RESEARCH ON THE ESTABLISHMENT OF INTERPRETATION LIMITS FOR THE AGROCHEMICAL INDICES IN SOIL IN DEFINING THE AGROCHEMICAL RISK AREAS IN THE FIELD TOMATO CROP UNDER THE INFLUENCE OF FERTILIZATION SYSTEMS

Ardelean Alina Grigorita*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: alina_popa_alina@yahoo.com

Abstract

In the interpretation of agrochemical indices for tomato crops in the field, their approach is made with a certain specificity, since applied fertilization systems cause significant changes in these indicators. Thus, the soil analyses show the achievement of some parameters of some indicators above the optimum agrochemical requirements recommended for this crop.

Key words: tomatoes, field crop, agrochemical indicators, risk areas, agrochemical monitoring**.**

INTRODUCTION

The changes induced in the chemistry and fertility of soils cultivated with tomatoes in the field, are based on the significant effects of the chemical and minerals fertilizers have on the major agrochemical soil indicators. The technology of field vegetables envisages large applications of organic and mineral fertilizers with the following objectives:

- optimization of organic matter content in soil as nutrient substrate and soil's physical control;
- agrochemical improvement of main nutrients N, P, K, S, Ca, Mg and micronutrients, which aims to prevent some nutritional disorders (deficiency and excess);
- compared to other intensive horticultural technologies for tomatoes, regardless of technology, the measures of organic and complex-mineral fertilization aim on the one hand to maintain a determined initial fertility and then to satisfy the intensive vegetable consumption without intensive nutrient risk areas and limits.

The field vegetables crops, including tomatoes, is usually done on the most fertile soils - chernozems and alluvial evolved soils, with good native fertility and through the organo-mineral fertilization programs the nutrients need is supplimented. This is the explanation that in the vegetables crop, including tomatoes, the agrochemical interpretations relate to the optimum and to define the risk circumstances or limits (Avarvarei I. et al.,1997, Black

A., 1992, Borlan Z. et al., 1984, 1994, Davidescu D, Velicica Davidesc, 1999, Lăcătuș, 2006, Marilena Mărghitaș, et al., 2005, Mocanu, Ana Maria Mocanu, 2003, Alina Popa, 2007, Rusu M. et al., 2001, 2005, I.C.P.A., 1998).

MATERIAL AND METHOD

Experiments were conducted in Oradea for tomato crop in the field, on a argic faeoziom soil type.

Unirea variety of medium vigor and with driven growth was used for the field crops.

The established crop benefited from soil fertilization with organic and mineral fertilizers and foliar fertilization applied on the plants during the growing season (Table 1).

Tabel 1

The foliar fertilizers assortment applied to field cultivated tomatoes at Oradea

Var. no.	Foliar assortment*	Concentration of solution %
1	Control sprinkled with water	-
2	Nutrifag	1%
3	Bionutrifag F	1%
4	Ferticare 24-8-16	1%
5	Polyfeed 19-19-19	1%

* with three treatments: the first treatment at the first inflorescence, the other at fourteen shifted days.

The types of foliar fertilizers were applied on an agrochemical background resulted from the interaction of organic fertilization (50 t / ha partially fermented stable manure) with the complex application of mineral fertilizers (N_{120} P_{120} K_{120}).

The soil analyzes were performed by the following methods: the pH was determined in aqueous suspension, soil-solution ratio of 1: 2.5 was determined by the potentiometric method with a pair of glass-calomel electrodes; humus was determined by wet oxidation and titrimetric dosing (according to Walkley-Black, modification Gogoașă); N_t was determined by Kjeldahl method; P-mobile (accessible) was determined by Egner-Riehm-Domingo method (P-AL), colorimetrically, in extraction with ammonium acetate-lactate; K-mobile (accessible exchangeable) in soil was dosed in the same ammonium acetate-lactate extract (Egner-Riehm-Domingo) (K-AL) by flame photometry; $N\text{-}NO_3$ in soil was dosed colorimetrically with phenoldisulfonic acid after a prior extraction with 0.1 n K_2SO_4.

RESULTS AND DISSCUSIONS

These indicators for the soil cultivated with field tomatoes shows specific values of chernozem, proving the large production capacity and even a better suitability for this crop.

Soil analyzes determined during the growing and last harvesting period of tomatoes reveal the achievement of parameters in some indicators over the optimal agrochemical requirements recommended for tomato crop (Table 2).

Tabel 2

Agro-chemical properties of chernozem from Oradea cultivated with field tomatoes

Var. no.	Applied foliar assortment	Soil analyses					
		pH_{H2O}	Humus %	I_N	P-AL ppm	$P\text{-}AL_c$ ppm	K-AL ppm
1	Control sprinkled with water	7.7	6.12	5.99	330	234	338
2	Nutrifag	7.6	7.56	7.40	320	227	450
3	Bionutrifag F	7.6	6.96	6.82	370	262	410
4	Ferticare 24-8-16	7.6	6.18	6.05	340	241	358
5	Polyfeed 19-19-19	7.5	6.00	5.88	335	237	450

In the interpretation of agrochemical indices for intensive vegetable crops, including tomatoes, their approach is made with a certain specificity, because here the practiced differentiated fertilization systems change essentially the relevant fertility indices and their applicability concur towards the following areas:

- vegetable soils for field crops and protected areas initially have or are formed with a slightly acid - slightly alkaline pH, of 6.5-7.5, which from the viewpoint of the reaction class generally presents several advantages for the fertilization and fertility of these media;
- the fertility indices of these soils determine significant growths in terms of humus / organic matter, nitrogen, phosphorus and potassium and other elements content to be recovered in quantitatively and qualitatively higher productive yields;

- taking into account these accumulations of nutrients in the vegetable soils, usually, the adverse impact states on soils and productions occur either due to mainly antagonistic influences of these accumulations, unbalanced reports between elements, and the ocurrance potential fof some excess states / toxicity due to high concentrations of some elements.

Based on these soil agrochemical indicators for field tomatoes, an agrochemical monitoring of the soil has been developed. By the data received from this monitoring system we intend as for the major agrochemical indices determined - pH, humus, P, K, N- NO_3 and mineral residue to establish the limits of classification and representation and allow the development of tomato technology forecasts that would prevent the manifestation of nutritional disorders and / or fertilization (Table 3).

Table 3

Agro-chemical monitoring of field cultivated with tomatoes

Crt. var.	Soil	Determined agrochemical indices	Classification of agrochemical indices	Agrochemical forecasts
1	Field soil – clayey-illuvial chernozem (argic – phaeozem)	pH_{H2O}	Weak alkaline reaction	The depreciation of this indicator is not forecast
		Humus	Very good supply	Maintains a high regime of nitrogen
		P-mobile	Very high-to excessive content	Induces a zinc and copper deficiency
		K-mobile	Very high content	Induces a magnesium and boron deficiency
		N-NO_3	High quantities of profile	With a dynamics towards the base of the profile, contamination forecast of groundwater
		mineral residue	Under the limit of toxicity	It doesn't degrade the system momentarily

We set in the same context of defining the soil's agrochemical monitoring elements to check and present the elements of nutrition, foliar diagnostic fields for its three key states –scarcity, normal state and excess (ICPA, 1998 table 4).

Table 4

Elements and domains of foliar diagnostic for the prognosis of negative vegetative states in tomatoes caused by the deficiency or excess of nutrients

Crt. var.	Nutritive element	M.U.	Areas of nutritional status		
			Insufficiency	normal	excess
1	Nitrogen	%/s.u.	<1.5	1.5-3.5	>3.5
2	$N\text{-}NO_3$	ppm	<100	100-1000	>1000
3	Phosphorus	%/s.u.	<0.15	0.15-0.40	>0.40
4	Potassium	%/s.u.	<1.5	1.5-3.0	>3.0
5	Sulfur	%/s.u.	<0.15	0.15-0.30	>0.30
6	Calcium	%/s.u.	<0.5	0.5-1.5	>1.5
7	Magnesium	%/s.u.	<0.2	0.2-1.0	>1.0
8	Iron	ppm	<50	50-200	>200
9	Manganese	ppm	<25	25-200	>200
10	Copper	ppm	<5	5-100	>100
11	Zinc	ppm	<10	10-100	>100
12	Boron	ppm	<10	10-50	>50
13	Molybdenum	ppm	<0.5	0.5-5	>5
14	Mineral residue	g/100g soil	• Limit to which the production starts to be affected:0.20 • Limit to which the production decreases with 50%: 0.45		

CONCLUSIONS

The following conclusions can be drawn from the analytical data presented on the agrochemical indices values for the field tomato crop:

1. Soil reaction is slightly alkaline (pH 7.5 to 7.7), and the buffering capacity of the soil and the high content of humus cannot forecast its degradation.

2. In contrast, a very high content of mobile phosphorus and potassium is potentially determining the disturbance of zinc chemistry

(being given the negative interaction P/Zn) and the excess potassium can result in a disturbance of the magnesium and boronon regime.

3. The dynamics of nitrate in this soil forecasts high and constant concentrations of these anions on the profile and to the end of the life cycle of the crop, their high concentrations moves its peak to the average and base of the soil profile, even with a potential of groundwater contamination.

4. From the point of view of soluble salt concentrations, there is no prognosis of adverse effects due to the high content of humus (and of the Humifiable organic matter).

5. The award/acordare of limits and agrochemical indices areas in the forecast of some poor nutritional state as the monitoring of soil quality, allows both fertilization decisions and measures to prevent failure/insuficienta states, deficiency and excess - toxicity in tomato culture.

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