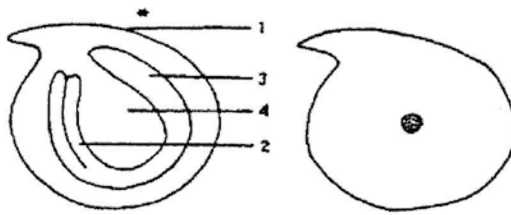
Fig. 1. Schemes illustrating the structures and cutting instructions of 6 ornamental plants seeds used in the experiments

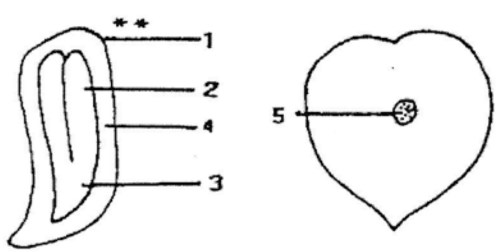
Species	Figures	Legend
	seed structures	cutting instructions

tassel flower



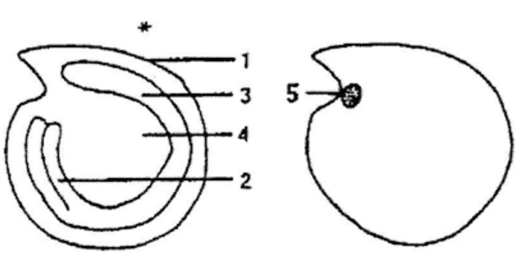
puncture the seed coat near the center

sand pink



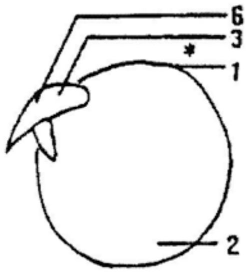
puncture the seed coat near the hilum

babies' breath



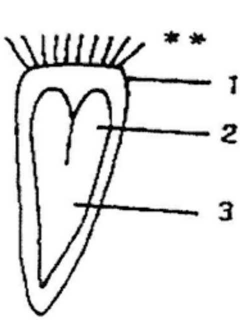
puncture the seed coat near the hilum

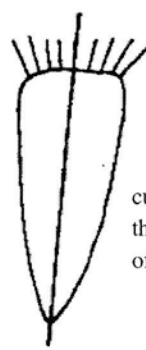
sweet pea



puncture the seed coat on the part which in opposite the radicle

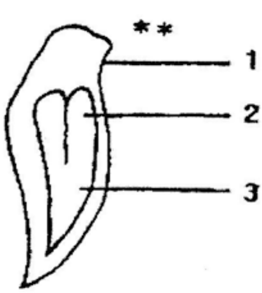
African marigold

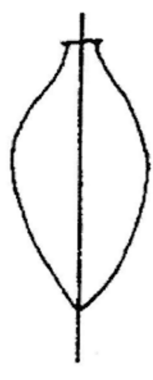




cut the seed complety throught the midsection of the distal half

zinnia cynia



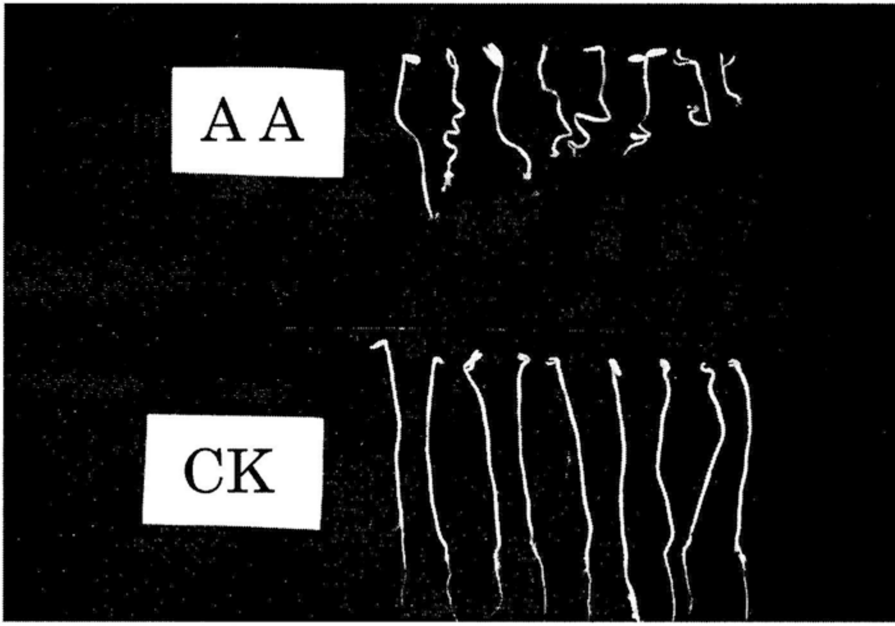


cut the seed complety throught the midsection of the distal half

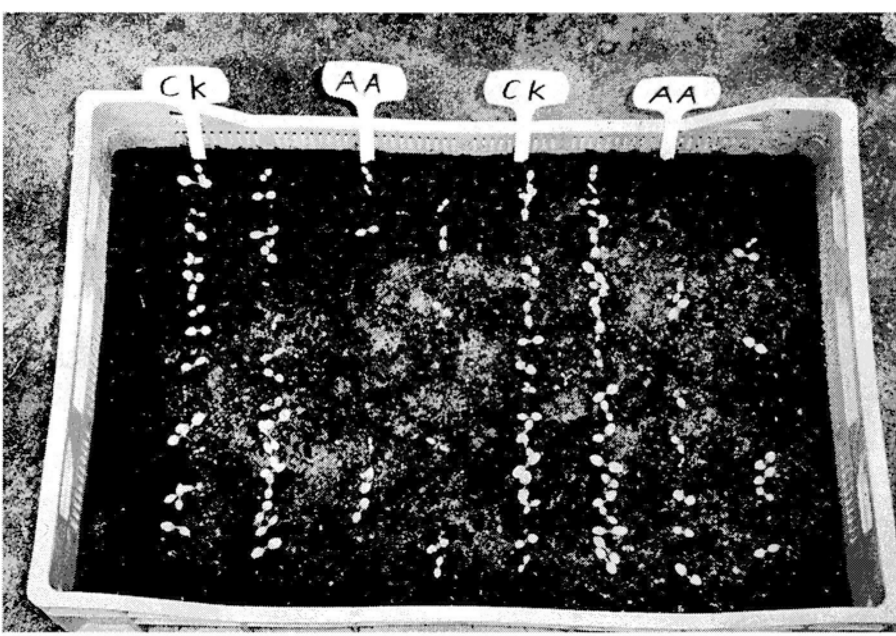
* – later section
** – longitudinal section

1. seed coat
2. cotyledons
3. radicle
4. endosperm or perisperm
5. hilum
6. plumule

Phot 1. Zinnia seedlings germinated from high (CK) and low (AA) vigour seeds in the Germ's test



Phot 2. Sand pink plants emergences in the greenhouse from high (CK) and low (AA) vigour seeds. Two replications; the picture was taken 7 days after sowing the seeds, i.e. on July 27, 1997



(Table 3). Effect of lowering seeds' vigour on decreasing their viability, expressed in percentage of alive and dead seeds, was different and depended on the tested species. The highest decrease in viability between high and low vigour seeds was observed for the alive seeds of African marigold, whereas no such phenomenon was observed for tassel flower and sweet pea seeds. These decreases in viability of alive seeds were always followed by proportional increases of the percentages of dead seeds in the tested seeds (Table 3).

Plant emergences in the greenhouse. The carried out experiment showed clearly that for 5 species, out of the 6 tested, there was a possibility to evaluate their seed vigour through plant emergences in the greenhouse (Table 4). Decreasing the seed vigour was followed by a delay in emergences and lowering the final numbers of seedlings (Phot. 2). The full evaluation of seed vigour through plant emergences in the greenhouse was possible for tassel flower, sand pink, babies' breath and zinnia seeds already 5 days after their first seedling emerged, whereas for sweet pea – even after 4 days (Table 4).

DISCUSSION

Storage of seeds under adverse conditions results in the production of naturally „aged" seeds, exhibiting a variety of symptoms, from reduced viability or germinability to abnormal seedlings (B e w l e y and B l a c k, 1994). The AA is the technique to simulate this situation in the laboratory conditions. As a result, low vigour seeds can be received in a shorter time in the laboratory. The method is rapid, inexpensive, simple and useful (C o p e l a n d and M c D o n a l d, 1995). Recently, the method has been modified to increase its reliability (P o w e l l, 1995). The received results confirmed the earlier findings about the possibility of receiving AA seeds in the laboratory, although for flower seeds of the tested species, the used temperature was higher. There was also longer time of the seeds exposure to it. The proposed temperatures for completing these experiments (42 and 44°C) were higher than that proposed in the general description (41°C) of the AA method. Also the time of their exposure to it was longer than that given in the general description of this method by C o p e l a n d and M c D o n a l d (1995).

The results of Germ' s test showed that this method can be used for seed vigour evaluation of some ornamental flowers, such as sand pink, African marigold, babies' breath, sweet pea and zinnia. However, it was not suitable for seed vigour estimation of tassel flower.

When seeds were sown in the greenhouse, except African marigold, the emergences of all tested species well corresponded with their seed vigour. It suggested that this method can be used for seed vigour evaluation in some ornamental plants.

Use of the TTC method to evaluate seed vigour has been receiving strong acceptance and it has been used in all kinds of cultivated crops (C o p e l a n d, M c D o n a ld, 1995). From the received TTC experiment results, one can observe, with the exception of tassel flower and sweet pea, for other four species, good relationship between their seed viability and vigour. Although TTC test is one of the most valuable technique for analysing seed quality (C o p e l a n d, M c D o n a l d, 1995), and widely used, it is frequently misused. Accuracy of results depends here largely upon the training and experience of the analyst (Anon., 1985). So, further works are needed on the seed vigour test of ornamental plants by using TTC method.

The tested methods of seed vigour estimation were found to be very suitable for sand pink, babies' breath and zinnia, but not for tassel flower. The satisfying results for the ornamental plant seeds were received despite their commonly known big variability (Netolitzky, 1926; Kozlowski, 1972; Hołubowicz et al., 2000).

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Wykorzystanie metod tetrazolinowej (TTC), Germa i wschodów roślin w szklarni do badania wigoru nasion wybranych gatunków roślin ozdobnych

Streszczenie

W latach 1996-1997 przeprowadzono badania nad metodami określania wigoru nasion szarłatu zwisłego (*Amaranthus caudatus* L.), goździka chińskiego (*Dianthus chinensis* L.), gipsówki wytwornej (*Gypsophila elegans* M. B.), groszku pachnącego (*Lathyrus odorathus* L.), aksamitki wzniesionej (*Tagetes erecta* L.) i cynii wytwornej (*Zinnia elegans* Jasq.). Zasadniczym celem badań było określenie warunków przyspieszonego starzenia (AA) nasion kilku wybranych gatunków roślin ozdobnych i wybranie najbardziej właściwych metod dla oceny ich wigoru w warunkach laboratoryjnych i szklarniowych. Nasiona użyte w doświadczeniu pochodziły z handlowej partii nasion z polskiej firmy nasiennej. Oceny dokonywano na próbkach nasion o wysokim i niskim wigorze. Nasiona o niskim wigorze otrzymywano poprzez poddanie próbek nasion przyspieszonemu starzeniu (AA), tj. przez umieszczenie ich w warunkach 100% wilgotności względnej (RH) w temperaturze 44°C, z wyjątkiem aksamitki wzniesionej – w 42°C, w ciemności i poddanie ich działaniu tych warunków odpowiednio przez 144, 88, 100, 48, 72 i 72 godziny. Do oceny wigoru nasion zastosowano metody: Germa, chlorku 2,3,5-trójfenylotetrazoliowego (TTC) i oceny wschodów roślin w szklarni. Próbki nasion o wysokim wigorze stanowiły kontrolę. Stwierdzono, że metoda Germa nadaje się do oceny wigoru nasion goździka chińskiego, gipsówki wytwornej i aksamitki wzniesionej, natomiast metoda TTC okazała się bardziej odpowiednia do oceny wigoru nasion goździka chińskiego, gipsówki wytwornej i cynii wytwornej. Przy obecnym poziomie wiedzy o wigorze nasion, ocena wschodów roślin w szklarni okazała się najlepsza do badania wigoru nasion szarłatu zwisłego, goździka chińskiego, gipsówki wytwornej, groszku pachnącego i cynii wytwornej. Wskazane jest łączenie kilku metod oceny wigoru nasion roślin ozdobnych.