

THE EFFECT OF SOWING DATE AND PLANT DENSITY ON YIELD ELEMENTS OF DIFFERENT WINTER OILSEED RAPE (*BRASSICA NAPUS VAR. NAPUS F. BIENNIS L.*) GENOTYPES

ÉVA VINCZE

INSTITUTE OF CROP SCIENCE, FACULTY OF AGRICULTURAL AND FOOD SCIENCES AND ENVIRONMENTAL MANAGEMENT,
UNIVERSITY OF DEBRECEN E-MAIL: VINCZE.EVIKE@GMAIL.COM

INTRODUCTION

Oilseed rape is the third most important cultivated oil plant all over the world while second in Hungary after sunflower. Its cultivation area has been increasing since 1990; currently it varies between 200 and 250 thousand ha.

MATERIAL AND METHOD

Our experiments were setup on calcareous chernozem soil in the Hajdúság, 15 km from Debrecen. The soil of the experiment is characterized by favourable physical, chemical and biological traits. The humus content of the calcareous chernozem soil of the experiment is 2.76%, its AL soluble P₂O₅ value is 133 mg kg⁻¹, its AL soluble K₂O value is 240 mg kg⁻¹. The soil has favourable water management traits. The soil saturated up to the field water capacity can store 578 mm water in the 0-2 m layer, 50% of which is disposable water. The experiment design was set as split-plot, plot areas were 36 m² in four replications and we used two hybrids (Arkaso and Hybridrock) and one varieties (Ontario). Three different sowing times were investigated in the experimental year (2015/2016). Three different plant densities were set: 200, 350 and 500 thousand plants ha⁻¹. Uniform nutrient supply and a row spacing of 45 cm were applied. Winter wheat was used as pre-crop. In the crop year were an early sowing date: August 28 (SD1), average: September 12 (SD2), late: September 23 (SD3). The harvest was done with a SAMPO plot combine harvester.

RESULTS AND DISCUSSIONS

Freezing rate was studied in the crop year 2015/2016 in case of two hybrids (Arkaso and Hybridrock) and a variety (Ontario) for three different applied plant densities and three different sowing times. The number of primary and secondary branches just as the number of siliquae per plant were registered (Table 1.) in case of the application of different plant densities and sowing times. It can be stated that parallel to increasing plant density the rate of winter loss increased as well. Results of the measurements confirm that the lower plant density was applied at sowing produced higher number of primary and secondary branches, just as the higher number of seed shells could be registered. Correlation analysis results of data in the crop year 2015/2016 are shown in Table 2. Medium negative correlation was found between sowing time and the number of primary ($r=-0.673$) and secondary ($r=-0.501$) branches, just as the number of siliquae ($r=-0.488$). As the later sowing was done, the less number of primary and secondary branches, consequently the less number of siliquae was developed. Medium negative correlation between sowing time and seed yield ($r=-0.686$) explains that in the earlier

sowing dates the higher seed yield could be produced. Sowing time affects plant physiological processes. Rapeseed seed yield is determined by the number of siliquae that develop on secondary branches. Sowing time affects the number of branches negatively and thus the number of siliquae, consequently seed yield as well. Strong positive correlation was found between primary and secondary branches ($r=0.870$), and between primary branches and the number of siliquae ($r=0.863$). The number of primary branches determines the number of secondary branches, that determines the number of siliquae developed per plant – this is confirmed by the strong positive correlation ($r=0.979$). As less loss of the studied population occurs from winter to spring, the higher number of primary ($r=-0.556$) and secondary ($r=-0.612$) branches will be developed, consequently the higher number of siliquae will be developed later. This is confirmed by the medium negative correlation that was found between all three studied parameters.

Parameters	Sowing date	Genotype	Plant density	Primary branches	Secondary branches	Number of siliquae	Yield	Winter loss
Sowing date	1	0	0	-0,673**	-0,501**	-0,488**	-0,686**	0,104
Genotype	0	1	1,000**	0,104	0,047	0,078	0,162	0,019
Plant density	0	1,000**	1	0,104	0,047	0,078	0,162	0,019
Primary branches	-0,673**	0,104	0,104	1	0,870**	0,863**	0,341	-0,556**
Secondary branches	-0,501**	0,047	0,047	0,870**	1	0,979**	0,298	-0,612**
Number of siliquae	-0,488**	0,078	0,078	0,863**	0,979**	1	0,317	-0,594**
Yield	-0,686**	0,162	0,162	0,341	0,298	0,317	1	0,087
Winter loss	0,104	0,019	0,019	-0,556**	-0,612**	-0,594**	0,087	1

** Correlation is significant at the 0.01 level (2-tailed).

Table 2: Correlation analysis of the studied parameters (Debrecen, 2015/2016)

Table 3. shows rapeseed seed yield obtained in the study. The highest seed yield was obtained in the early sowing time (5475 kg ha⁻¹). Regarding the applied sowing dates following yield results were registered: early sowing time: 5475 kg ha⁻¹, optimal sowing time: 4760 kg ha⁻¹ and late sowing time: 4590 kg ha⁻¹.

	Sowing date								
	SD1			SD2			SD3		
Genotype	200 t ha ⁻¹	350 t ha ⁻¹	500 t ha ⁻¹	200 t ha ⁻¹	350 t ha ⁻¹	500 t ha ⁻¹	200 t ha ⁻¹	350 t ha ⁻¹	500 t ha ⁻¹
1	4312	4668	5006	4196	4682	4760	4571	4584	4293
2	5160	5415	5475	4389	4485	4387	4043	3408	4104
3	4890	4912	5104	4752	4757	4696	4521	4590	4373

Genotype 1: Ontario, Genotype 2: Hybridrock, Genotype 3: Arkaso LSD 5%

Table 3: Rapeseed yield of the studied rapeseed genotypes in 2015/2016 (Debrecen)

Sowing date	Genotype	Primary branches			Secondary branches			Number of siliquae			Winter loss (%)		
		Plant density (thousand ha ⁻¹)											
		200	350	500	200	350	500	200	350	500	200	350	500
SD1	1	14,8	10,5	9	24,5	5,3	5,3	890	450	440	12%	18%	28%
	2	15	10,5	7,8	38,8	16,8	4,3	1409	803	358	18%	27%	44%
	3	12,8	11,5	13,3	32	9	16,5	1207	529	691	11%	21%	23%
SD2	1	13,3	9,8	7,8	28,8	8,8	9	1144	536	425	13%	16%	17%
	2	10	9,3	9	12,3	10,3	4,3	620	549	421	14%	16%	18%
	3	12	11	9,5	17	13,8	6	714	733	382	14%	14%	15%
SD3	1	9,3	7	7,3	15,8	2	0	707	301	256	15%	26%	29%
	2	8,8	6,8	6,8	6	1	6,3	383	298	333	15%	30%	31%
	3	9,3	8	6,8	6,8	5,3	3	581	550	257	20%	21%	28%

Table 1: Number of registered primary and secondary branches and number of shell of the studied rapeseed genotypes in 2015/2016 (Debrecen)

CONCLUSIONS

In the later sowing dates, the lower number of primary and secondary branches, thus the lower number of siliquae per plant were developed. Higher seed yield was obtained in the earlier sowing time: early sowing time: 5475 kg ha⁻¹, optimal sowing time 4760 kg ha⁻¹ and late sowing time 4590 kg ha⁻¹. Sowing time had negative impact on the number of branches, number of siliquae and seed yield. With the increasing plant density the rate of losses during the winter increased as well.

