

STUDY FOR THE EVALUATION OF DILL (*ANETHUM GRAVEOLENS* L.) SEEDS QUALITY

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Abstract: In this experiment two different lots of dill seeds (*Anethum graveolens* L.): lot A - cv. 'Amat' and lot B - cv. 'Lukullus' were evaluated for their characters in terms of their quality. The seeds of the B lot had a lack of embryos caused by lygus bugs (*Lygus* spp.), and as a consequence their germination capacity was lower and the number of seeds qualified in the germination test as healthy ungerminated was larger, in comparison with these seed characters of the A lot. Both lots were heavily colonised by fungi, but the percentage of dead seeds was higher in the B lot than in the A one. The seeds in the B lot were previously injured by lygus bugs.

Key words: dill, *Anethum graveolens* L., seed quality, seed germination, *Lygus* spp.

INTRODUCTION

Dill has been one of the most important spice vegetables grown in Poland. As reported by Dyduch (2000), there have been problems in some years with obtaining good quality seeds of this species. The aim of conducted experiments was to examine chosen seed characters which had an influence on their quality (2, 3, 4, 5, 6, 7, 8, 9, 10, 11).

MATERIALS AND METHODS

The experiment was carried out to evaluate two different seed lots of dill (*Anethum graveolens* L.): lot A - cv. 'Amat' and lot B - cv. 'Lukullus', by studying their characters which determine their quality. Both seed lots were produced in 2002. The following seeds characters of these lots were compared: germination energy and germination capacity, germination speed, maximum germination, weight of 1000 seeds, percentage of unripe seeds as well as seed health status and internal structure.

The germination test was conducted in 3 replications with 100 seeds each. The tested seeds were placed on plastic Petri dishes on the blotter soaked with distilled water. The test was conducted in darkness at alternating temperature of 30°C/16h. The germination energy

was calculated after 7 days, whereas the germination capacity - after 21 days. The germination energy and capacity were determined in conformity with ISTA rules (1996).

The germination speed was calculated with SeedCalculator 2.1 programme (Janik and van der Schoor, 1999) by giving T_{50} (time for 50% of the maximum germination) and MGT (mean germination time).

Weighing 1000 seeds in 3 replications determined the weight of 1000 seeds.

The percentage of unripe seeds was found after examination of 100 seeds in 3 replications, and seeds containing chlorophyll were counted.

The internal structure of seeds was examined in 20 seeds in 4 replications. The seeds were soaked with distilled water for 2 hours at 20°C. After that the seeds were longitudinally cut under binocular (enlargement 2,5x) to determine percentage of seeds without embryos.

Mycological analysis was performed on 400 seeds from each seed lot by the deep-freezing blotter paper method. Seeds were disinfected by soaking for 10 minutes in 1% sodium hypochlorite (NaOCl). After that seeds were watered three times in sterilized water. The seeds were placed on the blotter paper with distilled water in Petri dishes 9 cm in diameter, 20 seeds per dish, and incubated for 3 days at 20°C in darkness, then transferred to – 20°C for 24 h and subsequently incubated at 20°C under alternating cycles of 12 h NUV light and 12 h darkness for 8 days. The fungi were identified on the basis of growth and sporulation characteristics using a stereo-microscope and compound microscope. The mycological evaluation was done according to ISTA rules (1987).

The obtained results were statistically worked up using the analysis of variance. The significant differences were established using the Duncan's test at $\alpha = 0.05$ level.

RESULTS AND DISCUSSION

As a result of the conducted studies of two lots of dill seeds (*Anethum graveolens* L.): lot A - cv. 'Amat' and lot B - cv. 'Lukullus', significant differences were found in their quality (Tab. 1).

Table 1
Selected quality characters of two samples of dill (*Anethum graveolens* L.) seeds

Parameter	Sample A (`Amat`)	Sample B (`Lukullus`)
Energy of germination (%)	81.0 b*	14.7 a
Normal seedlings (Germination capacity) (%)	82.3 b	15.3 a
Deformed seedlings (%)	0.0 a	1.0 a
Diseased seedlings (%)	0.0 a	2.3 b
Dead seeds (%)	6.7 a	32.7 b
Healthy ungerminated seeds (%)	11.0 a	48.7 b
T_{50} (days)	1.6 a	1.7 a
MGT (days)	1.6 a	2.0 a
Maximum germination (%)	87.0 b	18.0 a
Weight of 1000 seeds (g)	2.0 b	1.5 a
Unripe seeds (%)	0.0 a	0.0 a
Seeds without embryo (%)	20.0 a	73.7 b

* Means in lines followed by the same letters are not significantly different at $\alpha = 0.05$ level according to Duncan range test

T_{50} – time for 50% of the maximum germination

MGT – mean germination time

Seeds of the seed lot A germinated better and were more ripe than seeds of the seed lot B. It has been found that the reason of a weaker germination of the B lot seeds was the lack of embryos caused by foraging lygus bugs.

There were frequently visible traces of completely or partially sucked out embryos, what directly increased the percentage of healthy ungerminated seeds (Figure 1).

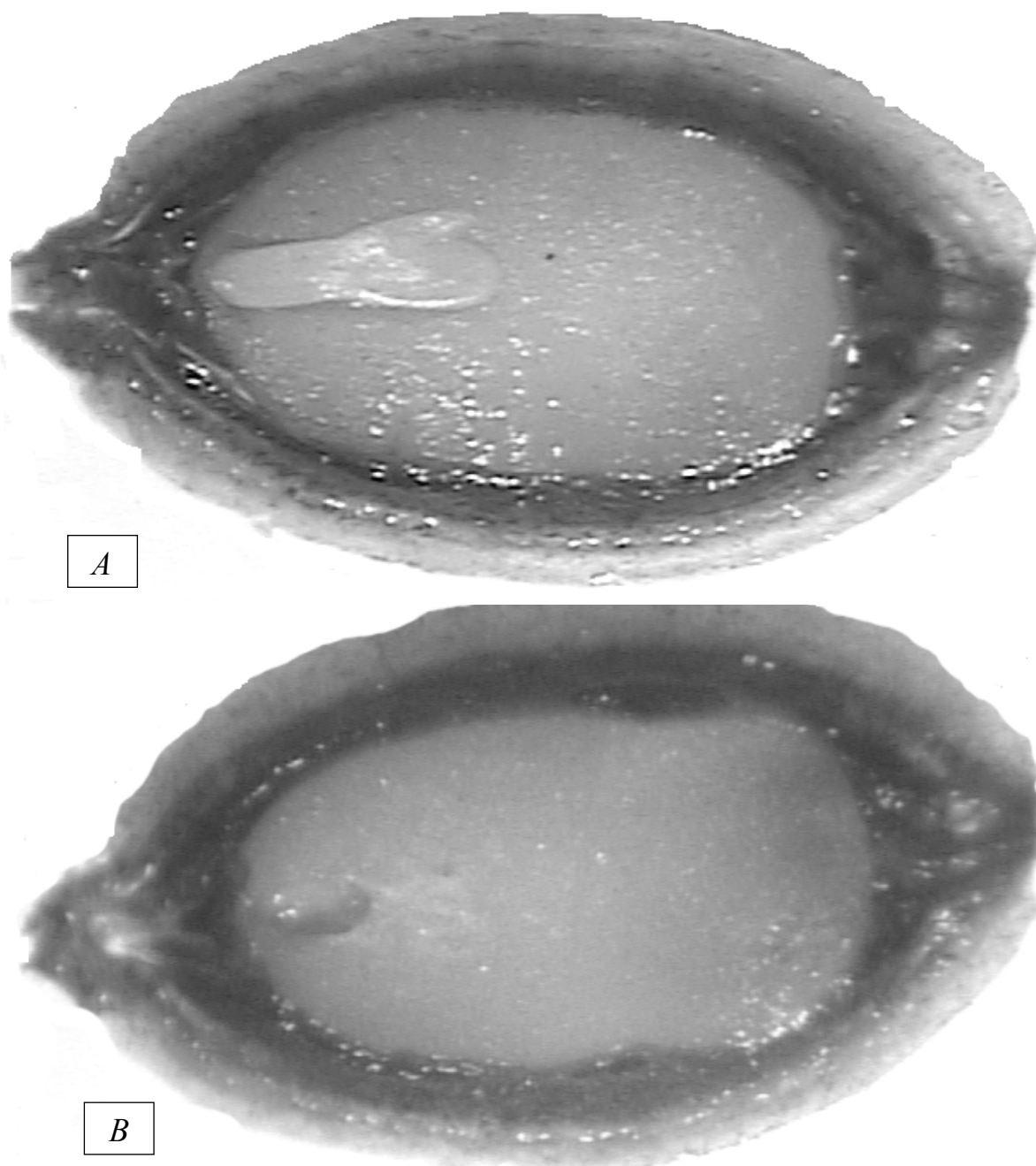


Figure 1. Longitudinal sections through dill seeds (*Anethum graveolens* L.):
A – with embryo, B - without embryo

On the basis of the mycological analysis the differences in infection of both dill seed lots by different fungi species were observed (Tab. 2). These differences did not affect the quality of the examined seeds.

Table 2

The health status of two samples of dill (*Anethum graveolens* L.) seeds

Fungi	Colonised seeds (%)			
	Disinfected seeds		Non-disinfected seeds	
	Sample A (`Amat`)	Sample B (`Lukullus`)	Sample A (`Amat`)	Sample B (`Lukullus`)
<i>Alternaria alternata</i>	99,5 b	83,5 a	100,0 a	100,0 a
<i>Bipolaris sorokiniana</i>	0 a	0 a	1,5 a	6,5 a
<i>Chaetomium</i> sp.	0,5 a	0 a	0 a	0 a
<i>Cladosporium</i> spp.	0,5 a	0 a	8,5 a	7,0 a
<i>Epicoccum purpurascens</i>	1,5 a	3,5 a	7,5 a	22,0 b
<i>Fusarium</i> spp.	0 a	0 a	0,5 a	1,5 a
<i>Gonatobotrys simplex</i>	3,0 b	0 a	30,0 b	6,0 a
<i>Penicillium</i> spp.	1,0 a	0 a	0 a	0 a
<i>Stemphylium botryosum</i>	1,5 a	11,0 b	9,5 a	6,0 a
<i>Stemphylium consortiale</i>	0 a	0 a	1,0 a	0 a
<i>Trichothecium roseum</i>	0 a	0,5 a	0 a	46,0 b
<i>Verticillium</i> sp.	0,5 a	0 a	0 a	0 a
Non-sporulating	0,5 a	0 a	0,5 a	0 a
Seeds free from fungi	0,5 a	12,5 b	0 a	0 a

* Means in the same row, separately for disinfected and non- disinfected seeds, followed by the same letters are not significantly different at $\alpha = 0.05$ level according to Duncan range test

Results obtained in this experiment confirm the views of other authors that a direct reason of a weak germination of dill seeds in the Polish conditions is the lack of embryos caused by lygus bugs (*Lygus* spp.) damages (Komorowska and Woyke, 1987; Sokołowska et al. 1993; 1994; Woyke, 1993).

The most numerous occurring pest of that genus, on the species from the family *Apiaceae*, is the lygus bug *Lygus rugulipennis* Popp. (Kołosowski, 2002; Robak and Wiech, 1998).

CONCLUSIONS

1. Low quality of the examined dill seeds (*Anethum graveolens* L.) resulted mainly from the lack of embryos what was caused by lygus bugs (*Lygus* spp.) feeding.
2. Seeds of dill (*Anethum graveolens* L.) injured by lygus bugs were more often infected by fungi and that increased the number of dead seeds.

REFERENCES

1. Dyduch, J., 2000, Koper ogrodowy (*Anethum graveolens* L.). In: Nasiennictwo, vol. 2, (eds): Duczmal K.W., Halina Tucholska, PWRiL, Poznań, 211-213.
2. ISTA, 1987, Handbook on Seed Health Testing, Section 2, Working Sheet No 5.
3. ISTA, 1996, International Rules for Seed Testing. Rules, Seed Sci. Technol., 24, Supplement. Zurich, Switzerland, 176-200.
4. Jalink, H., R. van der Schoor, 1999, SeedCalculator 2.1. License number: 100200122, Plant Research International, Wageningen, the Netherlands.
5. Kołosowski, S., 2002, Skład gatunkowy i dynamika występowania pluskwiaków różnoskrzydłych na roślinach nasiennych pasternaku (*Pastinaca sativa* L.). Materiały konferencyjne Sympozjum Sekcji Hodowli i Nasiennictwa PTNO "Hodowla i nasiennictwo roślin ogrodniczych", 5 Ogólnopolska Konferencja "Zastosowanie kultur *in vitro* w fizjologii roślin", Kraków 21-22 maja 2002, 58.
6. Jadwiga Komorowska, Halina Woyke, 1987, Dlaczego nasiona kopru nie kiełkują?, Hod. Roślin i Nasien., 5/6, 16-19.
7. Robak, J., K. Wiech, 1998, Choroby i szkodniki warzyw, Wyd. Plantpress Sp. z o.o., Kraków, 78.
8. Alicja Sokołowska, Anna Szafirowska, Regina Janas, Kołosowski R., Halina Woyke, 1993, Wpływ kalibrowania na jakość nasion kopru, Biul. IHAR, 188, 269-272.
9. Alicja Sokołowska, Anna Szafirowska, Regina Janas, R. Kołosowski, Halina Woyke, 1994, Współzależność pomiędzy paru cechami nasion, a wschodami kopru, Biul. IHAR 192, 135-141.
10. Halina Woyke, 1993, Zwalczenie zmienika na plantacja kopru nasiennego, Hod. Roślin i Nasien., 4, 15-17.
11. Halina Woyke, Anna Kamińska, 1993, Wpływ terminu siewu, zagęszczenia roślin i opryskiwania insektycydami na wysokość i jakość plonu nasion kopru, Biul. Warz., 40, 79-89.

REZUMAT

EVALUAREA CALITATII SEMINTELOR DE MARAR (*ANETHUM GRAVEOLENS* L.)

Au fost evaluate pentru caracteristicile lor de calitate două grupe de semințe de mărar (*Anethum graveolens* L.): lotul A – cultivarul Amat și lotul B – cultivarul Lukullus. Semințele din lotul B nu au avut embrioni din cauza ploșnițelor (*Lygus* spp.) și ca urmare capacitatea lor germinativă a fost mai scăzută și numărul de semințe înregistrate în testul de germinatie ca negerminate sănătoase a fost mai mare, comparativ cu aceleași caractere ale semințelor din lotul A. Ambele loturi au fost colonizate puternic cu micoze, dar procentajul de semințe moarte a fost mai ridicat în lotul B decât în A. Semințele din lotul B au fost anterior atacate de ploșnițe.