Wild flower seed yields in northern Finland

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Abstract

The characteristics of different wild flowers in cultivation were studied at the Lapland Research Station of MTT Agrifood Research Finland in Rovaniemi during 1996-1999. The main aim of the study was to clarify the opportunities for commercial production of wild flower seeds in northern Finland. In the experimental fields the winterhardiness, seed yield and germination of 16 different wild plant species were observed.
On the uncovered experimental plots the mean seed yields were 1.9-67.6 g m^{-2} and 13,400-364,400 seeds m^{-2}. On the plots covered by black plastic sheeting corresponding yields were 1.8-93.7 g m^{-2} and 10,700-798,800 seeds m^{-2}. The seed yield by weight was high in *Ranunculus acris*, *Rumex acetocella* and *Solidago virgaurea*. The largest numbers of seeds were produced by *Lychnis viscaria*, *Campanula rotundifolia* and *Rumex acetocella*. The seed yield of *Silene dioica* declined in the third production year. On average, *Erysimum strictum*, *Antennaria dioica*, *Ranunculus acris*, *Lychnis viscaria*, *Knautia arvensis* and *Campanula rotundifolia* had the best germination.
The results showed that seed production of early flowering and ripening wild plants is possible in the short growing season of northern Finland. Wild flower seeds of this northern origin can be available for landscape maintenance and the promotion of biodiversity in cultivated grassland.

Keywords: wild flowers, winterhardiness, seed production, seed germination

Introduction

There is a growing need for wild flower seeds of Finnish origin, but to date these have mostly been gathered in the wild. The most important wild flower seeds need to be produced in such quantities that Finnish seed material can be used also in large-scale green area creation. Such quantities can be supplied only by cultivation. For both cultivation and landscape management purposes it is important that the plants have good germination and winterhardiness, that the seeds are easy to harvest and clean, and that the flowers and foliage are beautiful (Kaunisto *et al.*, 1997). A further aim of this study was to ascertain the opportunities for increasing the plant diversity in cultivated grasslands. In the selection of dicotyledons for this purpose, the herbage yields and sanitary effects of the plants must be taken into account. Also ecological factors, landscape maintenance and adaptability to common cultivation techniques for grassland plants must be considered.
The main aim of the study was to clarify the opportunities for commercial wild flower seed production in northern Finland.

Materials and methods

The characteristics of different wild flowers in cultivation were studied at the Lapland Research Station of MTT Agrifood Research Finland in Rovaniemi during 1996-1999. In the experimental field, 16 different species were planted. The most common wild plants thriving in northern conditions were selected. The soil used was fine sandy till with low content of organic matter, pH 6.3, Ca 698, P 7.7, K 118, Mg 194 and NH_4-N 4.2 mg l^{-1}. No fertilisation and irrigation were used during the trial years.

The seed production trials were set up with seedlings pre-grown in greenhouse. Both uncovered plots and plots covered by black plastic sheeting were used. Also parallel experimental plots were established by seeding in order to observe the rate of development of those plants compared to those of pre-grown and transplanted seedlings.
Winterhardiness, growth rate, ornamental character, covering, flowering, seed yield and germination were observed. The development of the plants, their flowering and seed production were monitored weekly. Seeds were collected by hand and cleaned using different methods adapted to various plant species.
During the experimental years the growing period (daily mean temperature above +5 °C) averaged 138 days, the effective growing degree days (base +5 °C) 899 °C and the precipitation during May-September 271 mm. In all the winters, the soil froze before the formation of a permanent snow cover. The average number of days with snow cover was 189.

Results and discussion

The most winter damage was suffered by *Lychnis viscaria. Galium verum, Campanula rotundifolia, Solidago virgaurea, Achillea ptarmica, Leucanthemum vulgare, Veronica longifolia, Knautia arvensis* and *Erysimum strictum* were the most winterhardy species.
Rhodiola rosea and Silene dioica began to flower already at the end of June. The flowering of *Galium verum* at the end of July was the latest among the species. *Lychnis viscaria* had a very short flowering period. *Ranunculus acris, Rumex acetocella, Galium verum, Veronica longifolia, Dianthus deltoides* and *Silene dioica* had a long flowering period.
The seeds of *Lychnis viscaria, Silene dioica, Rhodiola rosea* and *Ranunculus acris* began to ripen at the end of July. *Galium verum* was the latest, setting seeds at the end of September.
On the uncovered experimental plots the mean seed yields were 1.9-67.6 g m^{-2} and 13,400-364,400 seeds m^{-2} (Table 1). On the plots covered by black plastic sheeting the corresponding values were 1.8-93.7 g m^{-2} and 10,700-798,800 seeds m^{-2}. The seed yield by weight was high in *Ranunculus acris, Rumex acetocella* and *Solidago virgaurea*. The largest numbers of seeds were produced by *Lychnis viscaria, Campanula rotundifolia* and *Rumex acetocella*. The seed yield of *Silene dioica* declined in the third production year.
On average, *Erysimum strictum* (91 %), *Antennaria dioica* (72 %), *Ranunculus acris* (70 %), *Lychnis viscaria* (68 %), *Knautia arvensis* (58 %) and *Campanula rotundifolia* (55 %) had the best germination values.

Table 1. Mean seed yields of wild flowers (g m^{-2} and seeds m^{-2}) in 1997-1999.

Species	Mean seed yields			
	Uncovered		Black plastic sheeting	
	g m^{-2}	seeds m^{-2}	g m^{-2}	seeds m^{-2}
Ranunculus acris L.	67.6	48,600	56.7	48,600
Rumex acetocella L.	63.5	227,600	93.7	321,400
Solidago virgaurea L.	59.6	103,400	81.1	157,300
Galium verum L.	26.6	71,300	29.5	84,700
Silene dioica (L.) Clairv.	20.5	26,800	41.3	56,000
Dianthus deltoides L.	18.0	74,900	6.8	39,400
Dianthus superbus L.	17.6	22,900	17.9	24,600
Campanula rotundifolia L.	12.4	294,100	19.8	513,600
Antennaria dioica (L.) Gaertner	8.6	140,800		
Lychnis viscaria L.	6.4	364,400	48.7	798,900
Achillea ptarmica L.	51.2	300,800		
Rhodiola rosea L.	1.9	13,400	1.8	10,700
Leucanthemum vulgare Lam.	48.5	112,400		
Veronica longifolia L.	7.1	88,800	18.2	224,200
Erysimum strictum	21.9	52,000		
Knautia arvensis (L.) Coulter	82.4	14,800		

The effect of the trial site on the seed yields of plant is hard to assess. In natural habitats, too, the seed yields of wild plants vary greatly depending on the availability of water and nutrients. In the present trials, no fertilisation was used. However, cultivated plants are tall, they produce many seeds and thus there is an increased need for fertilisation. Phosphorus and potassium are especially important. Most wild plants are very winterhardy and winter damage is not a problem in northern seed production. However, the seed yields of the different plant species varied greatly between the trial years. Species of northern origin seemed to be the most certain in production. In conditions of short growing period and low temperature sum early flowering plants and species which produce most of their seed yields in August must be selected. In the present study the main seed yields were gathered when the accumulated effective temperature sum was 600-800 °C. Use of pre-grown plants in establishing plant stands speeds up the seed production and seems to be advantageous in northern growing conditions. In nature, very many factors such as dormancy of seed, temperature, light, size of seed and chemical conditions in the soil affect germination, and different plant species behave in different ways. However, in germination tests performed in the greenhouse the seeds germinated fast, in 5-10 days. There was also only a slight variation in seed germination between different experimental years.

Conclusions

The results showed that seed production of early flowering and ripening wild plants is possible in the short growing season of northern Finland. Wild flower seed of this northern origin can be available for landscape maintenance and the promotion of biodiversity in cultivated grassland.

References

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