QUALITY OF SUGAR BEET IN RELATION TO WEATHER CONDITIONS AND GROWING FACTORS

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Summary

In the field trials with sugar beet carried out from 1994 to 1996 the effect of weather conditions, varieties (Intera, Hilma), different fertilizing (0 – without fertilization, A-cattle farmyard manure (FYM) + NPK, B-Ekofert + NPK, C-Mikrobion + NPK) and sowing spacing (157 mm, 210 mm) on the digestion and refined sugar was studied. From given three-year results it is evident the effect of weather conditions of the year, fertilization variants and seed spacing on digestion and refined sugar yield was statistically significant. However, the application of both substrates Ekofert and Microbion did not influence either digestion or refined sugar yield in roots.

Key words : weather conditions, variety, fertilizing, sowing spacing, digestion, refined sugar

Introduction

Sugar beet is very sensitive to drought during the critical growth period from June to August in which beet is forming a huge leaf system.Precipitation in autumn rises root yields but the root quality is reduced especially in colder weather (Švachula, 1998). The sugar beet quality is very influenced by nutrition especially by nitrogen and potasium (Šroller, Pulkrábek, Chochola, 1997). Except of conventional fertilizers there have also been tested the alternative organic fertilizers, substrates and growth stimulators (Pulkrábek, Šroller, Zahradníček, 1999, Šoltýsová, 1999). The sugar beet quality is influenced also by plant spacing (Minx, 1990).

Material and methods

Field trials were established in the years 1994 - 1996 on medium heavy luvisol soil type in warm and temperate arid maize-growing region in the South - Western part of the Slovak Republic at the Experimental site of the Slovak Agricultural University in Nitra-Dolna Malanta. The effect of weather conditions (table 1) and selected anthropogenic factors on the root quality of sugar beet was studied. Factors: two varieties: Intera and Hilma, four fertilizer management system: 0-without fertilization, two sowing spacing: 157 mm and 210 mm.The NPK rate was calculated on the basis of agrochemical analyses of soil (table 2) for the targeted root yield 50 $t.ha^{-1}$. Cattle FYM was used in the rate of 25 $t.ha^{-1}$. Ekofert (ecological organic substrate rich in organic components and active humic acids) application rate was 5 $t.ha^{-1}$ and treatment by Mikrobion (product of industrial microbiology) was done in the rate of 25 $l.ha^{-1}$. Both Ekofert and Microbion were incorporated into the soil together with stubble after harvesting of the preceding crop - winter wheat within the autumn soil cultivation.

Results and discussion

The highest mean of digestion value in the roots was found out in the most favourable year 1996 (table 3). Comparing to 1994 the following differences in digestion were observed: + 3,84 %, rel. 32,1 % and comparing to 1995 it was + 1.29 % relatively 8.9 %. More favourable weather conditions (1995, 1996) resulted in the higher sugar content (Bajči, Pačuta, Černý, 1998, Švachula, 1998). Cultivar Hilma had a higher digestion than cultivar Intera (+ 0.2 %, rel. 1.42 %) within the three-year period. However, this difference has not been statistically significant. Differences in digestions were found out between cultivars and years. In the less favourable year (1994) cultivar Intera had a higher sugar content (+ 0.88 %, rel. 7.6 %) while in the more favourable years (1995, 1996), as regards to the temperatures and rainfall, cultivar Hilma had a higher sugar content (+ 0.98 %, rel. 7.0 % and + 0.5 %, rel. 3.2 %. These results show better adaptability of cultivar Intera into less favourable (drier and warmer) conditions.
We also investigated the effect of four fertilizer management systems on the sugar beet root quality (table 3). Three-year results show a significant influence of fertilization variants on the sugar content (Bajči, Pačuta, Černý, 1997). From our trials it is also clear that Ekofert (B) and Mikrobion (C) did not influence the sugar content significantly. In both Ekofert and Microbion variants we found out similar digestion as with variant of cattle FYM application (A). Remarkably the higher sugar content was observed in case of 0 variant compared to A variant (difference: 0.93 %, rel. 6.7 %). Comparing two seed spacing (157 mm, 210 mm) the higher sugar content (+ 0.61 %, rel. 4.4 %) was found out at the lower seed spacing and this difference was statistically significant. The weather conditions had highly significant influence also on the refined sugar yield (Bajči, Pačuta, Černý, 1997).The highest values of this parameter were found in 1996 (table 3). The differences comparing to 1994 and 1995 were + 3.75 % rel. 42.0 % and + 0.89 % rel. 7.6 %. In case of the less favourable weather 1994 the better results in refined sugar yield were achieved by Intera cultivar (+ 0.66 % rel. 7.6 %). However, in the more favourable weather

(1995, 1996) the higher refined sugar yield gave cultivar Hilma (+ 1.4 % rel. 12.7 %, + 1.16 % rel. 9.6 %). Ekofert (B) and Mikrobion (C) did not influence the refined sugar yield (table 3) in comparing to cattle FYM application (A). We found out very close values in all three variants. The highest values of the refined sugar yield were found out at the variant without fertilizing

Table 1: Pattern of weather condition

Month	Sum of weather precipitation (mm)				Average temperatures (°C)			
	1994	1995	1996	30-year average	1994	1995	1996	30-year average
IV.	93,7	73,5	103,3	43,0	10,6	10,7	11,0	10,1
V.	109,9	63,0	143,0	55,0	15,2	14,6	16,4	14,8
VI.	29,4	88,5	49,8	70,0	18,7	17,7	12,2	18,3
VII.	32,9	0,1	69,4	64,0	23,1	22,9	18,3	19,7
VIII.	59,8	62,2	59,4	58,0	21,4	19,8	19,4	19,2
IX.	110,0	83,5	78,1	37,0	17,1	14,2	11,9	15,4
X.	111,6	3,3	33,0	41,0	8,3	11,0	10,5	10,1
Sum	547,3	374,1	536,0	368,0	114,4	110,9	106,7	107,6
Average	78,1	53,4	76,6	52,6	16,3	15,8	15,2	15,4

Table 2: Agrochemical soil analysis (mg.kg^{-1})

Year	N_{an}	P	K	Mg	Zn	% of humus	pH/KCl
1994	6,07	95	383	255	11	2,30	6,25
1995	9,10	60	210	222	11	2,04	5,31
1996	18,90	42	195	200	4,60	1,89	5,88

Table 3: Results of sugar beet quality

Fertilization variant	Year							
	1994		1995		1996		Average	
	Seed spacing (mm)							
	157	210	157	210	157	210	157	210
Digestion (°S)								
I N T E R A								
0	12,95	13,40	15,69	14,96	15,03	15,88	14,56	14,75
A	12,75	11,05	13,96	13,95	15,45	15,45	14,05	13,48
B	12,80	11,55	12,57	12,93	15,74	15,43	13,70	13,30
C	11,60	13,20	14,62	13,59	16,32	15,19	14,18	13,99
x	12,53	12,30	14,21	13,86	15,64	15,49	14,12	13,88
H I L M A								
0	14,25	11,25	16,44	15,44	14,94	17,32	15,21	14,67
A	11,95	9,30	15,18	14,78	16,34	16,28	14,49	13,45
B	13,30	11,41	15,11	13,37	15,76	16,37	14,72	13,71
C	12,50	8,35	14,93	14,85	15,66	15,86	14,36	13,02
x	13,00	10,08	15,42	14,61	15,68	16,46	14,70	13,72
Refined sugar (%)								
INTERA								
0	9,34	10,3	12,64	11,82	11,44	12,58	11,14	11,57
A	9,69	8,13	10,85	10,73	12,00	12,02	10,85	10,29
B	9,64	8,34	9,80	10,04	12,41	12,00	10,62	10,13
C	8,43	10,17	12,02	10,36	12,94	11,42	11,13	10,65
x	9,28	9,24	11,33	10,74	12,20	12,01	10,94	10,66
H I L M A								
0	11,65	8,22	13,93	12,86	12,41	14,91	12,66	12,00
A	9,47	6,01	12,54	12,12	13,24	14,04	11,75	10,72
B	10,62	8,46	12,69	10,78	12,85	13,28	12,05	10,84

C	9,81	4,52	12,28	12,20	12,66	12,70	11,58	9,81
x	10,39	6,80	12,86	11,99	12,79	13,73	12,01	10,84

(0) with following differences (a significant influence): to cattle FYM + 0.93 % rel. 8.52 %, to Ekofert + 0.93 % rel. 8.52 % and to Mikrobion application + 1.04 % rel. 9.63 %. The higher refined sugar yield was found out in case of the lower seed spacing 157 mm, too (+ 0.73 % relatively 6.8 %).

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THE INFLUENCE OF ZEOMIX N FERTILIZER ON THE WINTER RAPE YIELDS

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Summary

The experiments with winter rape were carried out on the Experimental place in Vysoká above river Uh during 1997 – 1999. The winter rape grown at the Luvisol. The ecological fertilizer ZEOMIX N was applied at 2nd additional fertilizing by nitrogen in dose 200 kg N .ha^{-1}. On this variant but was lower average thousand-kernel weight (4,9 g) than variant with calcium nitrate (5,0 g). The ecological fertilizer ZEOMIX N may be used as carrier of mineral nutrients for winter rape plants. Their application in soil decrease consumption of nutrients and costs on import of row materials are lower. Because less nutrients are leaching into groundwater the environment is protection, too.

Key words: crop rotation, physical and chemical soil properties, Eutric Fluvisol, Fluvi-Eutric Gleysol

Introduction

The winter rape is very interesting field crop in this time. Using of ecological fertilizer has serious role at its cultivation in field conditions.
The aim of this article is to determine effect of ecological fertilizer ZEOMIX N on the winter rape yields in the East-Slovakian Lowland conditions.

Material and methods

The field treatments were carried out on Albic Luvisol during 1996 – 1999. The experimental place is located in Vysoká above river Uh in central part of the East-Slovakian Lowland. Winter wheat was forecrop for winter rape.
Fertilization was realized by balance method and nutrients from manure were accepted, too. The placement of mineral fertilizers – superphosphate (21 % P) and potassium chloride (50 % K) – were realized before sowing. In spring the basic dose of 50 kg N.ha^{-1} as ammonium nitrate (27 % N) was applied. Further doses of nitrogen were applied during vegetation of winter rape (table 1). Chemical control of winter rape was made by suitable pesticides.
Each variant was three-times repeated and rape seeds were harvested from 10 m^2 experimental areas. The obtained data were tested by the analysis of variance.

Table 1: Nitrogen fertilizers and doses used in field treatment

Variant	Fertilizer	Dose of fertilizer (kg.ha^{-1})
1.	ZEOMIX N (ZEO, 10,4 % N)	100
2.	ZEOMIX N (ZEO, 10,4 % N)	200
3.	Ammonium nitrate (LAV, 27 %N)	100