

SEED QUALITY OF SELECTED VEGETABLE SPECIES ON THE POLISH MARKET

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Abstract. In the years 2001-2003 the seed quality of 108 samples of white head cabbage, garden carrot, red beet, onion, cucumber, tomato, radish, lettuce, common bean and garden pea were checked. They came from 3 Polish seed companies and 1 foreign one operating on the Polish market. It was found out that 22.2% of the examined seed samples did not meet the standards concerning germination capacity. The worst were seeds of lettuce and head cabbage. Their samples did not meet the germination capacity standards in 55.5% and 41.7%, respectively. The best quality was found for seeds of red beet and cucumbers - all their tested samples met the germination capacity standards. The highest number of samples, which did not meet the standards, came from the company number 2, the smallest - from the company number 4. All tested seed samples met the purity standards.

Key words: seed quality, seed market, seed germination, seed purity

INTRODUCTION

Seeds are one of the main production means in Horticulture. They have a crucial effect on the final result and success of the produced crop (Woyke and Dudek, 1976; Woyke, 1978; Duczmal and Tucholska, 1992; Krzymuski, 1993; Machowski et al., 1996; Grzesik et al., 1998; Duczmal, 2000; 2001a). Many factor affect seed quality (Górecki and Grzesiuk, 1993; Szyrmer et al., 1993; Dąbrowska, 1998; Górnik and Grzesik, 1998; Grzesik et al., 1998; Woyke, 1998). The main goal of the carried out research was to find out the quality of seeds of selected vegetable species on the Polish market and to compare it with present standards.

MATERIALS AND METHODS

The material for the experiment were seeds bought in small retail bags in selected seed companies: 3 Polish ones (No 1, 2 and 3) and 1 foreign one (No 4). They were seeds of the following species: head white cabbage (*Brassica oleracea* L. ssp. *oleracea* convar. *capitata* (L.) Alef. var. *capitata* L. *alba*), garden carrot (*Daucus carota* L.), red beet (*Beta vulgaris* ssp. *vulgaris* convar. *crassa* provar. *conditiva*), onion (*Allium cepa* L.), cucumber (*Cucumis sativus* L.), tomato (*Lycopersicon esculentum* Mill.), radish (*Raphanus sativus* L.), lettuce (*Lactuca sativa* L.), common bean (*Phaseolus vulgaris* L.), garden pea (*Pisum sativum* L.), except the company No 4, which did not offer seeds of snap beans, garden pea, radish and lettuce. Before starting the experiments, seeds from the small bags of the given species and company were taken out, mixed and prepared as representative sample.

The seed quality evaluation was carried out in the years 2001-2003. The germination tests were done following the Polish standards - PN-R-65950: 1994. The received results were then compared with the minimal germination standards given in the Polish standards to find

out whether they meet them. The seed purity tests were done following the routine ISTA standards (1999).

RESULTS AND DISCUSSION

As a result of the carried out tests, it was found out that 22.2% of all the tested samples did not meet the present germination capacity standards for vegetable species. The worst were seeds of lettuce and white head cabbage. 55.4% and 41.7% of the tested samples did not meet the germination standards, respectively. The highest percentage of failed samples (33.3%) was found for the company No 2, the lowest (3.3%) for the company No 4. Out of the Polish companies – the best seeds came from the company No 1. They had 83.7% of good samples. The quality of the tested vegetable seeds varied in the given years. In the year 2001 20% of the tested samples failed the germination test, whereas in the years 2002-2003 – 30% (table 1).

All the tested seed samples met the purity standards. No debris and seeds of other species were found in them. Only in one cucumber seed sample from the company No 2 in 2001 a few mechanically damaged seeds were found.

The problem of vegetable seed quality on the Polish market had been previously reported by many authors (Woyke and Dudek, 1976; Bielenin, 1980; Duczmal, 1980; Woyke, 1980; Just, 1989; Woyke, 1989; 1993; Duczmal et al., 1994; Hołubowicz et al., 2002).

In the period of the planned economy, when all Polish companies seed production was carried out in the country, low quality of vegetable seeds was due to unfavourable weather conditions (Duczmal, 1980; Woyke, 1990a; Woyke et al., 1990; Woyke, 1993) and agro technique mistakes as a result of production means shortage on the market (Duczmal, 1980; Woyke, 1980). In some unfavourable for seed production years in the past, the standards were omitted and poor quality seeds entered the Polish market (Woyke, 1980; Just, 1989).

After the economic system changed in 1989, the problem with lack of production means on the Polish market ended.

Moreover, species and cultivars risky in seed production in Poland had been moved to other places abroad (Klarzak, 1998; Hołubowicz and Bralewski, 2001; 2003a). In new circumstances seed company is now fully responsible for the quality of produced seeds. Despite all this, the research carried out in the middle of 90s (Duczmal *et al.* 1994) and the end of 90s (Hołubowicz et al., 2002) showed that there were still cases when seeds of vegetables did not meet the present quality standards. The data received by the authors showed that in the years 2001-2003 74.5% of Polish and 96.7% of foreign seeds did meet the quality standards. The received results are similar to the ones received by Duczmal and others in 1993: for domestic and foreign once: 76.5% and 100.0% respectively. In the authors' research, the best seeds were those of red beet and cucumbers. This was in agreement with the previous research done by Hołubowicz et al. (2002). Duczmal and others (1994) however, got different results in the case of the red beet seeds. In the carried out by us research, the lettuce seeds were the worst in terms of meeting present quality standards. This has been confirmed earlier by Duczmal and others (1994). For other species though, the results were not the same. Also in case of seed purity our results were confirmed by earlier data of the experiments carried out by Duczmal and others: in their research not less than 97.6% of the tested samples met the present purity standards.

Table 1
 Accordance with the standards of germination capacity of the seeds of 10 species of vegetables available on the Polish market in retail

Species	Samples not meeting standards - means for species %	Standard ¹ (2001)	Standard (2002, 2003)	Company											
				No 1			No 2			No 3			No 4		
				Year			Year			Year			Year		
				2001	2002	2003	2001	2002	2003	2001	2002	2003	2001	2002	2003
red beet	0.0	70	70	+	+	+	+	+	+	+	+	+	+	+	+
garden carrot	16.7	60	65	+	+	+	+	+	+	+	+	+	-	+	+
onion	25.0	75	75	+	-	+	+	-	+	+	+	+	-	+	+
head white cabbage	41.7	80	80	+	+	-	+	+	+	-	+	+	-	+	+
cucumber	0.0	80	80	+	+	+	+	+	+	+	+	+	+	+	+
tomato	25.0	75	75	+	+	-	+	+	+	+	+	+	+	+	+
common bean	11.1	80	80	+	+	-	+	+	+	+	+	+	+	X	X
garden pea	22.2	80	80	+	+	+	+	+	+	+	+	+	-	X	X
radish	30.0	70	70	+	+	+	+	-	+	+	+	+	+	X	X
lettuce	55.5	75	75	+	+	+	+	-	+	+	+	+	-	X	X
Samples not meeting the standards - mean for years (%)				10	20	20	50	30	20	0	30	50	0	10	0
Samples not meeting the standards - mean for seed companies (%)				16.7				33.3			26.7			3.3	

Explanations:

¹ PN-R-67050:1996. Materiał siewny. Nasiona roślin warzywnych.

For all species the minimal germination capacity was taken excluding the trade class "Extra"

² Dz.U. Nr 108, poz. 1184, Rozporządzenie Ministra Rolnictwa i Rozwoju Wsi z dnia 14 sierpnia 2001 r. w sprawie rejestracji odmian i udzielania ochrony wyłącznego prawa do odmiany oraz wytwarzania i kontroli materiału siewnego.

"+" - the sample met the standard

"-" - the sample did not meet the standard

"X" - lack of sample

Also results received by Hołubowicz and others in 2002 showed that purity was not a problem: out of the 484 tested samples, only 2 samples (of cucumber and red beet seeds) were found with purity not meeting the present standard. This has been confirmed by the authors' experiments, in which all samples met the purity standards. The found cases of seed germination capacities not meeting the present standards show that there has been a need for permanent monitoring of the Polish seed market in terms of seed quality. Such monitoring has been carried out for example in France (Anonymous, 2004) – in the country with a very strong position of both European and world's market (Hołubowicz and Bralewski, 2003b; Oleksiak, 2003).

In the carried out experiments, the differences were also found amongst the tested years and companies. It is in agreement with the results of earlier research of other authors (Duczmal et al., 1994; Hołubowicz et al., 2002).

In the literature, there has been no data concerning seed quality evaluation of vegetable species of other countries available on their markets. The exception here are the data concerning the French market provided by GNIS-SOC - the special unit responsible for seed certification (its role is equal to the Polish Seed Certification Agency). The organisation carries amongst other duties a constant monitoring of quality of vegetable seeds in packages present on the French market. In the year 2003, on average, 7.5% of the tested seed samples did not meet the standard concerning germination capacity. In the years 2000-2002 these percentages were 4.4%, 6.7% and 7.4%, respectively. It was found out in France that the worst were organic seeds and the seeds sold through mail. Amongst the species tested, the worst quality was found for the seeds of Brussel sprouts, onion, Italian dill, pepper, parsley, common bean, lettuce, celery and eggplant (Anonymous, 2004). The found data show a distinct difference between the quality of vegetable seeds on the French and Polish market. In the years 2001-2003 in France, 7.5% of vegetable seeds did not meet the standard concerning germination capacity. In the same time in Poland, this percentage was 3 times higher, i.e. 22.2%.

The problem of vegetable seed quality is also seen on the Asian market. A good example here is the results of the research carried out in Thailand. The experiment included 42 seed lots of 30 species of vegetable sold on the market in the 90s. They were provided by both seed and trade companies. There were many seed lots as well as companies found to provide the market with improper quality seeds (Lemonius, 1999). The similar experiment carried out in India showed that out of 207 samples tested, 32.9% of them did not meet the germination capacity standard and 1.9% - the purity standard (Kant et al., 1999).

CONCLUSION

In the years 2001-2003 22.2% of vegetable seed samples on the Polish market did not meet the present germination capacity standard.

The worst were seeds of lettuce and white head cabbage. 55.4% and 41.7% of the tested samples did not meet the germination standards, respectively.

The best quality was found for seeds of red beet and cucumbers - all their tested samples met the germination capacity standards. All tested seed samples met the purity standards.

It is needed to carry out a constant monitoring of vegetable seed quality on the Polish market.

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REZUMAT

CALITATEA SEMINTELOR LA SPECII LEGUMICOLE SOLICITATE PE PIAȚĂ ÎN POLONIA

În perioada 2001-2003 s-a verificat calitatea a 108 mostre de semințe de varză albă, morcov de grădină, sfeclă roșie, ceapă, castraveți, tomate, ridichi, salată verde, fasole și mazăre. Semințele au provenit de la trei companii poloneze producătoare de semințe și de la una străină ce operează pe piața poloneză. S-a descoperit că 22,2% din mostrele de semințe examinate nu corespundeau standardelor referitoare la capacitatea de germinație. Cele mai slabe rezultate s-au înregistrat la semințele de salată verde și varză. Mostrele lor nu au corespuns standardelor referitoare la capacitatea de germinație în 55,5%, respectiv 41,7% din cazuri. Cea mai bună calitate au avut-o semințele de sfeclă roșie și castraveți - în cazul lor, toate mostrele au corespuns standardelor. Cel mai mare număr de mostre care nu au corespuns standardelor a provenit de la compania numărul 2, iar cel mai mic – de la compania numărul 4. Toate mostrele de semințe testate au corespuns standardelor de puritate.