Improving the Quality of Wildflower Seeds for Commercial Users©

Natasha Ryan
Scotia Seeds, Mavisbank, Farnell, Brechin, Angus, DD9 6TR
Email: natasha@scotiaseeds.co.uk

INTRODUCTION

Over the past 25 years or so there has been a great increase in the use of seeds of native wildflower species in the United Kingdom, as in other European countries and North America. Wildflowers have been increasingly sown in urban regeneration and civil engineering projects for their attractive appearance and low maintenance requirements. Wildflowers also attract wildlife so are used in habitat restoration, community biodiversity projects and individual gardens and estates. The use of wildflower species in agri-environment schemes is also popular.

The increased use of wildflowers has been followed by an increase in commercial production and trade of approximately 200 species of plants, most of which are new to commercial trading. In many cases seeds are not sold directly to the end users but may be sold to commercial growers to be raised as plants before being sold on.

"Traditional" agricultural and ornamental crop seeds are subject to quality regulations. Seed lots are sampled and subject to germination testing, purity analysis, and varietal testing. However, in the U.K., regulation does not extend to wildflower species. Some species are coincidentally covered by agricultural seed legislation, in the form of the Fodder Seeds Regulations. This legislation covers some species which are also traded as "wild" material such as *Lotus corniculatus*. However, the requirement for registered cultivars means that natural populations cannot possibly conform to varietal standards. Wildflower seeds are therefore generally traded without germination or purity results being available.

Scotia Seeds is a commercial supplier of wildflower seed. The company recognised the problems a lack of seed quality knowledge can cause for both producers and users and over the last 6 years has carried out research into the quality and dormancy of wildflower seeds. This research was funded by the Scottish Government in the form of 'SPUR' and 'SMART' project grants.

The research initially looked at establishing germination testing protocols and examining dormancy for commercially traded wildflower species. To date, Scotia Seeds has developed protocols for around 150 native species and in doing so has developed knowledge of the types of dormancy present in these species. Some species had germination conditions described in the ISTA (International Seed Testing Association) rules. However, these conditions are for cultivated material and wild populations can have different requirements. Each species has particular requirements for light and temperature as well as treatments to remove dormancy.

SEED QUALITY SURVEY

After establishing testing methods, a seed quality survey was undertaken to obtain an indication of seed quality available in the commercial market. The study tested nine wildflower species from eight seed producers and merchants. The samples were first examined for purity before being tested for germination. Germination was

Table 1. Comparison of (a) germination (%) (seeds that achieve at least physiological germination, with a 2-mm radicle) and (b) purity (%) of wildflower seeds from different sources.

(a) Germination

	Species								
Company source	***Primula veris***	***Leucanthemum vulgare***	***Ranunculus acris***	***Papaver rhoeas***	***Prunella vulgaris***	***Silene dioica***	***Ajuga reptans***	***Achillea millefolium***	***Galium verum***
1	49	64	3	20	93	22	-	45	95
2	61	61	58	3	92	74	-	81	76
3	48	86	52	28	-	88	-	-	67
4	0	20	20	-	88	30	44	-	13
5	90	87	60	23	85	92	-	83	78
6	34	69	65	-	3	57	-	88	75
7	51	7	-	9	98	-	37	92	56
8	81	78	77	50	52	74	9	100	-

(b) Purity

Company source									
2	100	98.7	99.4	98.8	96.3	99.4	-	97.2	99.5
3	98.7	91.5	97.3	88.3	-	97.9	-	-	95.4
4	99.1	99.2	82.6	-	95.6	100	85	-	99.2
5	100	86.3	97.0	82.3	93.7	97.7	-	91.9	99.4
6	92.4	95.2	99.7	-	93.5	98.8	-	98.3	98.7
7	92.4	95.4	-	100	97.7	-	100	100	95.5
8	100	100	99.3	100	100	100	100	99.3	-

assessed as total germination, which includes all seeds that have achieved at least physiological germination (production of a radical at least 2 mm long) (Table 1).

Large differences in germination were found between samples. For example, in the case of *Primula veris*, germination ranged from 0% to 90% and for *Leucanthemum vulgare* germination ranged from 7% to 87%. Of the 59 samples tested, 13 had a germination rate below 25%. One sample of *Achillea millefolium* reached 100% total germination whereas in *Papaver rhoeas* the maximum was only 50%. There were also consistent differences in the overall quality of seed from different companies.

Purity testing also showed differences in the proportion of inert matter found in some of the samples. In the case of *Leucanthemum vulgare*, purity ranged from 86% to 100% and for *Ranunculus acris* and *Papaver rhoeas* 82.6% to 99.7% and 82.3% to 100%, respectively.

These results reveal quality problems in a high proportion of the wildflower seed lots being sold in the U.K., with some lots being clearly unsuitable for propagation or planting because of very low (or no) germination. Most suppliers provided seed with poor germination in at least one species, suggesting that they could all improve quality control, and some offer seed which is inferior to other companies overall. The variability within species may be due to differences in field, processing, or storage factors and there is a clear need to identify the causes of problems. Variation in purity may also be due to field factors, such as weedy plots, but it is also strongly affected by processing. Results for both germination and purity suggest that some users may be purchasing seeds of poor quality so will have poor results from sowings.

DORMANCY

Dormancy in wildflower species can be problematic, particularly for commercial growers who may require seed to germinate within a certain period and for whom delays in germination can cause production problems. As part of the Scotttish Government funded projects, Scotia Seeds carried out research to establish priming methods. These techniques remove dormancy and mean that when seed is sown, germination occurs within a few days or weeks instead of many weeks, months, or even years. For example, unprimed *Echium vulgare* seeds had a germination of 10% after sowing into trays whereas the germination of primed seed was 74%.

In grower trials, untreated *P. veris* seeds had nil germination after 10 weeks whereas primed seeds had 52% germination after 10 weeks and were continuing to germinate. Similarly, untreated *Geranium pratense* had 11% germination after 10 weeks while primed seeds had a germination of 67% after the same period. The development of priming techniques not only has benefits for end users but has improved the efficiency of seed production at Scotia Seeds, with some crops being a whole year ahead.

CONCLUSION

The development of germination testing at Scotia Seeds has informed post harvest handling methods for many species allowing effective quality control for seeds lots. In particular, processing and storage has improved quality for previously problematic species such as *Rhinanthus minor*. Priming also has benefits for both producers and users of wildflower seeds, increasing germination and improving seedling establishment.

These findings suggest that successful establishment of wildflower plants is greatly dependant on initial seed quality and dormancy. More widespread germination and purity testing would benefit all users and prevent poor establishment due to seed quality. In order to ensure the success of wildflower sowings, users should insist that seed being purchased has been subject to quality testing.