DESING ELEMENTS OF USED MATERIALS FOR DEVELOPMENT OF FORCED VEGETABLES CULTURES

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Abstract

This paper emphasizes the design elements of materials with greenhouse effect used in vegetables systems for forced and protected cultures. For the analysis and interpretation of material – vegetation factors – plant relationship we described a conceptual model of optimization of a complex functioning system.

Key words: forced cultures, polymeric foils, textile material, system;

INTRODUCTION

Vegetable cultures in protected areas represent a production area with a high degree of intensity and production possibilities much higher than field vegetables crops. From the history of cultures in lay out spaces we have (**Munteanu N.s.a.-2008**):

- The vegetable system of forced cultures which take place in special construction like greenhouses, heated solaria, hotbeds where the vegetation factors are controlled and handled permanently, and vegetables are obtained all year;
- The vegetable system of protected cultures which takes place in more simple constructions like solaria, glass houses, low shelters made of plastic materials where the plants have partially improved mycroclimate conditions. The temperature can increase in the interval 2-10^{0}C, because of greenhouse effect. This system protects cultures from cold drafts and is used to obtain crops out of season;
- The vegetable system of sheltered cultures ensures a mycroclimate through simple means, this being used as wind shelters (natural sheltered spaces) or cold (covers and individual shelters).

The selection of construction materials to ensure a mycroclimate with controlled parameters represents one of the most important problems in achieving durable and economic systems of forced cultures**.**

POSSIBLE DEVICES REGARDING THE DEVELOPMENT OF GREENHOUSE EFFECT USING POLYMERIC FOILS

The spectre of visible range contains radiations with wave lengths between 480-700nm. Due to the climate and environment changes with consequences on the consistency of the ozone layer, the quantity of ultraviolet radiations is larger. As the electromagnetic waves specific to the visible range and UV pass through a transparent material (glass or hydrocarbon polymers), the radiations change their frequency in that they diminish the frequency and increase the wave length. Practically, the UV and visible radiations become infrared radiations having a higher thermal effect proportionally with the wave length.

According to the transparency characteristics of the materials used to obtain the greenhouse effect we know that glasses with a content of iron higher than 0.3% completely obstruct the passing of UV radiations through normal glasses resulting in a decreased greenhouse effect.

It is extremely interesting the idea of using or synthetising of a polymer with a controlled greenhouse effect from the structure of the polymer. The implied aspects are extremely complex if we take into account that the using of a polymer with greenhouse effect must practically have a high resistance to UV action so that it will not be damaged by their presence. The UV radiation with a wave length of 300-450 nm is

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absorbed by the plants' pigments and have a major role in all physiological processes. That's why these materials must achieve a correlation between the high resistance to UV and the good transparency capacity in visible range.

The transparent polymers in visible range are those with hydrocarbon structure, for instance polyethilenes and polypropylenes. The absorbtion of UV radiations is explained by the presence in the polymer of some photoinitiation groups, for instance carbonyl groups, and the degradation process can be atributed to free radicals produced by photo-decomposition of these groups. The free radicals continue to react with oxygen resulting peroxy radicals which propagates the decomposition through a self-oxidation mechanism.

We add antioxidation stabilizers and light stabilizer to delay the thermal oxidation and prolongate the duration of using the olefinic polymers products. The selection of stabilizers must correspond to the decomposition mechanisms of the products.

THE TEXTILE MATERIALS USED FOR THE VEGETABLE SYSTEMS OF PROTECTED CULTURES AND FOR THE SOIL PROTECTION

The textile materials have been used for a long time in agriculture, in order to control the luminosity, weeds and insects, to extend the growth season of plants and to recover the soils damaged by erosion. From the raw materials class, the agrotextiles are made of both synthetic and natural yarns, for instance: polyester, polypropylene, jute and fleece. As obtaining technologies, the textile materials can be: knitted, wove and non-wove and are classified from a functional point of view into:

a) materials used to extend the growth season of plants which ensure a microclimate with controlled parameters of temperature and humidity;

b) materials used to control the surface erosion of soil;

a) The textile materials which ensure certain microclimate parameters are designed according to the specific requirements of plants i.e. temperature, light intensity, solar radiation and humidity. We know that the temperature and solar radiation play an important part in the life of plants acting frequently on photosynthesis, so that raw materials used for the obtaining of materials have an increased stability to UV radiations. UV. UV absorbers incorporated into the fibres are derivatives of o-hydroxy phenyl hydrazines, o-hydroxy phenyl triazines. Organic products like hydro benzophenone and benzotriazole are used for coating processes in order to achieve protection against UV rays.

Also, selecting certain wave lengths, the solar radiation contributes to the general exchange of heat, to radiation and caloric balance, complex phenomena in which take part temperature and humidity, evaporation and condensation water and has an important role for the physiological process of plants. According to the specific of plants, certain indicators must be established for the textile materials: the air flow which passes through the material q(m^3/min), light intensity I_0.

The knowledge of optical transparency and of rays tranmission percent in different areas of the spectre are of great importance for the photosynthesis process. The air permeability allows the evaluation of air flow which passes through material balancing this way the temperature and humidity from microclimate, this being directly influenced by the specific mass and consistency of the material. The porosity of materials can be independently evaluated as an indicator for making the structures of materials, but can also include the influence of other factors: humidity, air permeability, vapour permeability.

b) Although there are many textile structures for geotechnical applications, these must interact with the soil or the surrounding geotechnical environment considered as a complete system.

From the structure of the system, we understand that the role of the textile materials in the anti-erosion actions is expressed in the following main functions: filtration, separation, armament. In relation to attributed functions, the geosynthetical materials used to recover the soil must answer to certain mechanic and hydraulic characteristics: the resistance and elongation to pulling at maximum capacity, creep from pulling, creep from compression, resistance to abrasion, filtration characteristic opening, perpendicular permeability on the plane. The geotechnical applications from vegetal fibers as flax or jute can be used due to their superior technical properties (resistance to elongation and high elasticity module). The advantages of using natural geotextiles: are good for the environment (biodegradable), can have a superior resistance to chemical fibers, low cost.

The using of geosynthetical materials for soil consolidation works represent a special area of geotechnical engineering. In relation to the geosynthetical materials' functions in the development of appliances, these must accomplish certain mechanical, physical and hydraulically properties.

THE PROPOSED CONCEPTUAL MODEL REGARDING THE OPTIMISATION OF THE RELATION TEXTILE MATERIAL – MICROCLIMATE – GROWTH PROCESS OF PLANTS

The model of a system allows the characterization of the whole process and the analysis of experimental data by ensuring of numeric values to the important variables of the process. By modeling we understand the study method based on the usage of models. Most of the researches in the technical field use this method. The modeling represents the actual elaboration activity of the model of the source system, the specific activities for this purpose are:

- techniques and procedures of identification;
- simulation techniques;
- complementary techniques and procedures;

According to the material character, models can be:

- abstract: theoretical, mathematical;
- material: physical, replica;

The clasic stages for the modelling are:

1. The building of the base model:
- the preliminary analysis of the modelling system, to emphasize the relevant parameters and functional relations between them;
- the establishment of the model's structure;
- the establishment of the values of defining model's parameters;

2. The analysis of the model through simulation;

3. The comparison of analysis results with the behaviour data of source system in equivalent conditions;

4. The adjusting of the model, which means the contiguity of the behaviour to the source system;

In mathematics, studied as area of numeric analysis, the interpolation is a building method of new data in the interval of a known data set. In the engineering researches, it is often known a set of points, obtained directly through experiments or sampling techniques, and they try to build a function (aproximation curve) which passes as close as possible to these points. The interpolation represents a special case of aproximation curve, in which the function must pass right through the given points.

Another closely related aspect to interpolation is the approximation of a complicated function with a simple function, easier to use in mathematical calculations. Let's suppose that we know the function, but it is too complex to evaluate it efficiently. In this case, we could choose a known set of data from this function, creating a search table so we can interpolate them to build a simpler function. Of course, then when we use the simple function for the calculus of new values, we usually don't get the same results as when we use the initial function. But, with an attentive analysis on the problem area and the method of interpolation, the advantage of simplicity can compensate the approximation error. There are known lots of interpolation techniques, which can be particularized or combined for different problems which need to be solved. In the selection of a method in this area of possibilities, we must answer to the following questions: How much data is needed for interpolation? What is the class of derivability of the interpolation agent? The most simple interpolation method is that with constant values on portions.

For the development of proposed conceptual model, which represents a complex of elements or functional units which have relations and accomplish a function, we must analyse the relations between: the technological and functional indicators of the material – the variables of microclimate – the growth and development process of the plant. The total of relations between the said elements represent the structure of the system. (fig. 1)

The plant has the information regarding the optimal temperature ($T_{OP}{}^{0}C$) needed in its growth and development process. The external disturbance ($T_{M1}{}^{0}C$, $U_{M1}\%$) represented by an external source of heat and humidity, before is perceived by the plant, passes through the filter (system). The differences of temperature between the microclimate temperature ($T_{M2}{}^{0}C$+ $T_{S}{}^{0}C$) and the optimal one ($T_{OP}{}^{0}C$) represents the system error (ε). The base condition for adjusting in the functional parameters of the system is given by the error size which must be equal to 0.

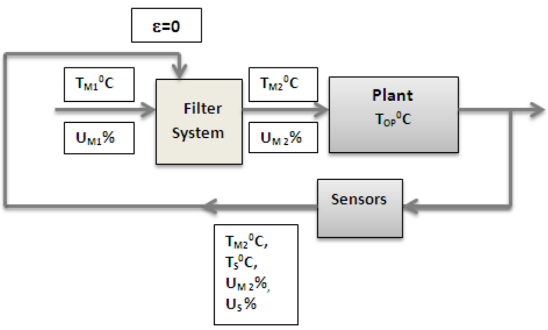

Fig.1 The conceptual system for the optimisation of the relation material – vegetation factors – plant

CONCLUSIONS

The design parameters of materials with greenhouse effect, the variations of microclimate parameters and the understanding of the physical processes which lead to a natural ventilation can not be totally modelled.

The materials used in special constructions, such as greenhouses, heated solaria, hotbeds must be easy to exploit, economic, durable and to respond to an increased photoselectivity.

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