PRELIMINARY STUDIES REGARDING THE IMPROVEMENT OF ECOLOGICAL VEGETABLE GROWING TECHNOLOGY BY USING MULCH AND SUPERABSORBENTS

STUDII PRELIMINARE PRIVIND ÎMBUNĂTĂȚIREA TEHNOLOGIEI DE CULTIVARE A LEGUMELOR ECOLOGICE ÎN SPAȚII PROTEJATE PRIN FOLOSIREA MULCIULUI ŞI A SUPERABSORBANȚILOR

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Abstract. *The aim of the present paper is to achieve a study regarding the classification and implementation of modern methods for vegetables grown within ecological agriculture system using superabsorbents polymers and different mulches. By applying these materials water will be saved and it will be accomplished an improvement of hydric and thermic conditions in soil. Therefore, the plants will have a propitious growing environment for obtaining early yields.*

Rezumat. *Lucrarea îşi propune realizarea unui studiu privind clasificarea şi implementarea unor metode moderne de cultivare a plantelor legumicole, în spaţii protejate, în cadrul sistemului de agricultură ecologică, folosind polimeri superabsorbanţi şi diferite tipuri mulci. Prin aplicarea acestor materiale se realizează o îmbunătăţire a regimului hidric şi termic în sol precum şi o economie de apă, asigurându-se condiţii normale pentru creşterea şi dezvoltarea plantelor şi obţinerea de producţii timpurii.*

A present tendency for worldwide agriculture, especially horticulture, is the development of new technologies that aim to increase yields, to utilize natural resources in the most efficient manner without using chemical fertilizers and controling pests and diseases with pesticides.

The balance less stable of the environment can be improved by applying some technical measures that influence natural conditions to the plants and yields benefit (Ciofu Ruxandra, 2003).

It is recognized water importance for physiological and biochemical processes; therefore, plants growing and development could happen in normal limits only in the presence of water. Unlike other agricultural plants, vegetables are succulent. In these circumstances, vegetables have larger demands for water.

A fundamental principle of biological vegetable growing statue that pesticides are forbidden. Therefore, it is necessary to find alternative methods that weeds control cannot be accomplished by using herbicides.

MATERIAL AND METHOD

Considering the aspects above, the present paper aim to achieve a study regarding two promising alternative methods: *mulching* and *superabsorbents.*

The information presented are a synthesis of a large documentation accomplished between 2005 – 2007.

RESULTS AND DISCUSSIONS

Mulching represents a technical method used for horticultural crops (especially for vegetables) through which the soil surface is covered with different materials with the view of assuring more propitious growing and development conditions for cultivated plants.

Alongside reconsideration of low inputs growing methods (as examples could be mentioned organic, biological, ecological growing methods which have as an aim the sustainability and durability of agricultural exploitation systems) mulching became important, being an alternative to soil thermical and hydric stress reduction and to decrease of some biological factors of major risk (pests and diseases attack and appearance of weeds).

Considering these aspects together with the necessity of using protection techniques and methods for vegetable crops it has been underlined the opportunity and importance of mulching usage with more and more efficient materials.

Research accomplished in mulching area divide the materials in two major groups: organics (straw, peat, compost, vegetal leavings, sawdust, wood chips, paper and others) and anorganics (gravel, broken stones, sand, transparent/coloured (especially, the black ones)/photodegradable plastics, unwoven polyesters, mineral oils reziduum and emulsions and others). Recently, on mulching area entered the organic and partially synthetic materials (agrotextiles) (**Munteanu**, 2003).

Practice and experiences underlined over time the influence of mulching on environment (humidity, soil air and temperature and its physical, mechanic, chemical, microbiological characteristics). Mulching assures the environment sustainability. The techniques use has to be adapted according to mulch type and quality, otherwise the eventual mistakes can cancel mulch positive effect.

Mulching effects become more important in the circumstances of sustainable agriculture systems promotion where the maintenance of soil productive potential represents an imperative objective and weeds control cannot be accomplished by using herbicides.

Some of the mulching possible disadvantages are as following: making an impediment for oxygen and water (plastic mulch stops the transfer of water and oxygen into the soil), appearance of a humidity excess (the mulch with a fine texture – grinding peat, freshly small mown grass and sawdust cand retain a large quantity of water), appearance of burns (black mulch warms too much during the

day; as a result, the plants are suffering, especially the succulent ones); it is necessary to reinstall or remove the mulch (depending on mulch type).

Superabsorbants – water management methods – are substances devoid of toxicity which acts like a "supersponge" absorbing and maintaining large volumes of water and aqueous solutions. Superabsorbents can release the liquid depending on environment neccesities.

From chemical perspective, superabsorbents are included in polymers group.

The use of polymers (with distinct chemical structures and properties) in order to improve soil physical properties has been known since '50.

The most used polymers and copolymers are the ones made from acrylates and acrylamide.

The history of superabsorbents polymers began in the 60's when the group of agricultural research „Union Carbide" developed a hydrogel that absorbed water more than 40 times its weight. At the beginning of 80's superabsorbents polymers ("superslurpers", "slush powder") began to be used in personal hygiene industry too. Worldwide production from middle 80's was estimated at 12.000 tones (2/3 was produced in Japan), at middle 90's the production increased to almost 230.000 tones and in 2003 the demand reached 1,05 millions tones, the main consumer countries being United States of America, Japan and European Union. In the next years it is been anticipating an exponential increase of the demand for superabsorbents due to their physical and chemical properties, favourable effects and many domains in which can be used.

Obtaining biodegradable hydrogel was intensively studied due to their special properties and aplications in various domains: food industry, agriculture, medicine, pharmacy etc.

Superabsorbents, due to their capacity of retaining and releasing water whenever plants need it and their capacity of increasing volume and transforming in gel particles, have a large use as additives for water retainment and degraded soil amelioration. Superabsorbent material can be used with distinctive results for sowing and transplanting, garden design, turf lands stabilization or salty soils amelioration.

Superabsorbent materials are available in different forms: granule, powder or fibers.

Superabsorbents may be considered a chemical "irrigation" system that assures to the plants a reserve of humidity available for a longer period of time.

The mechanism of volume increase and water attraction is based on osmotic pressure principle.

There are some basis methods for superabsorbents use:

a. For **sowing** superabsorbents are mixed with water and other supplementary elements that favor and stimulate germination:
   - use by mixing non hydrated superabsorbents cristals with growing medium;

- the dissipation and light incorporation of non hydrated superabsorbent on a surface to be sowed;
- the use of superabsorbent as a gel by its incorporation into the soil.

b. For plants **transplantation** superabsorbents can be used as following:
   - superabsorbents can be uniformly introduced into the vegetation nest where the plant will be transplanted;
   - superabsorbents can be mixed with the nutritive substrate that will cover plants roots;
   - plants roots can be introduced into the hydrogel prepared before planting the plant.

Over the time many researchers and farmers tried to explain the success of using superabsorbent materials and they formulated the following characteristics (Wofford, 1989):

*superabsorbents have the capacity of easily and rapidly storing water in significant quantities (200,300 to 500 times their weight);

*superabsorbents present *stopper effect*: the crystals have the capacity of partially closing capillary vessels, impeding water losses through evaporation;

*superabsorbents materials retain nutritive substances for a longer period of time;

*superabsorbents are very important in reducing stress; during drought times the roots consume large amounts of water; it has been shown that a small number of superabsorbent crystals around the roots can diminish hydric stress.

CONCLUSIONS

The facts presented above point out the importance of some materials less used in agriculture/horticulture for growing technologies improvement. This will have the following effects: quantitative and qualitative increase of yields, rational use of resources, environment preservation and its protection toward chemical agents that can pollute. Therefore, these technologies opt for a sustainable (durable) development of agriculture and especially horticulture.

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