Available online at www.notulaebotanicae.ro

Print ISSN 0255-965X; Electronic ISSN 1842-4309

Not. Bot. Hort. Agrobot. Cluj 36 (2) 2008, 47-50

Notulae Botanicae Horti Agrobotanici Cluj-Napoca

Effect of Pansy (*Viola x wittrockiana gams*) Seeds Colour and Size on their Germination

Rosińska AGNIESZKA[1)], R. HOŁUBOWICZ[1)]

[1)] *Agricultural University of Poznań, Department of Horticultural Seed Science and Technology, Ul.Szamotulska 28, Baranowo62-081 Przeźmierowo, Poland, e-mail: twbseed@interia.pl*

Abstract

Four commercial seed lots from the Polish seed companies of pansy (*Viola x wittrockiana* Gams) with low germination capacity were sorted into 2 size fractions: small and large: below 4 mm long and above 4 mm and 3 colour fractions: yellow, brown and dark, using hands and colour catalogue of British Royal Horticultural Society. The seeds were then tested for their germination following the ISTA routine rules. The seed size did not affect neither its energy nor capacity of germination. In one of the seed lots, smaller seeds germinated slightly better than the big ones, but in the two others ones, it was opposite. The smaller seed also gave higher amount of abnormal seedlings in the tests. There was a clear effect of seed colour on the seeds' germination. The dark seeds had the highest germination capacity, whereas the yellow ones – the lowest. The carried out experiments proved that color sorting of pansy seeds can improve their germination, mostly due to eliminating light, immature seeds.

Keywords: seed germination, seed quality, seed size, seed color, seed grading

Introduction

Pansy (*Viola x wittrockiana* Gams) has been one of the most important biannual plants for garden beds and borders (Krause et. el., 1991). Its commonly used transplants are prodeced through seeds, which sometimes do not emerge as expected. This brings up a problem of high germination of starting sowing material (Korohoda, 1972). The seed production needs a lot of hand labouur, is risky because of the plants' overwintering and needs proffesional off-typing due to long breeding history (over 150 years) and easiness of cross pollination with some weeds (Korohoda, 1972, Drobný, Osvald, 1993).

Seed grading has been one of the best known method to improve seed quality (Taylor et. el., 1998). Color and size sorting of seeds have been proved to improve seed germination of verbena (Zhang, 1998), cabbage (Taylor et. el., 1998), root parsley (Sokołowska et el., 1993), root chicory (Pimpini et al., 2002) and garden carrot (Domaradzki, Korpal, 2002, Domaradzki et el., 2002).

The purpose of this experiment was to find out the effect of pansy seed size and colour on its germination.

Materials and methods

The experiments were carried out on 4 commercial seed lots of pansy (*Viola x wittrockiana* Gams) from the Polish seed companies with low germination capacity. These were: the lot 9048/C from the Horticultural Seed Company "CNOS – Poznań" (SC) and 3 seed lots: 230197/825 (SL1), 0136C (SL2) and 130197/225 (SL3) from the Plant Breeding and Seed Production Co. "W.Legutko". Seed were divided into 2 seed size fractions: small 2 mm long and big above 2 mm long. The separation was done by hands. Then each fraction was sorted manually into three colour fractions: yellow (Y), brown (BR) and dark (D), using the special colour charts issued in the UK by the Royal Horticultural Society (Anonymous, 1964). The colour was equal to 160 abc, 161 bc, 162 abcd, 163 bed, 164 c, 165 cd (yellow), 163 a, 164 ab, 165 b, 166 cd, 167 abc (brown) and 165 a, 166 ab, 177 abc and 200 bed (dark) charts. The check seeds (CH) were not sorted.

Seed germination tests were done following the International Seed Tests Association (ISTA) routine seed testing rules (Anonymous, 2003). The germination tests were run in 6 replications of 50 seeds each on the 9 cm Petri dishes on 6 layers of blotting papers. The 7 days prechiling at 5°C in the darkness was used. The germination test was run at 20°C/30°C for 16/8 hours, respectively. The energy of germination was calculated after 4 days, the germination – after 7 and 14 days. The 5 categories of seeds were evaluated: normal, contaminated with diseases, deformed, dead and healthy ungerminated. The sum of the normal seedlings was charged into per cent and considered as germination capacity (Anonymous, 2003).

The received data was subjected to statistical analyses. Loss, 1-factor variance analyses was done. The means were compared using the Duncan's test at $\alpha = 0.05$. The data was transformed for the Bliss grades following the pattern: $y = \arcsin(\mathrm{sqr}(x / 100))$.

Table 1 The effect of colour of SL1 pansy seeds on their germination (%)

Combinations*	Energy of germination (4 days)	Energy of germiantion (7 days)	Energy of germination (14 days)	Germination capacity (normal germs)	Contaminated with diseases germs***	Derofmed germs	Dead seeds	Healthy ungerminating seeds
CH	8.0a**	17.0a	21.0a	22.0a	10.7a	1.7a	49.7a	16.0b
D	8.3a	15.3a	20.0a	20.0a	3.3b	1.0a	61.7a	14.0b
BR	6.0a	11.7a	14.0a	14.3a	8.0a	1.3a	58.3a	18.0b
Y	1.3b	2.7b	3.7b	3.7b	1.7b	1.0a	59.3a	34.3a

* CH – check, D – dark, BR – brown, Y – yellow; ** means followed in columns by the same letters are not significantly different according to the Duncan's test at $\alpha = 0.05$

*** the identified on the seeds fungi were: *Penicillium* ssp., *Rhizopus* ssp., *Fusarium* ssp. and *Alternaria alternata* (Fr.) Keissl.

Results and discussion

Sorting the pansy seeds by size did not affect their germination. In all 4 lots tested, they germinated from 3.7% to 25.3% and the received results were not correlated with their size (data not shown). The seed size did not affect neither its energy nor capacity of germination. In one of the seed lots, smaller seeds germinated slightly better than the big ones, but in the two others ones, it was opposit.

The smaller seed also gave higher amount of abnormal seedlings in the tests (data not shown).

However, sorting them by colours affected their germiantion. The yellow seeds were found to germinate the worst, i.e. 3.7% in comparison with the check seeds – 22.0% (Table 1). In the poorest seed lot (SL1), they did not germinate at all (Table 2). In two other seed lots (SL2 and SL3), the dark seeds germinated better than the check ones (Table 3 and 4). That was because they had definitely lower per cent of dead seeds and germs contaminated with diseases (Table 3 and 4) in comparison with the check ones.

The new ways of growing ornamental plants, indroduction of new technologies and sale increase put in front of flower breeders new challangies (Hołubowicz et el., 2005). This resulted in increasing demands for quality of ornamental seeds. New, more effective ways of improving their quality are needed (Żuradzka 1994). The carried out experiments did not give a definite answer whether the size of the pansy seeds affected their germination. In the seed lot SL2, in small seeds, more abnormal germs were found than in the large and check ones. Also in the seed lot SL1 small seeds had the highest per cent of the abnormal germs. However, these two observations were not proved statistically.

Every trade year in flower seed companies, there are pansy seeds with poor germination. A company then wants to improve germination of such seed lots. Unless such an improvement is done, these seeds, under present

Table 2 The effect of colour of SL2 pansy seeds on their germination (%)

Combinations*	Energy of germination (4 days)	Energy of germiantion (7 days)	Energy of germination (14 days)	Germination capacity (normal germs)	Contaminated with diseases germs***	Derofmed germs	Dead seeds	Healthy ungerminating seeds
CH	2.7 a**	10.3b	13.3b	13.3b	5.0a	1.0a	80.7b	0.0a
D	1.3ab	18.3a	22.7a	23.0a	8.7a	0.7a	67.3c	0.3a
BR	4.0a	13.7ab	17.3 ab	17.7ab	3.3a	0.7a	78.0b	0.3a
Y	0.3b	3.3c	4.0c	4.3c	1.3a	0.0a	93.0a	0.3a

* CH – check, D – dark, BR – brown, Y – yellow; ** means followed in columns by the same letters are not significantly different according to the Duncan's test at $\alpha = 0.05$

*** the identified on the seeds fungi were: *Penicillium* ssp., *Rhizopus* ssp., *Fusarium* ssp. and *Alternaria alternata* (Fr.) Keissl

Table 3 The effect of colour of SL3 pansy seeds on their germination (%)

Combinations*	Energy of germination (4 days)	Energy of germination (7 days)	Energy of germination (14 days)	Germination capacity (normal germs)	Contaminated with diseases germs***	Derofmed germs	Dead seeds	Healthy ungerminating seeds
CH	1.0b**	6.3b	8.0b	8.0b	2.7bc	0.3a	89.0ab	0.0a
D	5.0a	16.7a	21.7a	21.7a	13.7a	1.0a	63.3c	0.3a
BR	0.0b	5.7b	6.7bc	6.7bc	6.3ab	1.0a	85.0b	1.0a
Y	0.0b	1.7c	2.3c	2.7c	0.7c	0.3a	95.7a	0.7a

* CH – check, D – dark, BR – brown, Y – yellow; ** means followed in columns by the same letters are not significantly different according to the Duncan's test at $\alpha = 0.05$
*** the identified on the seeds fungi were: *Penicillium* ssp., *Rhizopus* ssp., *Fusarium* ssp. and *Alternaria alternata* (Fr.) Keissl

Table 4 The effect of colour of seed lot SC pansy seeds on their germination (%)

Combinations*	Energy of germination (4 days)	Energy of germination (7 days)	Energy of germination (14 days)	Germination capacity (normal germs)	Contaminated with diseases germs***	Derofmed germs	Dead seeds	Healthy ungerminating seeds
CH	1.3ab**	3.3b	4.0ab	4.0ab	4.3a	0.3a	90.0b	1.3a
D	2.0a	5.7a	6.0a	6.0a	0.3b	0.0a	91.0b	2.7a
BR	0.7bc	2.7b	3.0b	3.0b	0.3b	0.0a	96.7ab	0.0a
Y	0.0c	0.0c	0.0c	0.0c	0.3b	0.0a	99.3a	0.3a

* CH – check, D – dark, BR – brown, Y – yellow
** means followed in columns by the same letters are not significantly different according to the Duncan's test at $\alpha = 0.05$
*** the identified on the seeds fungi were: *Penicillium* ssp., *Rhizopus* ssp., *Fusarium* ssp. and *Alternaria tenuis* (Fr.) Keissl

market demands, will be rejected and never reach the market. In our experiment, there was a tendency that bigger was the pansy seeds, smaller was the per cent of abnormal seedlings received from them. This is in agreement of the results received for garden carrot seeds calibrated by Domaradzki et al. (2002), who found smaller carrot seeds to germinate worse than the bigger ones.

Pansy seed color affected its germination. Both energy and capacity of seeds germination were the highest when the seeds were dark. The darker seeds, better their final germination, although not always fully proved statistically. Still, the dark seeds germinated 6.7% better than the brown ones. The dark seeds had the best germination in the carried out tests because they were the most mature ones. On the other hand, in the seed lots SL3, SL4 and SC yellow seeds were the most contaminated ones with fungi. It may be concluded then that the yellow pansy seeds are the least useful fraction in a given seed lot. Lighter seeds could have smaller embryos or may, in some cases, do not have them at all (Pimpini et al. 2000). Also verbena seeds were found the best germinating if they were dark (Zhang , 1998). The role of seed colour and size in ornamental seed quality was also proved by Finch-Savage et al. (1991). Also Pimpini et al. (2002) proved that dark root chicory (*Cichorium intybus* var. *silvestre* Bischoff) seeds germinated better than the light ones.

The carried out experiments proved that colour sorting of pansy seeds can improve their germination, mostly due to eliminating light, immature seeds.

References

Anonim, 1964, Color charts. Royal Hort. Soc., London.

Domaradzki, W. Korpal, 2002, Research on calibrating garden carrot seeds, Selected Problem of Horticultural Seed Industry (ed. Michalik B., Weiner W), SHRiN. Warszawa, 85 – 91.

Drobnỳ, I., Z., Osvald, 1993, Summer flowers lexicon. Wyd. Multico, Warszawa, 88 - 96.

Finch-Savage, W. E., D. Gray, G. M. Dickson, 1991, The combined effects of osmotic priming with plant growth regulator and fungicide soaks on the seed quality of five bedding plant species. Seed Sci. Technol. 19, 495 - 503.

Hołubowicz, R., T. Bralewski, W. Legutko, 2005, Ornamental plant seed industry in Poland. Zesz. Prob. Post. Nauk Rol. 504, 601 – 610.

Korohoda, J, 1972, Ornamental plants seed production. PWRiL, Warszawa.

Krause, J., A. Lisiecka, 1991, Ornamental plants I, Field grown species. Skryty AR w Poznaniu, 31 – 32.

Pimpini, F., M. F. Filippini, P. Sambo, G. Gianquinto, 2002, The effect of seed quality (seed color variation) on storability, germination temperature and field performance of radicchio. Seed Sci. And Technol. 30, 393-402.

Sokołowska, A., A. Szafirowska, R. Janas, S. Kołosowski, H. Woyke, 1993, Effect of dill (*Anethum graveolens* L.) seeds size on their germination and emergences. Biul. IHAR 188, 269 – 274.

Sokołowska, A., A. Szafirowska, R. Janas, S. Kołosowski, H. Woyke, 1993, Effect of root parsley (*Petroselinum crispum* var. *tuberosum*) seeds size on their germination and emergences. Biul. IHAR 192, 143 – 153.

Taylor, A. G., D. B. Churchill, S. S. Lee, D. M. Bisland, T. M. Cooper, 1993, Color sorting of coated brassica seeds by fluorescent sinapine leakage to improve germination. J. Amer. Soc. Hort. Sci. 118, 551 - 556.

Taylor, A. G., P. S. Allen, M. A. Benney, K. J. Bradford, J. S. Burris, M. K. Misra, 1998, Seed enhancements. Seed Sci. Res. 8, 245 - 256.

Zhang, S. Y., 1998, Factors affecting seed germination of verbena (*Verbena x hybrida* Voss.) seeds. Master of Science made in Departament of Seed Science and Technology, AR-Poznań.

Żuradzka, I., 1994, New directions in breeding ornamental palnt. In Seed Science and Technology (ed. K. Duczmal, H. Tucholska), PWRiL. Poznań, 335 – 336.