

**TECHNOLOGICAL PARAMETERS OF SUGAR BEET INFLUENCED BY LIQUID FERTILIZERS**

**Jana ORŠULOVÁ, Vladimír PAČUTA**

Department of Crop Production, Slovak Agricultural University in Nitra, A. Hlinku 2, 94976 Nitra, Slovak Republic, e-mail: orsulova@hotmail.com

**Summary**

During years 1998 and 1999 the effects of two varieties: (Fox, Zenith) and different fertilizing: V<sub>1</sub> – NPK (100 % N – control), V<sub>2</sub> – NPK (50 % N + Avit 35), V<sub>3</sub> – NPK (100 % N + Avit 35), V<sub>4</sub> – NPK (50 % N + Humix universal), V<sub>5</sub> – NPK (100 % N + Humix universal) on the technological parameters of sugar beet were studied. The better results were gained at variety Zenith (digestion, potassium, sodium) but variety Fox obtained better results of alpha-amino-nitrogen. The influence of leaf liquid fertilizers (Avit-35 and Humix universal) positively affected some variants of observed parameters of sugar beet.

**Key words:** sugar beet, variety, liquid fertilizers, technological quality

**Introduction**

The technological value is defined by the properties of the beet which determine the extraction of sugar. The influence of variety, site, agronomic factors, harvest techniques and storage on parameters: content of sugar, potassium, sodium and alpha-amino-nitrogen are considerable. (Eigner, 2000). The leaf fertilizers used in sugar beet cropping systems and produced on the base of humate can improve the utilization of basic nutrients N P K etc. (Pačuta, Peťková, 1999). These fertilizers contain bioactive natural substances which are essential for growth and development of plants and they have a stimulating effect on the yield and quality of crops (Ložek, Varga, 1998). Avit 35 is a liquid fertilizer produced on organomineral basis. Its synthetic organic composition is based on macro and micro active nutrients. Hudec, Bystrická (1998) found that it can positively affect yield formation under relatively low level of nutrients.

**Materials and methods**

Field multifactorial trials were conducted during the years 1998 and 1999 on medium heavy luvisol in warm and temperature arid maize – growing region in the South – Western part of Slovak Republic at the Experimental site of the Slovak Agricultural University in Nitra - Dolná Malanta. The effect of two varieties: (Fox, Zenith) and five different fertilizations on chosen technological parameters was studied. Variants of fertilizing: V<sub>1</sub> – NPK (100 % N – control), V<sub>2</sub> – NPK (50 % N + Avit 35), V<sub>3</sub> – NPK (100 % N + Avit 35), V<sub>4</sub> – NPK (50 % N + Humix univerzal), V<sub>5</sub> – NPK (100 % + Humix univerzal). The NPK rate was calculated on the basis of agrochemical analysis of soil for targeted root yield 50 t per hectare. Avit 35 and Humix univerzal are liquid fertilizers made on the base of bioactive components. The treatment of sugar beet was done in the stage of 9 – 11 th leaves. Avit 35 was used in the total rate 18 l.ha<sup>-1</sup>. Humix univerzál was applied in the total rate 10 l.ha<sup>-1</sup> in two doses. Preceding crop was winter wheat.

Table 1: Observed parameters of sugar beet (1998 - 1999)

Parameter	Variety	Variants of fertilizing					x
		V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>5</sub>	
Digestion (°S)	Fox	16,48	15,97	15,19	16,31	15,82	15,96
	Zenith	16,95	16,87	16,46	16,90	16,83	16,81
	x	16,72	16,45	15,83	16,60	16,33	16,38
Content of K <sup>+</sup> mmol.100 g <sup>-1</sup>	Fox	4,88	4,51	4,68	5,04	4,85	4,79
	Zenith	4,80	4,61	4,58	4,91	4,77	4,74
	x	4,84	4,56	4,63	4,97	4,81	4,76
Content of Na <sup>+</sup> mmol.100 g <sup>-1</sup>	Fox	1,00	0,81	1,13	0,80	0,77	0,85
	Zenith	0,65	0,61	0,67	0,61	0,59	0,63
	x	0,65	0,61	0,67	0,61	0,59	0,63
α amino nitrogen mmol.100 g <sup>-1</sup>	Fox	5,19	4,91	4,90	4,55	5,31	4,97
	Zenith	5,22	5,11	5,04	4,95	5,20	5,10
	x	5,21	5,01	4,97	4,75	5,26	5,04

**Results and discussion**

During observed period (1998 and 1999) the better results in digestion were gained at variety Zenith 16,81 °S with difference to Fox: + 0,85 °S and variability was 5,33% (table 1). It was statistically high significant difference (table 2). The highest recorded value of digestion was on control variant V<sub>1</sub> but differences to variant V<sub>2</sub> (an application of Avit 35) and variant V<sub>4</sub>

(an application of Humix univerzal) where were applied half doses of nitrogen were comparable. Our results correspond with results of Pačuta, Petřková (1999). The difference to  $V_2/V_1$  : - 0,27 °S, rel. 1,64 %, resp.  $V_4/V_1$ : - 0,12 °S, rel. 0,72 %. The next observed parameter was content of  $K^+$ . We recorded lower (preferable) content of  $K^+$  at variety Zenith comparing to Fox. Variety had significant and fertilization had high significant influence on the content of  $K^+$  in the roots but their interaction was not significant. An application of organo – mineral fertilizer Avit 35 positively affected content of  $K^+$  on both variants ( $V_2$  and  $V_3$ ) comparing to control ( $V_1$ ): ( $V_2/V_1$  - 0,28 mmol.100 g<sup>-1</sup>, rel. 6,14 %,  $V_3/V_1$  - 0,21 mmol.100 g<sup>-1</sup>, rel. 4,54 %). Humix univerzal positively affected content of  $K^+$  on variant  $V_5$  :  $V_5/V_1$  - 0,03 mmol.100 g<sup>-1</sup>, rel. 0,62 %. The higher value of  $Na^+$  content was recorded by variety Zenith with difference to Fox - 0,22 mmol.100 g<sup>-1</sup>. The difference was statistically high significant. Both leaf liquid fertilizers Avit 35 and Humix univerzal high significantly influenced content of  $Na^+$  in sugar beet root. Favourable (the lowest) values of this parameters were recorded on variants  $V_2$  and  $V_4$  and their evaluation is followed:  $V_2/V_1$  - 0,04 mmol.100 g<sup>-1</sup> rel. 6,56 %,  $V_4/V_1$  - 0,04 mmol.100 g<sup>-1</sup> rel. 6,56 %. The similar tendency was found out also in interaction between variety and variants of fertilizing except  $V_3$  variant in both varieties. Our results correspond with results of Hudec, Bystrická (1998).

Table 2: Analysis of variance (1998-1999)

Source of variation	df	Parameter			
		Digestion	$K^+$	$Na^+$	aN
		F – ratio			
Year	1	1295,949**	45,225**	345,818**	1190,215**
Variety	1	132,323**	4,505*	124,997**	3,775
Fertilization	4	17,246**	14,911**	10,090**	7,123**
Replication	2	0,042	0,325	2,209	0,107
(Y) x (V)	1	0,430	32,680**	17,284**	23,960**
(Y) x (V)	4	25,614**	12,916**	5,528**	1,544
(Y) x (V)	4	3,788*	1,865	3,920**	1,614
Residual	42				
Total	59				

Unfavourable parameters of internal quality of sugar beet is alpha-amino- nitrogen (aN). In the field trial was also investigated the influence of above mention sources of variation on aN in sugar beet roots. Lower aN was gained at variety Zenith with difference to Fox: - 0,13 mmol.100 g<sup>-1</sup> rel. 2,62 %. It was not statistically significant difference. But aN was high significantly influenced by leaf liquid fertilizers. We recorded favourable values of aN on variants  $V_2$  and  $V_3$  (an application Avit 35) with difference to  $V_1$ : - 0,20 mmol.100 g<sup>-1</sup> rel. 3,99 %, resp. 0,24 mmol.100 g<sup>-1</sup> rel. 4,83%.

Tab. 3: Tukey test

Source of variation	Limits	Parameter			
		Digestion	$K^+$	$Na^+$	aN
Year	0,05	0,153	0,084	0,048	0,139
	0,01	0,206	0,113	0,065	0,187
Variety	0,05	0,153	0,084	0,048	0,139
	0,01	0,260	0,113	0,065	0,187
Fertilization	0,05	0,343	0,188	0,109	0,312
	0,01	0,422	0,231	0,134	0,263

### References

- EIGNER, H.: Development and future challenges of the internal quality of sugar beet. In: Proceedings of 63<sup>rd</sup> IIRB Congress, Interlaken 2000, p.55-66.
- HUDEC, J., BYSTRICKÁ, J.: Použitie antistresového kvapalného hnojiva AVIT 35 na cukrovú repu. In: Nové možnosti pri pestovaní cukrovej repy, Nitra, Agrotár 1998, s. 16 - 19.
- LOZEK, O., VARGA, L.: Využitie stimulačného efektu humátu sodného pri pestovaní zeleninovej papriky. Acta fytotechnica at zootechnica, I., 1998, č.4, 96 –98.
- PACUTA, V., PETKOVÁ, J.: Vplyv odrody a kvapalných hnojív s obsahom bioaktívnych prírodných látok na kvalitu repy cukrovej. . In: Zborník referátov z "Tret. ved. celoslov. rep. konferencia, Nitra, Agrotár 1999, s. 112 – 116.