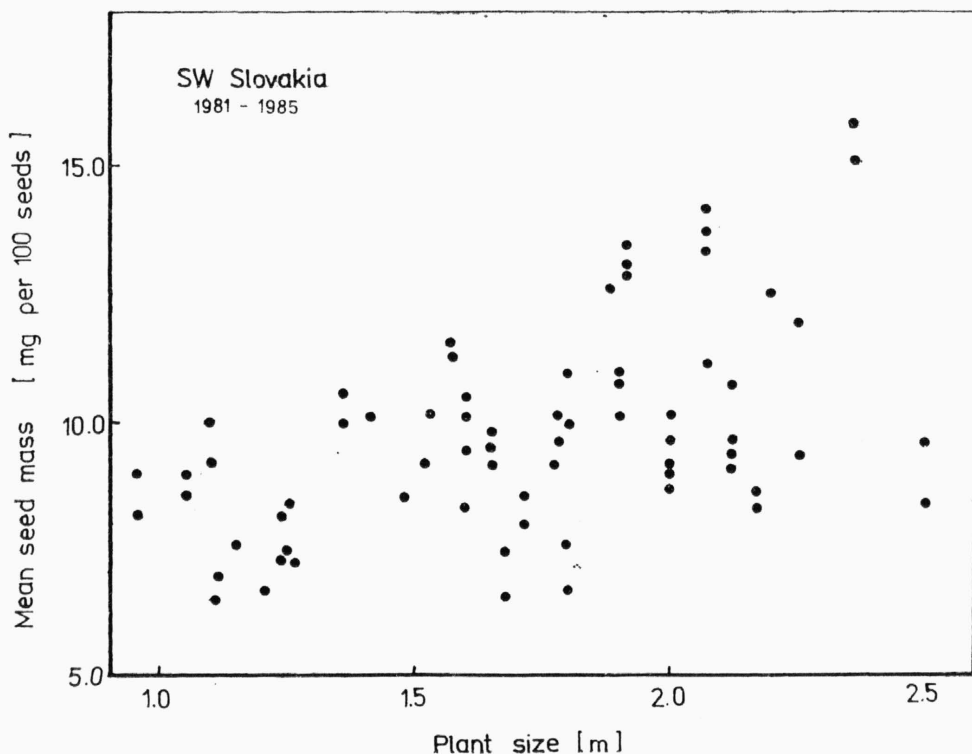


Fig. 1. — The relation between mean seed weight and plant size indicated by height of fruiting stalk in *Verbascum speciosum* SCHRADER. Seeds were collected in the period of 1981 to 1985 from more than 70 plants in four field populations in SW Slovakia.

The mean seed weight is, therefore, expressed in mg per 100 seeds. Determination of mean weights per 100 seeds were then made on replicate samples representative of different collections. All samples for each population and date were weighed on the same day. Numbers of analysed seeds for each population and date of sampling are given in Tab. 1.

RESULTS AND DISCUSSION

Analysis of variation in seed weight in the mullein has shown differences among years of sampling as well as local field populations (Tab. 1). Among field populations, the heaviest seeds were found in the local population in SW Moravia and the lightest ones in the Horné Orešany population. The lightest seeds in average were collected in the hot and dry year (1983). Inter-populations and year-to-year variations in mean seed weights of the mullein may be caused by differences in habitat conditions and weather, respectively.

Plant size we considered to be a source of variations in mean seed weights among the mullein plants. In the first step, we plotted seed weight against plant height, neglecting localities and years of sampling, and a scatter diagram was obtained (Fig. 1). However, the potentiality for heavier seeds increased with plant height. The trend was more evident when the localities and the years of sampling were evaluated separately (Fig. 2).

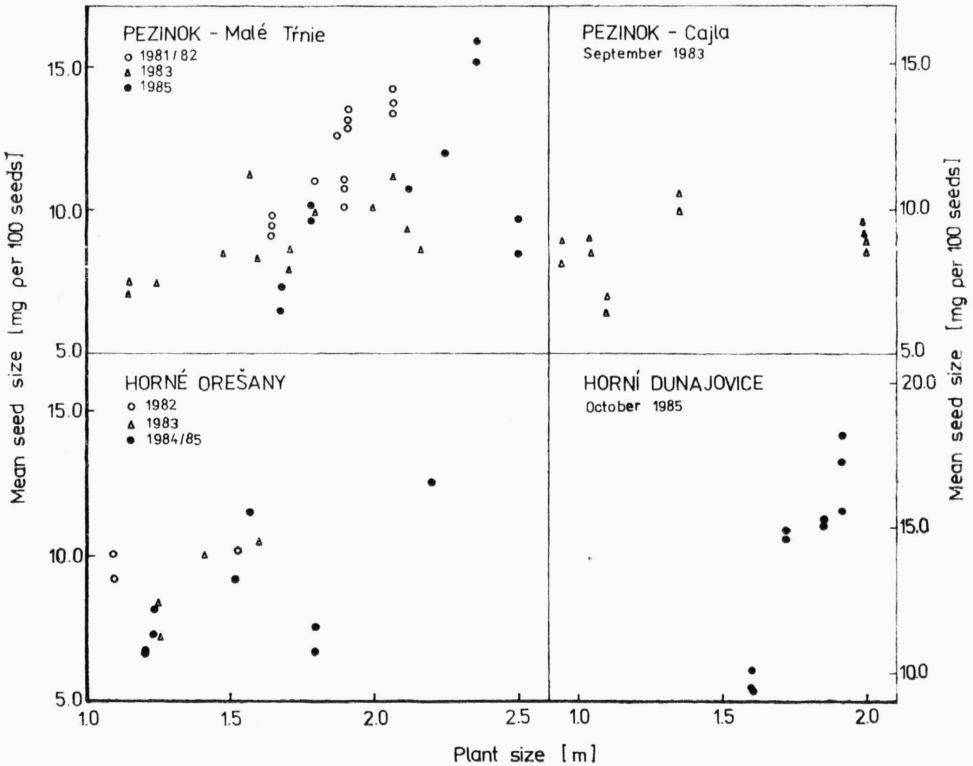


Fig. 2. — The relation between mean seed weight and plant size indicated by height of fruiting stalk in *Verbascum speciosum* SCHRADER for four field populations in SW Slovakia and Moravia.

There were some exceptions from the general tendency found in the relation between seed weight and plant height of the mullein. For example, some tall plants (2.0 m and higher) produced lighter seeds than those predicted from theoretical linear regression. The differences could be resulted from variations among the mullein plants in richness of inflorescences, in plant age or/and the position of sampled branches within the inflorescences. Mean seed weight varied among whorls in the inflorescence of *Rumex crispus* (MAUN et CAVERS 1971). But the seed position on the branch exhibited no effect on mean mass per seed in cabbage (GRAY *et al.* 1985). In *Verbascum speciosum*, mean weight of seeds produced in the bottom of the inflorescence was lower than the weight of seeds in the middle part or in the top of the inflorescence (e.g., 8.8 mg *versus* 9.1 mg and 9.5 mg per 100 seeds, respectively). The phenomenon of declining mean seed mass over the fruting season (CAVERS et STEELE 1984) could be partly participated in the variations.

The mullein plants differ evidently in richness of inflorescences (ELIÁŠ 1984, 1985). Tall plants with lot of branches in the inflorescence appears to produce smaller and/or lighter seeds than tall plants with lower number of branches. Total seed mass per plant produced by plants of *Verbascum thapsus* varied markedly with plant age and rosette diameter at the end of the first growing season (REINARTZ 1984).

SÚHRN

Priemerná hmotnosť semien zozbieraných v rokoch 1981–1985 z viac ako 50 rastlín divozela, ktoré sa odlišovali výškou (rozsah od 1,05 do 2,50 m) a rástli na piatich lokalitách v Československu (juhozápadné Slovensko: 4, juhozápadná Morava: 1), varíovala od 6,5 do 18,5 mg na 100 semien. Táto premenlivosť v hmotnosti semien sa dáva do vzťahu s veľkosťou rastliny. Potenciál pre ťažšie semená sa zvyšoval s výškou rastliny. Tento trend bol zreteľnejší, keď sa rozlíšili lokality a roky zberu semien.

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