

THE INFLUENCE OF CULTURE TECHNOLOGY ON CONTENT NITRATES AND NITRITES IN CARROT (*Daucus carrota* XYZ) ROOTS

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Abstract. *In optimal growth and development conditions of plants, ammoniacal salts and nitrates are absorbed in higher quantity than their ability to transform into protein substances. Achievement of a rational system of supplementary fertilization requires setting of the most appropriate combination of fertilizers, the ratio between these epochs and the doses of administration and knowledge of how each variety or hybrid reacts to fertilizers used. The behavior way of carrots on the content of nitrate and nitrite as a response to the experimental factors is different. The highest nitrate content in carrots roots from variant Nantes-sown early- chemical fertilized (17.03 mg/100 g sp) is descending followed, at statistically significant difference, by variant Nantes-sown later chemically-fertilized (15.27 mg/100 g sp). Flakker variety has the lowest content of nitrates into variant with late sown and chemical fertilization 10.85 mg/100 g sp Regarding the nitrite content, the values obtained from each experimental variants, did not exceed the admitted norms but they framed between 0,17 and 0,33 mg/100 g s.p.*

Keywords: carrot, variety, sowing epoch, tehnology of carrots culture

INTRODUCTION

Almost all food products contain nitrates, because nitrates are naturally present in the ground. The nitrates are not toxic, but about 5% are converted into nitrites, (Monica Negrea 2009) which reacts with the amines and become carcinogens. In the presence of gastric juice, nitrates can generate carcinogenic nitrosamines which are heavily carcinogenic (Oeldaf, 1978, Lampkin, 2000, Vandendries, 2002, Zakaria și Vimala, 2002). Mode of application of technology culture, especially fertilization leads to accumulation of these components into vegetative parts of vegetables which involves more accurate research on the way and doses of fertilization. Mitre (2008) observes that the nitrate content in carrot roots increased after fertilization showing values ranging between 107 ppm (4 kg manure /m²) and 308 ppm (4 kg poultry manure /m²).

MATERIAL AND METHOD

The experience was established in 2010 in Garbau, Cluj county. In experience were followed three experimental factors: carrots varieties (Flakker and Nantes), sowing date (March and May) and fertilization applied (organic – cattle manure and chemical – NPK complex 16:16:16).

For both recipes of fertilization in growing season were used in the experiment 20 m³/ha urine of cattle (for organic fertilization) and 130 kg/ha NPK, 16:16:16 (for chemical fertilization), the mode of application was after the appearance of 5-6 true leaves.

Five roots were chopped from each of the experimental variants. The extract of analysis was obtained after homogenization and for proper determination was used a fotocolorimeter.

RESULTS AND DISCUSSION

Nitrate content of factor interaction between sowing epoch and fertilization can be seen in Table 1 and the conclusion drawn is as follows:.

In both case of early and late sowing, the organic fertilization causes a smaller amount of nitrates accumulation of 2.74 mg/100g f.s and 2.68 mg/100g f.s. respectively, compared to chemical fertilization, the differences being very significant negative.

Table 1

The influence of sowing dates and fertilization on content of nitrates in carrots roots

(Cluj-Napoca, 2010)

Sowing dates	Fertilization	Nitrates		Difference ±	Significance
		mg/100g	%		
Early	Chemical	15,74	100	-	-
Early	Organic	13,28	84,3	-2,47	000
Late	Chemical	14,05	100	-	-
Late	Organic	11,37	80,9	-2,68	000
LSD	5%			0,48	
LSD	1%			0,70	
LSD	0,1%			1,04	

A comparative analysis of all variants tested, in which the three studied factors have interacted , on the nitrate content of carrot roots (Table 2) showed that:

- ⇒ statistically significant differences between most variants tested;
- ⇒ the highest nitrate content at Nantes variety, sown early and chemically fertilized (17.03 mg/100g f.s.);
- ⇒ the lowest nitrate content in carrot roots recorded at Flakker variety, late-sown and organic fertilized (10.85 mg/100g f.s.) followed at statistically significant difference by Nantes variety, sown late and fertilized organic (11.90 mg/100g f.s.).

Table 2

The combined influence of factors variety, sowing dates and fertilization on content of nitrates in carrots roots

(Cluj-Napoca, 2010)

Cultivar	Sowing dates	Fertilizer	Total nitrates	Significance *
			mg/100g s.p	
Flakker	Late	Organic	10,85	A
Nantes	Late	Organic	11,90	B
Flakker	Early	Organic	12,72	C
Flakker	Late	Chemical	12,82	C
Nantes	Early	Organic	13,84	D
Flakker	Early	Chemical	14,46	D
Nantes	Late	Chemical	15,27	E
Nantes	Early	Chemical	17,03	F

DS 0.6-0.74

*Values marked with different letters are significant

Analyzing the interaction between fertilization and sowing dates under the aspect of influence accumulation of nitrites in carrot roots (Table 3) it is observed that organic fertilization determine a highly statistically significant reducing of the amount of nitrites in carrots roots compared to chemical fertilization in both case of early and late sowing dates.

Table 3.

The influence sowing dates and fertilization on content of nitrites in carrots roots

(Cluj-Napoca, 2010)

Fertilizer	Sowing dates	Nitrites		Difference±	Significance
		mg/100g	%		
Chemical	Early	0,30	100	-	-
Organic	Early	0,25	84,4	- 0,05	000
Chemical	Late	0,26	100	-	-
Organic	Late	0,22	84,3	- 0,04	000

SLD 5% 0,01

SLD 1% 0,01

SLD 0,1% 0,02

Under the combined influence of experimental factors on the amount of nitrites accumulated in carrots roots (Table 4) is noted:

- ⇒ the differences are significant between most variants
- ⇒ variants at the top of the Duncan ranking which are characteristic of low levels of nitrites content (under 0.25 mg/100g) are formed on Nantes variety;
- ⇒ the best variant under this aspect is Nantes variety -sown late and organic fertilized, followed at statistically significant difference by variant Nantes variety - sown later and chemically fertilized;
- ⇒ Flakker variety early sown and chemical fertilized accumulate the highest amount of nitrites with significant difference compared to all other variants.

Table 4

The combined influence of factors variety, sowing dates and fertilization on content of nitrites in carrots roots

(Cluj-Napoca, 2010)

Cultivar	Sowing dates	Fertilization	Total nitrites	Significance*
			mg/100g s.p	
Nantes	Late	Organic	0,17	A
Nantes	Late	Chemical	0,21	B
Nantes	Early	Organic	0,23	C
Flakker	Late	Organic	0,26	D
Nantes	Early	Chemical	0,27	D
Flakker	Early	Organic	0,28	E
Flakker	Late	Chemical	0,30	F
Flakker	Early	Chemical	0,33	G

SD 0,01

*Values marked with different letters are significant

CONCLUSIONS

As a consequence of the results obtained we can say that a decisive factor in the content of nitrate and of nitrites depends on the way of fertilization and applied doses.

The highest nitrates content in carrots roots at variant Nantes variety – early sown and chemical fertilized (17.03 mg/100g f.s.) is descending followed, at statistically significant difference, by variant Nantes variety - sown later and chemically-fertilized (15.27 mg/100g f.s.), Flakker variety registered the lowest content of nitrates at variant with late sowing and organic fertilized (10.85 mg/100g f.s.).

The best variant under the aspect of the nitrate content is Nantes variety - sown late and organic fertilized (0.17 mg/100g f.s.) followed at statistically significant difference by Nantes variety - sown later and chemical fertilized (0.21 mg/100g f.s.).

The organic fertilization is useful for the carrot plantation scoring the lowest values with respect to the accumulation of nitrates and nitrites, no matter which the planting period is.

REFERENCES

1. Lampkin, NH, 2000, Organic farming. In: S. Padel (Ed.). Soil sickness and soil fertility. Cab Publisher, Wallingford, USA;
2. Negrea Viorica Monica, 2009, Cercetări privind monitorizarea conținutului de nitriți și nitrați în principalele legume: salată, spanac, morcov și varză cultivate în condițiile din vestul României Teză de doctorat, Timișoara;
3. Oelhaf, RC, 1978, Organic agriculture: Economic and ecological comparisons with conventional methods <http://ideas.repec.org/a/eee/jfpoli/v6y1981i3p207208.html>;
4. Vandendries, H., 2002, A decision support system for field vegetable crops. Focus on fertilization. Acta Hort. 571, 149 – 152 ;
5. Zakaria A., P., Vimala, 2002. Research and development of organic crop production in Malaysia. FAO Expert Group Workshop on Preparation of Technical Guidelines on Organic Cultivation of Tropical and Subtropical Fruits. Intan Bukit Kiara, Kuala Lumpur;