

TOP APPLICATION OF NITROGEN AND CHLOROCHOLINE CHLORIDE /CCC/ ON
THE PLANTATION OF WINTER TURNIP RAPE /BRASSICA RAPA L. VAR
SILVESTRIS BRIGGS / FOR SEED

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1. SUMMARY

In the years 1976/77-1978/79 experiments with winter turnip rape were carried out on two types of soil. Two factors were investigated : top application of nitrogen and CCC on the plantation. The results of investigations proved : On the light soil CCC autumn spraying increased slightly /2,2%/ the winter hardiness of plants. The yields of seeds, fat, protein and straw were higher on the medium heavy soil. On that soil the higher rates than $100 \text{ kgN}/10^4 \text{ m}^2$ did not augment the yields of seeds and fat. The significant and profitable increases of seed, fat and protein yields were obtained at CCC spring spraying with $300 \text{ kgN}/10^4 \text{ m}^2$ on the light soil and with 200 kgN on the medium heavy one.

2. INTRODUCTION

Latterly winter rape and turnip rape are cultivated also on the lighter soils after cereals with the spring dressing of high nitrogen rate amounting from 160 to $200 \text{ kg}/10^4 \text{ m}^2$ /Dembinski 1975/ even to 276 kg /Balcerek and co-auth. 1978/. It is related with the possibility of plant freezing and lodging as well of yield quality decreasing. The application of plant auxo-substance, chlorocholine chloride /CCC/ at appropriate quantity and time may check that and cause the better nitrogen use. Rajowski/1971/ and Chrominski with co-authors /1969/ proved that CCC foliar spraying in autumn increased considerably the yields of winter rape seeds and diminished the ones of straw on the light soil as well in unfavourable vegetation conditions. CCC spraying lowered the height of plants and had no effect on fat contents in seeds. Rajewski/1971/ writes that CCC autumn spraying has had an advantageous effect on the frost and winter hardiness of rape plants, but other authors have got the minimal influence /Belt 1972, Chominski and co-auth. 1969/. In accordance with their results CCC foliar spraying of rape plants is the most proper one in the final phase of autumn growth in quantities of $2-4 \text{ kg}/10^4 \text{ m}^2$ and of weak concentration /0,1 %/.

The object of this work was to investigate the effect of top nitrogen and chlorocholine chloride application on winter turnip rape plantation for seed cultivation on two types of soil.

3. EXPERIMENT CONDITIONS and METHODS

a. Weather conditions in the years 1976/77-1978/79 are portrayed in the chapter 4.c when these have been necessary.

b. Soil conditions. At the Agricultural Experimental Station "Lipki" the experiment was carried out on the light, podsollic soil with clay substratum of IV bonitation class and at the Agric. Exper. Station "Ostoja" on the medium heavy soil of III bonitation class.

c. Agrotechnical conditions. Varieties of winter turnip rape, elite were : 1/ on the light soil "SUR 181" and 2/ on the medium heavy one "Szczecinski". Forecrops of turnip rape were : in the first case winter barley or wheat and in the second one winter wheat or mixture of pulses with sunflower. Before sowing turnip rape the field was dressed with $\text{kg}/10^4\text{m}^2$: 120 P_2O_5 , 140 K_2O and after cereals 92-100 N. From the end of August till the beginning of September and on the 13th of September in 1978 on the medium heavy soil 10 kg of seeds were sown on 10^4m^2 with 12-20 cm between rows. The experiments were set up in randomized split blocks with 4 replications. Two factors were investigated : 1/0, 100, 200, 300 $\text{kgN}/10^4\text{m}^2$ applied after vegetation starting up in the period from 15 to 31 March with 100 kg doses every 10-12 days and 2/ CCC on 10^4m^2 - 2 kg in 1976/77 and 4 kg in the following years in 0,1-0,2 % water solutions : a/ no spraying, b/ autumn spraying in the second decade of October / at the phase of 4-6 leaves /, c/spring spraying between the second decades of March and April after vegetation starting up / at the phase 6-9 leaves /.

d. Analyses. Percentages of plant hibernation, height of plants, mass of 1000 seeds, germination viability and capacity of seeds were determined. In chemical laboratories of Institute of Plant and Soil Cultivation, Academy of Agriculture in Szczecin seed samples for dry matter, fat and total nitrogen were analysed according to generally used methods. Differences of significance were computed at the Department of Research and Information Methodology, IUNG at Pulawy /Tab. 1/.

4. RESULTS AND DISCUSSION

a. Hibernation. In the 3-year period on the light soil CCC autumn spraying of turnip rape plantation affected positively the hibernation of plants though on the average not much - 2,2% and on the medium heavy one did not influence at all. The probable cause of that was : After the autumn vegetation ending on the light soil the ratio of leaves to roots of turnip rape plants was 7,1 and due to CCC autumn spraying the mass of roots increased 6,0% whereas on the medium heavy one the above values were respectively 11,1 and 2,6%.

b. Height of plants. On both types of soil nitrogen augmented slightly the height of plants in comparison with the

control object but without the effect of differentiated rates. On the light soil CCC spraying time lowered it a little.

c. Yields of seeds, fat and protein. The mean yields of winter turnip rape seeds in each year were in tons/10⁴m² - 1/ on the light soil : 1977 - 0,63, 1978 - 0,98 and 1979 - 0,34 and 2/ on the medium heavy one respectively : 1,47, 1,52 and 0,62. On both types of soil mean yields of fat in seeds came off in each year kg/10⁴m² : 1977 - 292, 1978 - 533 and 1979 - 169 as well of total protein correspondingly : 248, 282 and 123. The low yields were brought about due to lack of pesticides application against spring noxious insects. Moreover in 1976/77 on the light soil owing to the acid reaction /pH_{H2O} = 5,4, pH_{KCl} = 3,9 / the great vanishing of plants took place in spring and the speedy growth of weeds. In 1977/78 climatic winter conditions conduced to the good hibernation of plants however the autumn and spring were droughty as well the spring was cool. In 1978/79 the weather conditions were unfavourable to the turnip rape growth because autumn, winter and early spring were rainy. The level of ground water was high. Therefore some plants got drenched and to the others the upper part of root and hypocotyl were only left from which the plants shot up. The plantations got very weedy especially with bent grass.

In three years on the light soil 100 and 200 kgN/10⁴m² heightened the yields of seeds on the average 46,5 %, fat 45 and protein 53 % in comparison with the control object, and 300 kgN correspondingly : 67 %, 63 and 86 %. On the medium heavy soil 100 kgN/10⁴m² increased the yields of seeds 18 %, fat 12 and protein 14 % while the higher rates gave no more rises /tab. 1/. Then the nitrogen effect on the light soil was greater what was proved already by many scientists. On both types of soil CCC spraying with nitrogen top dressing of the turnip rape plantation increased the yields of seeds, fat and protein on the average about 16 %, a little with the greater effect on the light soil. On the medium heavy soil the combination of 200 kgN/10⁴m² with CCC spring spraying in comparison with the only factor of 200 kgN dressing heightened the yields of seeds, fat and protein about 22 %. Whereas on the light soil 300 kgN/10⁴m² with CCC spring spraying in comparison with the only 300 kgN dressing augmented those yields about 32 %. In both cases increments were significant and profitable. Two CCC sprayings in comparison with the only spring spraying gave about the same increases of seed, fat and protein yields /tab. 1/. The favourable influence of CCC spraying on the yields of seeds, fat and pretein also on the medium heavy soil does not corroborate results obtained by Rajewski/1971/ and the other authors.

d. Fat and protein contents. On the light soil CCC sprayings augmented the fat contents 0,8 % but on the medium heavy one only the spring spraying 0,7. On both types of soil nitrogen top dressing increased the total protein contents, but CCC sprayings exerted no influence on them.

e. Mass of 100 seeds. On the average under the influence of top nitrogen and CCC application on the turnip rape plantation the mass of 1000 seeds dropped slightly.

f. The germination viability and capacity of turnip rape seeds were very high /99,7%/. The top application of nitrogen and CCC improved the above qualities however insignificantly.

g. Straw. The mean straw yields of turnip rape on the light soil were lower 11,2 % and more or less equal in each year because arisen decreases were compensated by weeds. Whereafter on the medium heavy soil in case of bad crops the yields went down as the fields were less weedy. On both types of soil the nitrogen top dressing augmented the yields and with increased nitrogen rates they rose while CCC sprayings decreased them somewhat only on the light soil.

h. Ending. The 3-year experiments proved that on both types of soil chlorocholine chloride sprayed in small quantity and concentration at the proper time and growth phase of plants and coupled with proper nitrogen rates had the good effect on quantity and quality of the turnip rape yields. For the above reasons and in this case for very valuable, breeding material as well the low costs of CCC application and its harmlessness it should be used in practice.

5. INFERENCES

1. Weather conditions during vegetation season, type of soil and high nitrogen top dressing in spring as well CCC foliar spraying of plantation had great effect on the yields of winter turnip rape.

2.a. The yields of seeds, fat, total protein and straw were higher on the medium heavy soil.

2.b. The effect of nitrogen dressed in spring and CCC spraying on the yield increases was greater on the light soil.

2.c. On the medium heavy soil the higher rates than $100 \text{ kgN}/10^4 \text{ m}^2$ did not augment the yields. Significant and remunerative increases of seed, fat and protein yields were obtained at CCC spring spraying with $300 \text{ kgN}/10^4 \text{ m}^2$ on the light soil and with 200 kg N on the medium heavy one.

2.d. Two CCC sprayings /autumn + spring / in comparison with the only spring one did not give significant and profitable differences in the yields of seeds, fat and protein.

2.e. Increased nitrogen dressing heightened the straw yields on both types of soil and CCC spraying lowered them slightly on the light one.

3. On the light soil the effect of CCC autumn spraying on the winter hardiness of plants was favourable though not great, and on the medium heavy one without influence.

4. The germination viability and capacity of turnip rape seeds was very high. Top application of nitrogen and CCC foliar spraying improved them slightly.

5.a. Fat contents in seeds were higher on the light soil, and the protein ones more or less similar on both types of soil.

5.b. With the increase of nitrogen rates fat contents fell slightly and of protein augmented.

5.c. All CCC sprayings were effective on fat contents on the light soil and the only spring spraying on the medium heavy one. CCC sprayings had no influence on protein contents.

6. REFERENCES

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Table 1 : Yields of seeds, and straw, fat and total protein at top application of nitrogen and CCC on the winter turnip rape on light and medium heavy soils in years 1976/77 - 1978/79, Agric. Exper. Stations Lipki and Ostoja, Academy of Agriculture in Szczecin / W. Balcerek /.

Rate of N dressing	Time of CCC spraying	Light soil				Medium heavy soil			
		yields							
		t/10 ⁴ m ²		kg/10 ⁴ m ²		t/10 ⁴ m ²		kg/10 ⁴ m ²	
		seeds	straw	fat	protein	seeds	straw	fat	protein
0	0	0,39	3,59	157	85	0,95	4,95	376	222
100	W	0,56	5,22	228	124	1,12	5,85	423	252
	A	0,54	4,78	226	125	1,14	5,86	429	256
	S	0,57	5,04	233	126	1,19	5,90	453	271
	AS	0,60	5,01	250	138	1,24	6,05	475	276
200	W	0,58	5,68	227	137	1,09	5,88	415	254
	A	0,64	5,16	257	150	1,17	6,15	436	278
	S	0,71	5,32	280	162	1,28	6,28	498	305
	AS	0,65	5,31	259	151	1,24	5,91	452	298
300	W	0,65	5,93	256	158	1,11	6,18	414	274
	A	0,73	6,02	295	173	1,25	6,61	469	290
	S	0,77	6,30	308	185	1,28	6,35	485	305
	AS	0,81	6,11	325	191	1,36	6,57	510	327
100		0,57	5,01	234	128	1,17	5,91	445	264
200		0,65	5,37	256	150	1,20	6,06	450	284
300		0,74	6,09	296	177	1,25	6,43	469	299
LSD 1*	W	0,60	5,61	237	140	1,11	5,97	417	260
	A	0,64	5,32	259	149	1,19	6,21	445	275
	S	0,68	5,56	274	158	1,25	6,17	479	294
	AS	0,69	5,48	278	160	1,28	6,17	479	300
	/0,05/	0,081	0,622	32,6	18,9	0,046	0,269	17,4	10,8
	II*	0,066	0,465	26,6	13,4	0,066	0,239	24,9	15,4
II/I		0,114	0,806	45,9	26,6	0,114	0,413	43,0	26,7
	I/II	0,125	0,913	50,3	29,1	0,108	0,439	40,8	25,3

*I factor - rate of nitrogen dressing in spring kg/ 10⁴ m²

*II factor - CCC time spraying the plantation of turnip rape: W - no spraying, A - spraying in autumn, S - spring spraying, AS - two sprayings/in autumn + in spring/.

Fig. 3. Yields of straw / t/10⁴m² / on medium heavy and light soil, 1976/77-1978/79
 Agric.Exper.Stations Osteja and Lipki, Academy of Agric. in Szczecin / W. Balcerak /

Winter turnip rape

CCC spray
 W no
 A autumn
 B spring
 AS autumn +
 spring

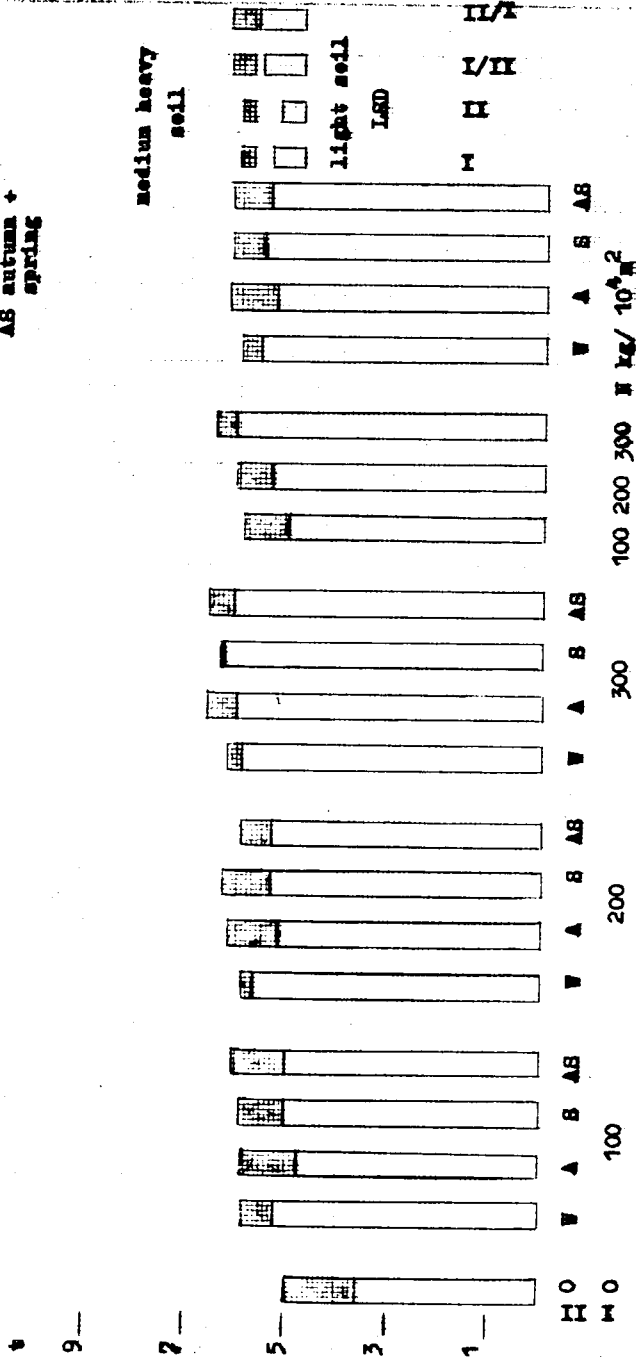


Fig. 1. Yields of seeds, fat and protein / $t/10^4 m^2$ on medium-heavy soil, 1976/77-1978/79
 Agric. Expt. Station Osteja, Academy of Agric. in Sescia / W. Balcerek /

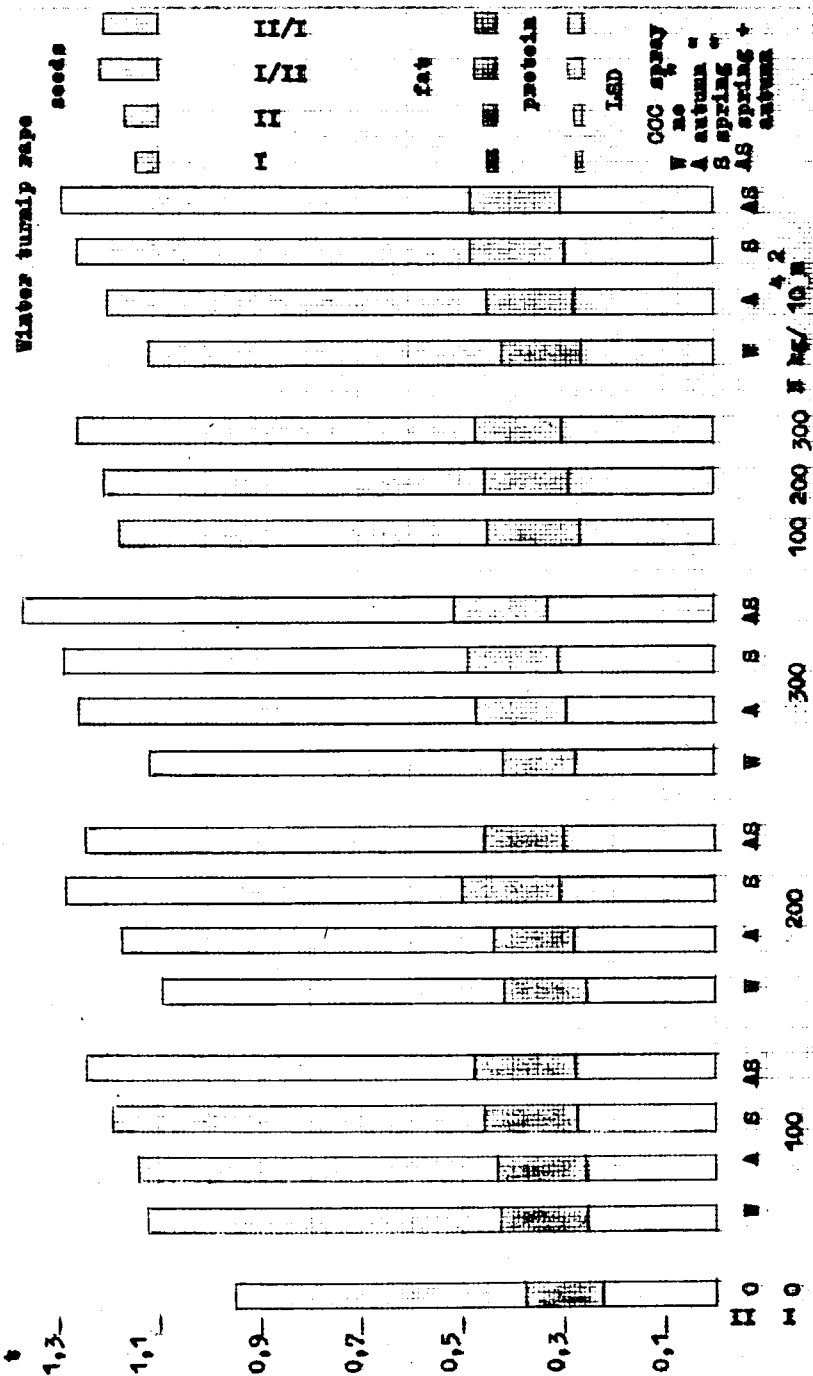


Fig. 2. Yields of seeds, fat and protein / $t/10^4 m^2$ / on light soil, 1976/77-1978/79
 Agric. Exper. Station Lipki, Academy of Agric. in Szczecin / W. Balcerak /

Winter turnip rape

COG spray
 W no
 A autumn
 S spring
 AS autumn+
 spring

