DEGRADATION OF SOME PPHYSICAL SOIL PROPERTIES AFTER INTENSIVE EXPLOITATION OF GREENHOUSES DUMBRAVA-NEAMT

DEGRADAREA UNOR ÎNSUŞIRI FIZICE ALE RESURSELOR DE SOL DIN SOLARIILE DUMBRAVA-NEAMȚ

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Abstract. *Getting early production, plant protection against natural risk factors (hail, frost, frost, etc.) are the main advantages of planting vegetables in greenhouses. Implementations of modern technologies for growing plants without knowing the soil characteristics determines degradation of soil resources and reduce the qualitative and quantitative obtained yields. Researches carried out on greenhouses soils allowed us to detach some conclusions: (i) soil cover with plastic favored increasing compaction within the area between rows, (ii) reduce the aeration porosity, (iii) decrease plant vigor and production obtained.*
Key words: soil proprieties, greenhouse, degradation of soil

Rezumat. *Formarea şi evoluția solurilor din sere este influențată în măsura mai mare de Obținerea de producție timpurie, protecția plantelor împotriva unor factori de risc natural (grindină, brumă , îngheț, etc) sunt principalele avantaje ale cultivării lor legumicole în solarii. Implementarea unor tehnologii moderne de cultivare a plantelor fără cunoaşterea însuşirilor resurselor de sol are ca efect accentuarea proceelor de degradare a solului şi implicit diminuarea calitativă şi cantitativă a producțiilor obținute.. Cecetările efectuate asupra solurilor din sere şi solarii ne - au permis să desprindem unele concluzii: (i) acoperirea solului cu folie de plastic a favorizat creşterea gradului de tasare în zona aflată între rânduri; (ii) micşorarea porozității de aerație; (iii) scăderea vigorii plantelor şi a producției obținute.*
Cuvinte cheie: proprietăți ale solului, seră, degradarea solului

INTRODUCTION

The main criteria for the loccation of the greenhouses are the existence of heating and water sources. Due to the compulsory location imposed by the above conditions, many greenhouses were placed on soils considered with a low capability (Filipov, 2001, 2002, 2004) but then through the application of land improvement works satisfactory results have obtained (Canarache, 1995).

The greenhouse soils must have a medium texture (clay- 12-20%), without coarse rock fragments and present a good water and air permeability (Florea, 1987, Canarache, 1973).

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The intensive technology for growing the horticultural plants, high irrigation requirement and the high soil moisture, specially with low internal drainage, favor on short term the degradation of morphological, physical and chemical properties of the greenhouse soils. After 7 years of intensive exploitation of Dumbrava-greenhouse one discontinous compact impermeable horizon was formed. This horizon represents a barierr for roots pentetration, water and air mowement and favors also high accumulation of solouble salts.

The growing of the legumes plants in the greenhouses or plastic tunnels has some advantages such as obtaining of early production, plant protections against of some natural risk factors (hailstone, hoar frost, frost etc.). The surface of plastic tunnels are extended significant in the last period (2000 - 2008) due to improving of plants growing technology such as using of plastic mulch, drip irrigation. It is well known that plastic mulch have some advantages: increase soil temperature and diminishes diurnal amplitude of temperature,, reduce leaching of fertilizers, conserve moisture, increase nutrients bioavailability, decrease losses of nitrogen compounds.

Our investigation concern to the greenhouses soils hortic pharm Dumbrava evidenced that plastic mulch have some negative influence on the soil properties and production quality (fig.1): increasing of soil compaction between plant rows, decrease air porosity, and cucumber seed production.

Fig. 1 - The negative effects of plastic mulch and moisture excess on the tomato plants

Water stagnation over the compacted soil horizon requires amelioration works. Improvement the soil fertility can be obtain by deep losening without reversal soil horizons and avoid soil cover with plastic mulch.

MATERIAL AND METHOD

In the hortic pharm Dumbrava there are 5 greenhouses (fig. 2), each of them has almost 450 m^2.

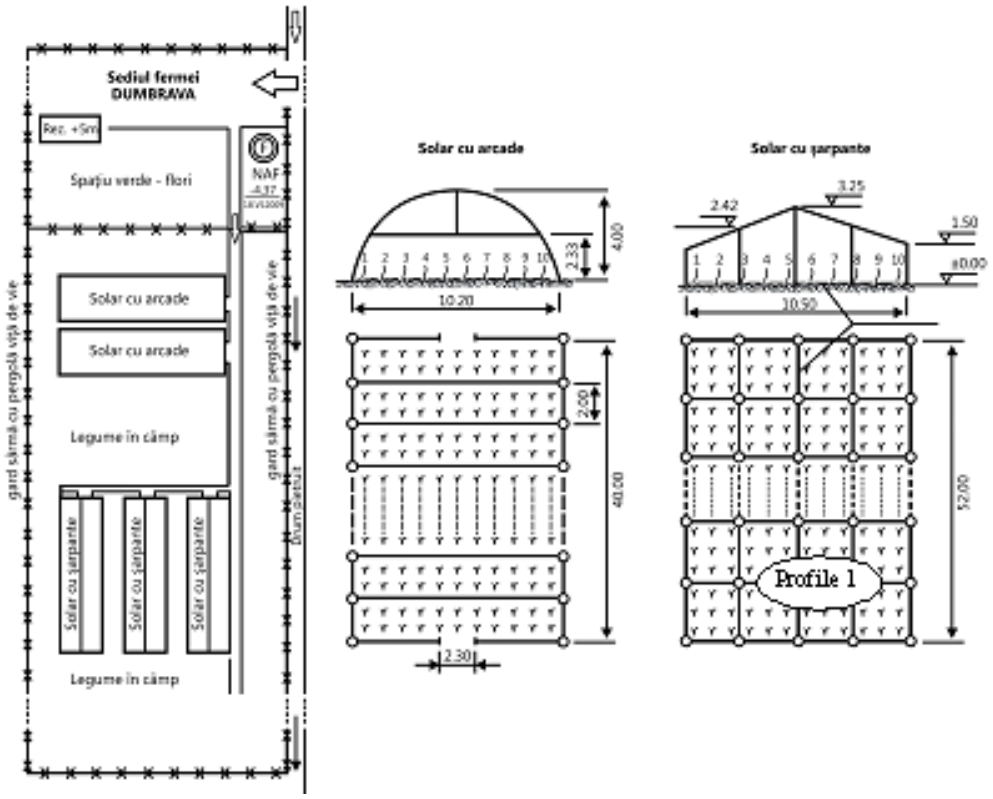

Fig. 2 - Location of different greenhouses type on Dumbrava pharm. Placement of representative soil profile

The greenhouse was located on a plain surface, the slope present the possibility of a landslide. The soils from the first class capability for greenhouses must have in 0-50 cm layer a humus reserve higher than 300 t/ha, slightly acid reaction and a low content of soluble salts and exchangeable sodium less than 5% of cation exchangeable capacity.

Four soil profiles were also studied. After morphological characteristics soil diagnosis is hipohortic vermic Faeoziom (after Romanian Soil Taxonomy-2003, 2009) For this study one representative soils profile have been selected. After morphological description, undisturbed samples from 10 to 10 cm were collected down to, the depth of 50 cm. In the lab, the bulk density and water content was determined. The physical analyses in four replicates for each depth were independently performed.

Disturbed samples from the soil profiles were also taken. These samples were used to determine the total soil organic matter by potassium dichromate method (Walkley-Black), total nitrogen content by Kjedahl method, pH by potentiometric method, size particle by Kacinski method. The chemical analyses in three replicates for each depth were independently performed.

RESULTS AND DISCUSSIONS

After morphological description the soil is diagnosticated as hipohortic hipovermic Faeoziom. Soil consists of one loose ploughed horizon (Ap1), one moderately compacted horizon (Atp) with high content of organic matter, molic horizon (am), slight weathered horizon (B cambic) anh C horizon (fig. 3).

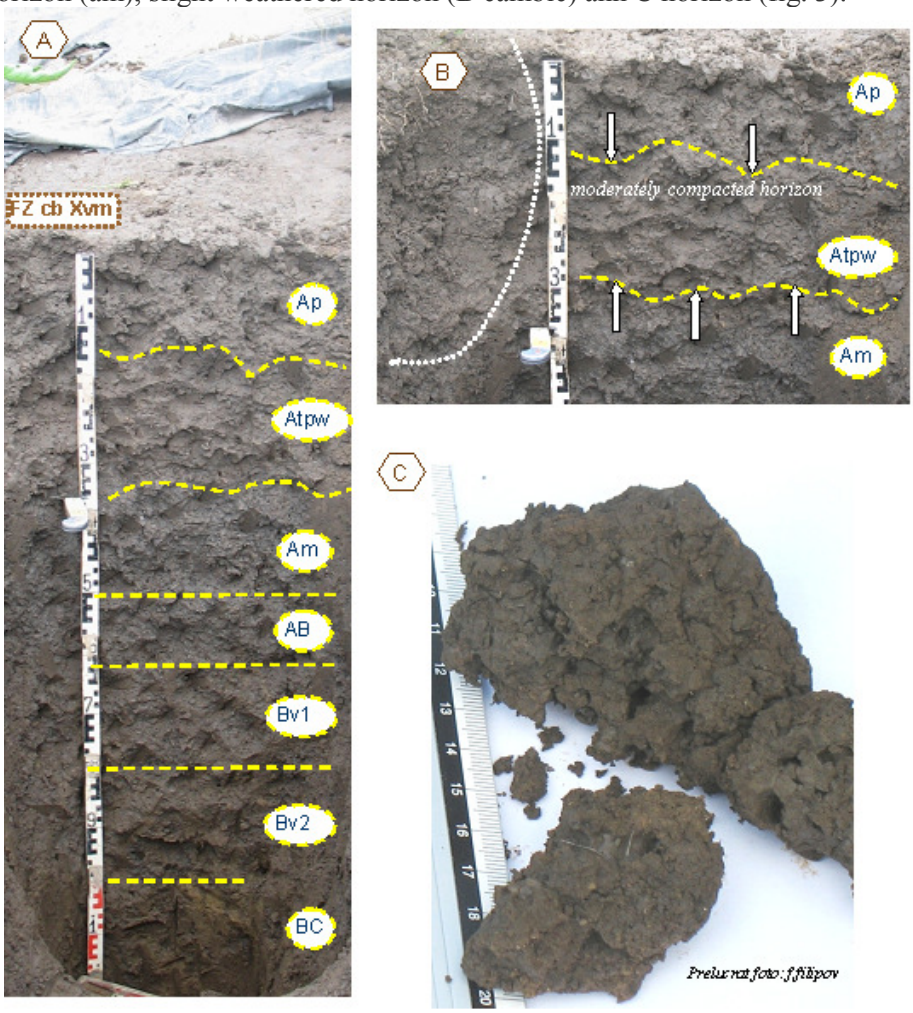

Fig. 3 - A- Hipo**ho**rtic (**Xho**) **c**am**b**ic (**cb**)**F**aeo**z**ioms (**FZ**): **B-** Moderately compacted soil horizon suited between plant rows and slight loose soil horizon on the plant rows; **C**-High biological activity evidenced by presence of special biological soil formation.

The presence of frequent earthworm channels suggests a great biological activity. The soil texture is loamy clay. The soil is slight drained due to plain surface of greenhouse and to moderately compacted horizon on the upper part of soil profile (Atpw). The bulk density intervals values are between 1,25 and 1,59 g/cm^3. The highest bulk density values is registered on the marginal yone of plastic tunells and shows a stronger soil compaction.

Table 1

The bulk density medium values of the upper part of soil from greenhouse Dumbrava

Depth (cm)	Horizon	Bulk density g/cm^3			
		RP_c	BR_c	RP_m	BR_m
5-10	Ap_1	1,25	1,33	1,35	1,43
15-20	Ap_1	1,29	1,38	1,41	1,47
20-25	Atpw	1,35	1,52	1,41	1,57
30-35	Atpw	1,33	1,47	1,43	1,59
45-50	Am	1,32	1,36	1,39	1,42

Legend: **RP_c**-plants rows; BR_c– between rows; c - central part of plastic tunnels; m – marginal zone of plastic tunnels

Uneven distribution of water content on the soil from Dumbrava plastic tunnels is shown in the figure 5.

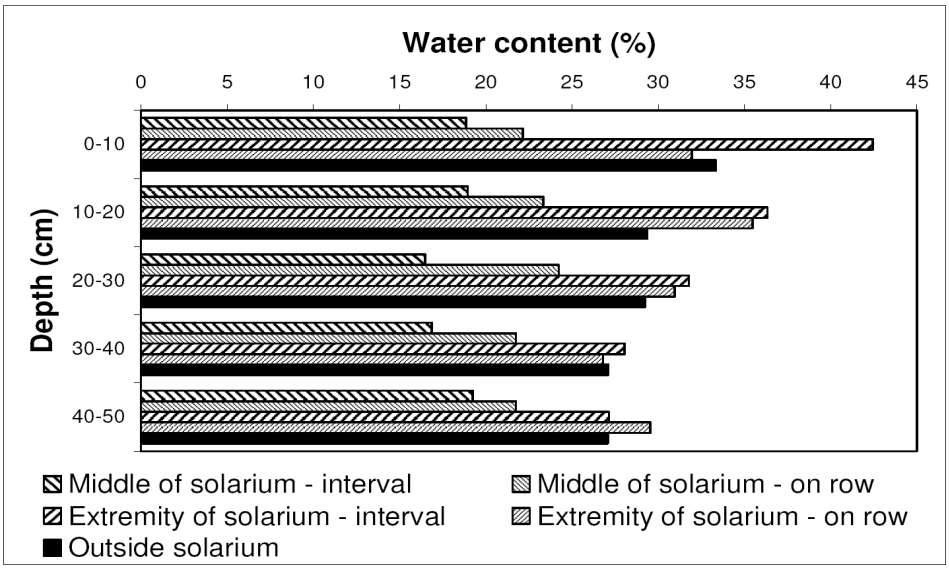

Fig. 5 - Water content from soil according to depths and zones in the classical-type solarium

For avoiding the formation of water excess at the extremity of classical-type solariums, during the periods with abundant rainfall, we recommend the achievement of ditches that collect and evacuate water runoff from the top of solarium.

Another recommended measure are deep losening works without reversal soil horizons and avoid soil cover with plastic mulch which prevent water evaporation loose and increase the period of water stagnation.

CONCLUSIONS

1. A discontinuous compacted horizon has been formed at the depth of 15 – 40. The more frequent alternations of the wetting and drying processes favor a

closed packing of soil aggregates. The improvement of the soil properties could be realized by deep loosening works without reversal soil horizons.

2. For avoiding the formation of water excess at the extremity of classical-type solariums, during the periods with abundant rainfall, we recommend the achievement of ditches that collect and evacuate water runoff from the top of solarium and prevent moisture excess on the marginal solarium zone.

REFERENCES

1. **Canarache A.,1973** - *Solution for creating of the optime water regime in greenhouse soils*. Horticulture and Viticulture Journal, no. 6.
2. **Canarache A.,1995** - *Problems in soil physics of specific interest for horticulture.* Simp Ecotehnologies and ecotechinques in soil tillage for horticultural crops (in romanian) I.C.L.F Vidra Ed, AGIR, p.16-24.
3. **Filipov F., Tomiță O., Zaharia M., Ulea E., 2001** – *Modificarea unor însuşiri fizice ale antrosolului hortic din seara Copou – Iaşi, sub influența tehnologiilor intensive de cultivare a plantelor*. Lucr. Şt., U.Ş.A.M.V. Iaşi, seria Agronomie.
4. **Filipov F, Tomiță O, Volf Mariana, Zaharia M., 2002** – *Influența tehnologiilor intensive de cultivare a plantelor asupra unor însuşiri chimice ale antroposolului hortic din sera Copou – Iaşi.* Lucr. şt. U.Ş.A.M.V. Iaşi, seria Horticultură, vol. 45.
5. **Filipov F, Tomiță O, Lupaşcu Angela, 2004** – *Procese de degradare a solurilor din sere.* Lucrările Simpozionului Ştiințific „Factori şi procese pedogenetice din zona temperată", vol. 4, serie nouă, Editura Universității „Al. I. Cuza", Iaşi.
6. **Florea N., Bălăceanu V., Răuța C., Canarache A., (redactori coordonatori), 1987** – *Metodologia elaborării studiilor pedologice, vol.1-3*. Institutul de Cercetări pentru Pedologie şi Agrochimie, Bucureşti.
7. **Florea N., Munteanu I., 2003, revz. 2012** – *Sistemul Român de Taxonomie a solurilor.* Ed. ESTFALIA, Bucureşti.