INVESTIGATION OF SOME QUALITATIVE CHARACTERS IN THREE WINTER RAPE CULTIVARS IN THE COURSE OF RIPENING

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INTRODUCTION

There are exclusively grown zero-erucic acid rape cultivars in Czechoslovakia, and the testing of double-zero cultivars is going on successfully. Under the Czechoslovak climatic conditions approximately 70 % of winter rape is grown in potato and mountain productional types, on shallow skeleton and often acid soils, up to altitude over 600 metres, under conditions relatively even drier, and mainly under conditions jeopardized in terms of overwintering. Comparing these conditions with the lowland deep soils of a sugar beet productional type in West Europe and England with high air moisture content and mild winter we can conclude that not all the cultivars imported to Czechoslovakia from the West European countries, where they usually show an excellent performance, prove well under our conditions. The testing of these cultivars before their introduction in practice as well as the comparison of their performance with that of our own cultivars is therefore at the centre of general attention.

MATERIAL AND METHODS

In small plot experiments in 1983-85 the mass of 1000 seeds, and the dynamics of oil, protein, and glucosinolate formation were studied. At each sampling from green to full maturity the seed from 12 plants was analyzed, viz. 4 repetitions each of three average plants. The control cv. was Jet Neuf (France) to which cv. Silesia (Czechoslovakia) was compared. Within the scope of the double-zero cultivar testing in 1984-85 the same characters were assessed in the

French cv. Tandem. The oil content was determined by the continuous petroleum ether extration after Soxhlet /JAM, 1956/. Nitrogen was determined by the Kjeldahl method. For the conversion of nitrogen to crude protein a re-count factor of 6.25 was used. The assessment of glucosinolates (GSL) was made by a potentiometrical titration of potassium hydrogensulphate originating in the enzymic hydrolysis of glucosinolates after Croft /1979/, modified according to Svoboda, Dědková /1981/.

RESULTS AND DISCUSSION

The summary of results obtained is presented in Table 1 and 2. The mass of 1000 seeds raised in the course of ripening. An intensive increase in seeds was delimitated /Vincenc, 1985/ by the period over which the seeds constituted from 10 up to 50 % of the total mass of silicles. This interval began approx. 20 to 25 days after the end of flowering and lasted 21 to 28 days. In the course of ripening the seed mass increase rate markedly decreased (last samplings) and finally ceased with the end of the second technical maturity, when the seed mass reached its maximum values. The average mass of 1000 seeds in the second technical maturity was 5.10 and 5.15 in cvs. Jet Neuf and Silesia, resp., the two-year average in cv. Tandem being even 5.22. All the three cultivars corresponded to 7 points (high mass) in the classification according to Voškeruša et al. /1984/. As presented by Vincenc /1985/, cv. Jet Neuf reached 5.60 g mass of 1000 seeds and 45.24 % oil content in 1981. Compared to cvs. Třebíčská (mass of 1000 seeds 4.75 g), and Primor (4.70 g) formerly grown in Czechoslovakia /Vincenc, 1980/, cvs. Jet Neuf, Silesia and Tandem proved to be better in this respect.

The seed oil content had the similar dynamics as the above character. At the first samplings it fluctuated around 35 % reaching values from 41.9 up to 45.8 % at harvest in dependence on year and cultivar. In 1984 and 1985, the oil content in cv. Silesia was by almost 2 % higher than in Jet Neuf; however, it was lower by 0.78 % in 1983. In successive years Jet Neuf had oil content of 42,64; 42.68; and 43.76 %, Silesia 41.86; 44.05; and 45.21 %, and Tandem 43.21, and 45.81 %, which was classified as the mean, mean to high, and

mean to high oil content, resp. according to Voškeruša et al. /1984/. The oil content is one of the main characters. At the complex evaluation it is associated with the rape yield. The high oil content is the proviso for an effective seed processing as well as for reduction of losses and costs in the course of the whole technological process. In an ideotype of rape there is the oil content of 43 to 45 % requested /Vašák, Fábry, Zukalová, 1985/, and the cultivars under test conform to these conditions.

In addition to the oil content there is also an ever rising importance of the rape seed protein component the significance of which becomes lately as important as that of oil. The seed should content as much as 22 to 25 % protein. All the cultivars tested comply with this condition and their values at harvest draw rather nearer to the upper limit. Our trials suggested that the protein percentage in the rape seed does not change markedly in the period from green to full maturity. In the formerly grown cultivars there was an obvious negative correlation between oil and protein components. In the new cultivars grown since 1981 the seed protein content was fixed (in spite of the lower oil content at the first sampling) and did not change considerably even when the oil content significantly increased in the course of ripening.

A specific component of the rape seed are glucosinolates which reduce the dietary value of groats and biomass. Their content varies between 120 and 150 µMol/g oil-free seed dry matter in the present day single-zero cvs. Jet Neuf and Silesia. The upper limit of the total glucosinolate content in the double-zero rape types is somewhere between 25 and 30 µMol/g oil-free DM. This is the rank for cvs. Tandem and Darmor. At the introduction of the double-zero cultivars it is necessary to follow their oil content, yield, winter-hardiness as well as their state of health. It was found in cvs. Jet Neuf and Silesia that the total glucosinolates increase in the course of ripening. Their dynamics is illustrated in Table 2. There was an increase in cv. Jet Neuf from 36.22 to 95.96 µMol/g oil-free DM between the first and the second sampling in 1983. Similarly in cv. Silesia we could see the increase from 48.78 up

to 134.36 µMol/g oil-free DM in the same year. The total glucosinolate content decreased between the second technical and the full maturity. The similar dynamics was found in cv. Tandem. The increasing value between the individual samplings corresponded to the double-zero type. Zukalová, Vašák, Fábry /1986/ found that an optimum sowing date (Sept 1) positively affected not only yield but also this quantitative character. In the characters tested (mass of 1000 seeds, oil content) cv. Tandem seemed to be comparable to Jet Neuf and Silesia. It complied with the requirements even in terms of the GSL content and surmounted Jet Neuf in yield by 3 %.

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Table 1 Mass of 1000 seeds, oil content and proteins : development in the course of rape maturation

Year / Cultivar Type	1983 No. Date of sampl.	1983 MTS (g)	1983 % Oil in seed DM	1983 % Prot.	1984 No. Date of sampl.	1984 MTS (g)	1984 % Oil in seed DM	1984 % Prot.	1985 No. Date of sampl.	1985 MTS (g)	1985 % Oil in seed DM	1985 % Prot.
Jet Neuf "0" (France)	1- 9.6.	2,35	35,94	24,32	1-27.6.	2,03	35,85	23,35	1- 4.7.	4,02	37,94	24,56
	2-22.6.	4,39	42,34	24,79	2- 6.7.	3,82	43,57	25,26	2-10.7.	4,38	39,88	24,31
	3-27.6.	5,03	42,00	24,50	3-13.7.	4,27	42,66	25,11	3-16.7.	5,20	40,45	24,61
	4-30.6.	5,11	42,64	24,16	4-23.7.	5,11	42,68	24,69	4-19.7.	5,08	43,76	25,59
					5-30.7.	4,73	42,43	24,89				
Silesia "0" (Czecho-slovakia)	1- 9.6.	3,43	39,77	24,82	1-27.6.	1,89	33,90	23,24	1- 4.7.	4,24	41,21	24,13
	2-22.6.	4,78	41,66	23,22	2- 6.7.	3,26	38,70	24,14	2-10.7.	4,29	42,53	24,35
	3-27.6.	5,08	41,29	24,47	3-13.7.	3,75	40,79	23,80	3-16.7.	4,93	44,63	23,84
	4-30.6.	5,11	41,86	24,49	4-23.7.	4,26	42,89	21,65	4-19.7.	5,41	45,21	23,14
					5-30.7.	4,94	44,05	24,80				
Tandem "00" (France)					1-27.6.	1,69	29,59	21,84	1- 4.7.	3,05	40,68	23,83
					2- 6.7.	2,42	35,51	22,98	2-10.7.	4,02	42,11	22,71
					3-13.7.	3,21	40,28	24,34	3-16.7.	4,75	44,27	22,80
					4-23.7.	4,55	42,54	24,33	4-19.7.	5,20	45,81	21,48
					5-30.7.	5,23	43,21	24,68				

Table 2 Dynamics of the glucosinolate content in selected winter rape cultivars

Cultivar	1983		1984		1985	
	No. Date of sampl.	GSL µMol/g	No. Date of sampl.	GSL µMol/g	No. Date of sampl.	GSL µMol/g
Jet Neuf "0" (France)	1- 9.6.	36,22	1-27.6.	16,10	1- 4.7.	100,23
	2-22.6.	95,96	2- 6.7.	44,13	2-10.7.	117,21
	3-27.6.	142,09	3-13.7.	97,80	3-16.7.	127,41
	4-30.6.	130,23	4-23.7.	104,25	4-19.7.	122,68
			5-30.7.	139,83		
Silesia "0" (Czecho-slovakia)	1- 9.6.	48,78	1-27.6.	46,61	1- 4.7.	49,60
	2-22.6.	134,36	2- 6.7.	82,56	2-10.7.	91,12
	3-27.6.	138,78	3-13.7.	97,59	3-16.7.	91,12
	4-30.6.	124,61	4-23.7.	101,00	4-19.7.	112,98
			5-30.7.	101,39		
Tandem "00" (France)			1-27.6.	16,28	1- 4.7.	23,64
			2- 6.7.	18,49	2-10.7.	33,91
			3-13.7.	16,11	3-16.7.	33,43
			4-23.7.	28,48	4-19.7.	24,60
			5-30.7.	21,89		