POTENTIAL OF LINE VARIETIES OF WINTER OILSEED RAPE WITHIN ORGANIC GROWING TECHNOLOGY*

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Different responses of winter oilseed rape (WOSR) varieties to various growing locality conditions as well as to the intensity of technological inputs are known. Organic grower-need varieties provide sufficient yield even within extensive growing conditions. Ten commonly grown line varieties in the Czech Republic were tested using extensive organic growing technology. These varieties were evaluated for the occurrence of fungal diseases by ripening and seed yield. Some of OSR tested varieties proved to have higher resistance to fungal diseases as well as significantly higher seed yields. Higher resistance against *Phoma lingam* proved varieties Caracas, Ontario, Liprima, Cando and Manitoba. Higher resistance against *Sclerotinia sclerotiorum* proved varieties Ontario, Smart and Oponent. The highest yield within a two-year average was produced by the Caracas, Manitoba and Ontario varieties. These varieties are more likely to be recommended for practical organic growing.

winter oilseed rape; varieties; organic growing technology; fungal diseases; yield

INTRODUCTION

More than 60 varieties of WOSR are currently registered for cultivation in the Czech Republic. This broad spectrum of varieties provides the growers with many options, but also forces them to make difficult choices. Different responses of varieties to growing locality conditions as well as to the intensity of inputs are known. Organic grower-need varieties provide sufficient yield even within extensive growing conditions. Currently, there is a lack of verified information. Baer et al. (2007) tested the suitability of OSR varieties for minimum-tillage or zero-tillage systems to increase the cost efficiency for the farmers. Mrówczynski et al. (1998) performed studies on susceptibility of OSR varieties to the degree of damage by pests of stem and generative parts. Baranyk et al. (2008) compared variable reactions of OSR varieties to basic and intensive conventional growing technology. The varieties with positive responses to intensification factors (fertilizing, protection) were classified as "adaptable", and varieties with low responses were classified as "steady". In conventional agriculture, the steady varieties are commonly recommended to the growers with lower technology sources. Ten of WOSR line varieties were chosen right from this unit in order to find out their responses to organic growing technology.

MATERIAL AND METHODS

The small-plot trials with a range of selected WOSR varieties were based at the certified and checked Research Station for Organic Agriculture the Czech University of Life Sciences Prague in Prague-Uhříněves, in both years 2006 and 2007. In the Czech Republic ten commonly grown line varieties were chosen. They were sown in precisely measured plots with harvest extents of 10 m^2 and in three replications. A fore crop composed of a green manure mixture of horse bean and peas proved to be successful. Regular inter-rows weeding cultivation also contributes to the next improvement of crop nutrition and soil structure. Experimental growth was established by verified technology of higher rate sowing into wide rows, with regular inter-rows weeding cultivation – 1–2x during autumn and 1–2x during the spring (Table 1). Following line varieties of OSR were sown in both years (2006, 2007): Cando, Caracas, Liprima, Lisek, Manitoba, Oksana, Ontario, Oponent, Slogan, Smart. The following important factors were evaluated: the occurrence of fungal diseases (*Phoma lingam*) by ripening (BBCH – 85) and seed yield of the varieties.

RESULTS AND DISCUSSION

Autumn germination and uniformity of OSR growth were optimal during both years.

Important results were already obtained by the assessment of fungal diseases by growth ripening.

Phoma lingam occurred in both experimental years. Higher resistance against *Phoma lingam* proved varieties Caracas, Ontario, Liprima, Cando and Manitoba. Lower resistance proved varieties Slogan, Smart and Oksana (Figs 1 and 2). *Sclerotinia sclerotiorum* was detected only

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Table 1. Summary of WOSR field trials crop management and soil conditions in the year 2006 and 2007 (ES Prague-Uhříněves)

	Experimental year	
	2006–2007	2007–2008
Forecrop	mixture of horse bean with pease	mixture of horse bean with pease
Ploughing	15. 8. 2006	14. 8. 2007
Before – sowing cultivation	24.–25. 8. 2006	23.–25. 8. 2007
Sowing	25. 8. 2006	26. 8. 2007
Sowing rate	1.2 MGS/ha	1.2 MGS/ha
Inter-rows space	25 cm	25 cm
Weeding cultivation*	2x (20. 9. 2006, 28. 3. 2007)	2x (8. 10. 2007, 10. 4. 2008)
Harvest	3. 7. 2007	20. 7. 2008
Growing season	days from sowing – 313 days from 1. 1. 2007 – 184	days from sowing – 329 days from 1. 1. 2008 – 202
Soil analysis:	(ppm)	(ppm)
P	112	118
K	218	233
Mg	141	123
Ca	3077	2717
N_{min} (> 30 cm)	11.7	4.0
N_{min} (> 60 cm)	3.7	5.8
NH_4 (> 30 cm)	0.3	1.2
NH_4 (> 60 cm)	0.2	1.2
NO_3 (> 30 cm)	11.4	2.8
NO_3 (> 60 cm)	3.5	4.6

* Hand-wheel cultivator

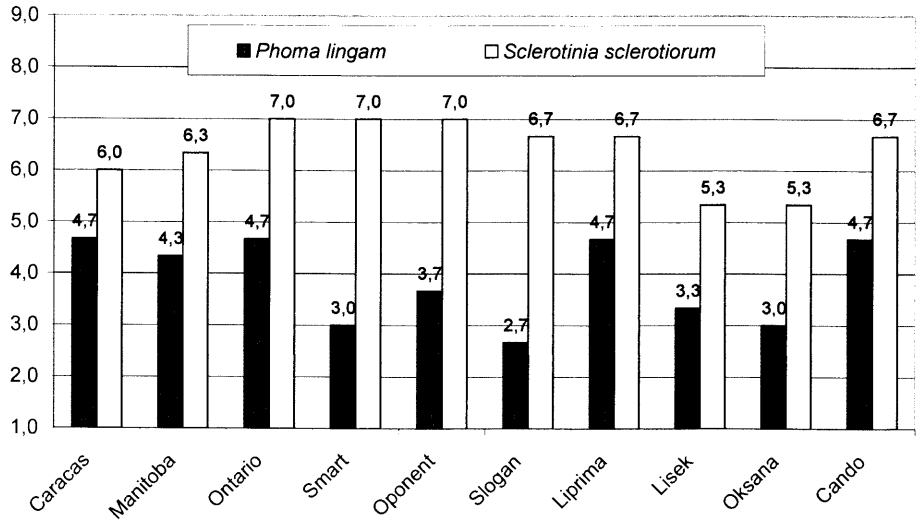

Fig. 1. Varieties susceptibility on *Phoma lingam* and *Sclerotinia sclerotiorum* infection in 2008 (9: without symptoms, 1: more than 50% crops with symtoms), BBCH – 85, ES Prague-Uhříněves

in second experimental year – 2008. Higher resistance against *Sclerotinia* proved varieties Ontario, Smart and Oponent. Lower resistance proved varieties Lisek and Oksana (Figs 1 and 2).

Significant differences in the varieties' responses to the extensity of organic growing technology were determined in both years. The yields ranged between 1.98–3.43 t/ha (2007) and 2.88–3.84 t/ha (2008) (Fig. 3). The highest yield within a two-year average was produced by the Caracas (3.64 t/ha), Manitoba and Ontario (3.52 t/ha) varieties. The lowest yield was produced by the Cando variety (2.43 t/ha). The Caracas variety was the most efficient and exceeded the yield average of all the varieties by about 17.1%, whereas the Cando variety was the weakest and only reached 78.2% of the yield average.

Statistically significant difference between the yield means of the most efficient varieties (Caracas, Manitoba, Ontario) and less efficient varieties (Lisek, Oksana, Cando) was confirmed at the 95,0% confidence level (Tables 2–4; Fig. 4).

Though the yields were reached only within conditions of small-plot trials, they still give evidence to the hidden

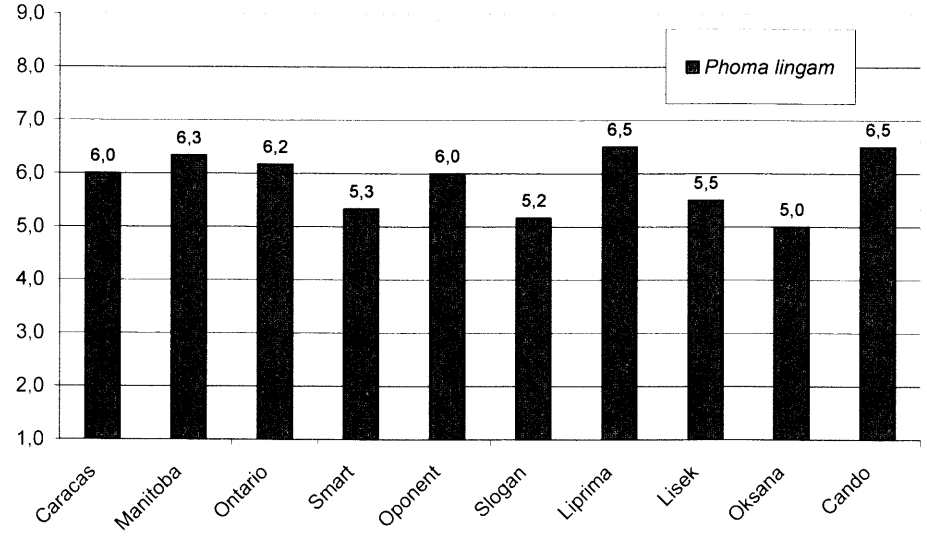

Fig. 2. Varieties susceptibility on *Phoma lingam* infection, average of 2007–2008 (9: without symptoms, 1: more than 50% crops with symtoms), BBCH – 85, ES Prague-Uhříněves

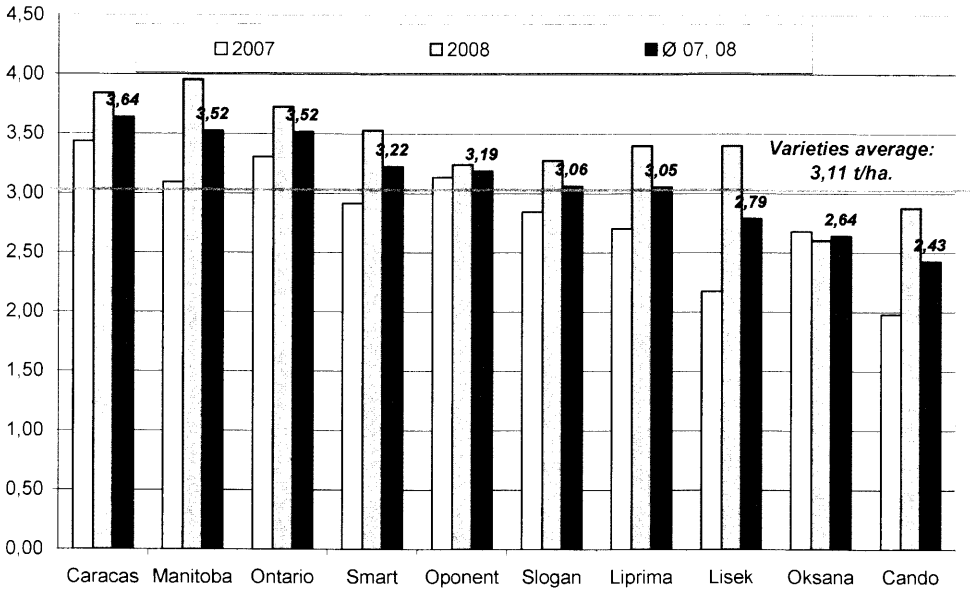

Fig. 3. Seed yields of WOSR varieties in organic growing technology, average of 2007–2008, ES Prague-Uhříněves

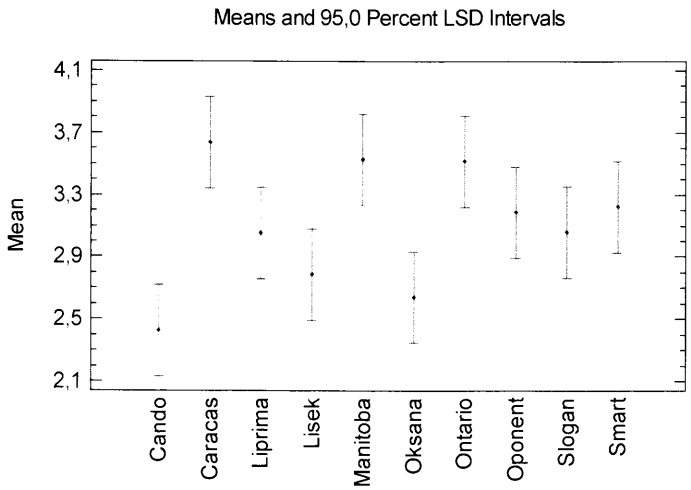

Fig. 4. WOSR varieties seed yields in organic growing technology, average of 2007–2008, ES Prague-Uhříněves; means and 95% LSD intervals

Table 2. Statistical evaluation of WOSR varieties seed yields in organic growing technology, average of 2007–2008, ES Prague-Uhříněves, summary statistics

	Count	Average	Standard deviation	Coefficient of variation (%)	Minimum	Maximum	Range	Stnd. skewness
Cando	6	2.42833	0.559729	23.0499	1.55	2.99	1.44	–0.59496
Caracas	6	3.63667	0.428143	11.773	2.98	4.08	1.1	–0.87328
Liprima	6	3.05333	0.529591	17.3447	2.12	3.65	1.53	–1.12237
Lisek	6	2.78667	0.723399	25.9593	1.81	3.59	1.78	–0.11565
Manitoba	6	3.525	0.670366	19.0175	2.27	4.11	1.84	–1.6586
Oksana	6	2.64167	0.428598	16.2245	2.25	3.42	1.17	1.44302
Ontario	6	3.515	0.497624	14.1572	2.93	4.09	1.16	–0.126995
Oponent	6	3.18667	0.18694	5.86633	2.96	3.42	0.46	0.160061
Slogan	6	3.06	0.318998	10.4248	2.64	3.58	0.94	0.509314
Smart	6	3.22333	0.504804	15.6609	2.54	3.78	1.24	–0.567244
Total	60	3.10567	0.602561	19.402	1.55	4.11	2.56	–1.17911

Table 3. Statistical evaluation of WOSR varieties seed yields in organic growing technology, average of 2007–2008, ES Prague-Uhříněves – ANOVA Table

Source	Sum of Squares	*Df*	Mean Square	*F*-ratio	*P*-value
Between groups	8.55854	9	0.950949	3.70	0.0013
Within groups	12.8631	50	0.257263		
Total (corr.)	21.4217	59			

Table 4. Statistical evaluation of WOSR varieties seed yields in organic growing technology, average of 2007–2008, ES Prague-Uhříněves, Multiple Range Tests, Method: 95.0 percent LSD

	Count	Mean	Homogeneous groups
Cando	6	2.42833	X
Oksana	6	2.64167	XX
Lisek	6	2.78667	XX
Liprima	6	3.05333	XX
Slogan	6	3.06	XX
Oponent	6	3.18667	XX
Smart	6	3.22333	XX
Ontario	6	3.515	X
Manitoba	6	3.525	X
Caracas	6	3.63667	X

potential of some OSR varieties for organic farming. A necessary prerequisite of that is the suitable choice of field and particularly keeping to technological principles (suitable fore crop, soil cultivation, sowing rate and row distance, mechanical weeding, possible crop protection within registered preparations).

Baer et al. (2007) states, that the varieties in their trials also showed a wide range of poor to good development. Therefore the yields had a very wide range between genotypes and tillage methods. Especially in the low tillage plots, where hybrids showed extra yields of 0.5 t/ha. When growing conditions were ideal, crop development was quite good regardless of the tillage system or genotype. The harvest results proved that the hybrids had a comparable yield within the three tillage systems. However, the line varieties showed a yield decline again due to the tillage depth. There are differences within the genotypes developing more vigorous plants and a better root system. Mrówczynski et al. (1998) founded large differences in the degree of damage to winter rapeseed cultivars and lines by pests like *C. napi* (1 – 13%), *C. pallidactylus* (2 – 42%), *M. aeneus* (3 – 21%), *C. assimilis* and *D. brassicae* (3 – 18%).

CONCLUSIONS

Within the extensive conditions of organic growing technology some of OSR tested varieties proved a significantly higher resistance to fungal diseases as well as a higher yield of seeds.

These varieties are more likely to be recommended for practical organic growing, especially to the areas with higher pressure of diseases (heavier soils, warmer and more humid areas).

A necessary prerequisite of maximal genetic potential utilization of some OSR varieties within extensive organic farming is the suitable choice of field and particularly keeping to technological principles (suitable fore crop, soil cultivation, higher sowing rate and row distance, regular mechanical weeding, possible crop protection within registered preparations).

REFERENCES

BAER, A. et al.: Breeding and testing WOSR varieties for conservation tillage systems. In: Abstracts of 12th Int. Rapeseed Congr. GCIRC, Wuhan – China, 2007, 258 pp.

BARANYK, P. et al. (2008): Standpoint to OSR varieties composition for the year 2008/09. Praha, SPZO 2008. (In Czech)

MRÓWCZYNSKI, M. et al.: Studies on pest damage of cultivars and lines of winter oilseed rape. IOBC wprs Bulletin, Vol. 21, 1998 (5): 153–154.

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Potenciál liniových odrůd ozimé řepky v ekologické pěstební technologii.

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Pěstitel v ekologickém zemědělství potřebuje odrůdy, které poskytují uspokojivý výnos i v extenzivních pěstebních podmínkách. Odrůdy ozimé řepky reagují rozdílně na podmínky pěstební lokality i na úroveň intenzifikačních vstupů. Baranyk (2008) srovnává rozdílnou reakci odrůd řepky na základní a intenzivní agrotechniku. Odrůdy pozitivně výnosově reagující na intenzifikační faktory (hnojení, ochrana) řadí do skupiny „adaptabilních", odrůdy málo reagující na intenzifikační faktory řadí do „stabilních". Stabilní odrůdy jsou v konvenčním zemědělství obecně doporučovány pěstitelům s nižší úrovní vstupů. Právě z této skupiny bylo vybráno 10 liniových odrůd ozimé řepky za účelem zjištění jejich reakce v extenzivních podmínkách ekologické technologie.

V srpnu 2006 byl na pokusné stanici v Praze-Uhříněvsi založen přesný maloparcelní pokus se sortimentem odrůd ozimé řepky. Bylo vybráno 10 liniových odrůd ze skupiny „stabilních", běžně pěstovaných v podmínkách ČR. V obou letech (2006, 2007) byly vysety odrůdy: Cando, Caracas, Liprima, Lisek, Manitoba, Oksana, Ontario, Oponent, Slogan, Smart. Vysévány byly do přesných parcelek o sklizňové ploše 10 m^2 ve třech opakováních.

Jako hlavní faktory byly u odrůd hodnoceny: výskyt houbových chorob ve fázi dozrávání (BBCH – 85) a výnos semen jednotlivých odrůd.

Vyšší odolnost vůči Fomové hnilobě prokázaly odrůdy Caracas, Ontario, Liprima, Cando a Manitoba. Nižší odolnost prokázaly odrůdy Slogan, Smart a Oksana. Vyšší odolnost vůči Sklerotinii prokázaly odrůdy Ontario, Smart a Oponent, nižší odolnost pak odrůdy Lisek a Oksana.

V obou pokusných letech byly zjištěny významné rozdíly v reakci odrůd na extenzitu ekologické pěstební technologie. Dosažené výnosy se pohybovaly v rozmezí 1,98–3,43 t/ha (rok 2007) a 2,88–3,84 t/ha (rok 2008). V průměru dvou let dosáhly nejvyššího průměrného výnosu odrůdy Caracas (3,64 t/ha), Manitoba a Ontario (3,52 t/ha). Nejnižšího výnosu dosáhla odrůda Cando (2,43 t/ha). Nejvýkonnější odrůda Caracas převyšovala výnosový průměr všech odrůd o 17,1 %, nejslabší odrůda poskytla výnos na úrovni 78,2 % z celkového průměru všech odrůd. Statisticky významný rozdíl mezi průměry výnosů nejvýkonnějších odrůd (Caracas, Manitoba, Ontario) a odrůd méně výkonných (Lisek, Oksana, Cando) byl potvrzen na hladině významnosti 95 %.

Z testované skupiny lze odrůdy s vyšší rezistencí vůči chorobám a odrůdy s vyšším výnosem semene přednostně doporučit pro praktické pěstování v ekologickém zemědělství.

Předpokladem maximálního využití genetického potenciálu odrůd v provozních podmínkách extenzivní ekologické technologie je vhodný výběr pozemku pro zásev a zejména pak dodržování technologických zásad (vhodná předplodina, příprava půdy, vyšší výsevek a meziřádková vzdálenost, pravidelné plečkování, případná ochrana rostlin povolenými preparáty).

ozimá řepka; odrůdy; ekologická technologie; houbové choroby; výnos

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