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Quality properties of vegetables and fodder crops grown on salt-affected soils

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Summary. This physiological study have demonstrated that enhanced hydrolysis of total carbohydrates may regulate the adaptation of plants to salt-affected soils as environmental stress. Pepper, tomato, parsley, carrot, alfalfa and red clover were cultivated on open field in Ovce Pole region.

Key words: crop growing, salt-affected soils.

1. Introduction

Several compounds have a crucial role in higher plants in their response to various environmental stresses like salt-affected soils (Seemann & Sharkey 1987; Chandler & Robertson 1994). Physiological studies have demonstrated that enhanced synthesis of compatible solutes like proline, glycine-betain and soluble carbohydrates (Blackman et al. 1992) regulate the adaptation of plants to environmental stresses. In Ovce Pole produced food such as vegetables, forages, cereals have a good taste and yields. Salt-affected soils in the region of Ovce Pole (Republic of Macedonia) are actively used for agriculture and these soils are very fertile. Producers used mostly seeds of locally adapted varieties or traditional landraces.

2. Study area

The emergence of arid and semiarid and continental-Mediterranean climate (mean annual temperature 12.5°C, number of summer days 123.3) with strong evapotranspiration more than the amount of annual rainfall 471.8 mm (April – October 229 mm) along with the accumulation of easily soluble salts and dissolution of paleogenic salt sediments are the main factors for the genesis of saline soils (Filipovski & Ciric 1963). Such basic properties of these soils like humus content, reaction and exchangeable cation percentage are given in Table 1 (Filipovski 2001).

3. Research methods

Pepper (*Capsicum annuum* L.) landrace *ajvarka*, tomato (*Lycopersicon esculentum* L.) l. *jabucar*, parsley (*Petroselinum sativum* L.) l. *mustafinski*, carrot (*Daucus carota* L.) l. *amzabegovski*, alfalfa (*Medicago sativa* L.) l. *ovcepolska* and red clover (*Trifolium pratense* L.) l. *ovcepolska* as fodder crop were cultivated on open field, v. *mustafino*. Materials used for analysis were stem, leaves and fruits or roots gathered from mature plants. In the case of alfalfa

Table 1. Chemical properties of sulphate solonchak on arable land (Filipovski 2001)

Depth	Humus	pH		Ca^{2+}	Mg^{2+}	Na^{+}	K^{+}
	(%)	in H_2O	in KCl	(%)			
0–20 cm	0.81	8.8	8.7	51.1	16.1	28.3	4.5
20–40 cm	0.56	8.8	7.9	47.7	14.8	35.9	1.6

material used for analysis were stem and leaves collected from 3nd cut. They were dried out on 60–70°C. The content of total and soluble sugars was measured according to the method of Dubois et al. (1956). During the growth crops were irrigated regularly. Parallel control samples were set in Kocani in order to compare with ones growth on salt-affected soils.

4. Results and discussion

The results concerning the content of total and soluble sugars are given in Table 2, whereas concentrations are relatively high particularly at soluble. If there is consider the content of soluble sugars, it becomes clear that their concentration is very high in cultures grown on salt-affected soils and alert that "something" is happening. Salinity acts like drought on plants (Jagendorf & Takabe 2001), preventing roots from performing their osmotic activity where water and nutrients move from an area of low concentration into an area of high concentration. Therefore, because of the high salt level in the soil, water and nutrients cannot move into the plant roots. Activation of hydrolysis of total sugars in the plant which increases the concentration of cellular content and osmotic pressure rise (Cheeseman et al. 1985), are measures for adaptation of the plant which is trying to overcome stress (Hanson et al. 1985; Stewart & Voetberg 1985). If we compare with control samples that were analyzed can be concluded that the content of total sugars was higher than in plants grown on salt-affected soils, but the concentration of soluble sugars was significantly lower. This is probably due to the fact that there is no stress factor such as in plants grown on salt-affected soils. Major unsolved questions about high salt tolerance are occurred; this work reported here consists entirely of observations on the physiology of the salt tolerant plant. At this level the mechanisms cannot be solved, but may help point at significant areas to be investigated at a deeper level.

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Table 2. Total and soluble sugars at vegetable and fodder crops

Crop	Salt-affected soils	Control soils	Salt-affected soils	Control soils	Salt-affected soils	Control soils
	Stem		Leaf		Fruit/Root	
	Total / soluble sugars content (in % of dry mass)					
Pepper	14.1/10.7	14.9/8.6	13.5/11.6	14.1/8.9	20.2/17.4	18.4/12.3
Tomato	12.6/8.2	11.8/7.5	14.1/10.9	14.7/7.6	21.3/16.8	20.6/13.4
Parsley	10.1/6.7	12.0/6.4	13.4/9.2	13.6/6.9	–	–
Carrot	11.5/7.7	12.2/7.1	11.9/8.3	13.4/7.7	9.4/7.6	13.7/8.1
Alfalfa	9.2/6.4	8.4/6.2	14.1/11.3	14.0/9.2	–	–
Red clover	8.5/6.1	8.0/5.7	12.7/8.9	13.1/8.2	–	–

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