

ORIGINAL PAPER

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## THE TRANSGENIC PLANTS – ADVANTAGES REGARDING THEIR CULTIVATION AND POTENTIALLY RISKS CONCERNING THE FOOD SAFETY

### PLANTELE TRANSGENICE – AVANTAJE ÎN PRIVIINȚA CULTIVĂRII LOR ȘI RISCURI LEGATE DE SIGURANȚA ALIMENTELOR

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#### ABSTRACT

During the last decades the genetic modified organisms (GMO) have started to “conquer”, little by little our lives. The most widely used are the transgenic plants, because they have bigger productions and they are resistant to different pests. In the beginning, the spread of the transgenic plants was controlled, but today many countries cultivate genetic modified plants without any control. Among these countries Romania is ahead, starting the cultivation of the transgenic plants in 1999, very soon after their obtaining. This paper outline the effect of the food consumption obtained from this plants which may determine different effects on human body. Also, because the genetic modified plants have bigger productions than the normal ones and they are more resistant, the farmers are not encouraged to declare that they are using genetic modified seeds. So, in that way, the consumer does not know what kind of food he consumes.

Key words: transgenic plants, cultivation advantages, consumption risks

#### REZUMAT

În timpul ultimelor decenii organismele modificate genetic (OMG) au început să ne “cucerească” viețile. Cele mai răspândite sunt plantele transgenice, pentru că ele au produsele mai crescute și sunt rezistente la diferite boli. La început răspândirea plantelor transgenice era controlată dar în prezent multe țări cultivă plante transgenice fără nici un control. Printre aceste țări România ocupă un loc de frunte, începând cultivarea plantelor transgenice încă din 1999, imediat după obținerea lor. Această lucrare subliniază efectele consumării alimentelor obținute din aceste plante care pot avea efecte diferite asupra corpului uman. De asemenea, deoarece plantele modificate genetic au producții mai crescute comparativ cu plantele normale și, de asemenea sunt mai rezistente, fermierii nu sunt încurajați să declare că folosesc semințe provenite de la plante transgenice. Astfel, în acest fel consumatorul nu mai știe ce fel de aliment consumă.

Cuvinte cheie: plante transgenice, avantaje al cultivării, riscuri de consum

## INTRODUCTION

The aim of this study is to realize an exhaustive image regarding the presence of the GMO, regarding their use and of the risk of them, in the context of the environment protection.

The study presents the way the transgenic plants were obtained and the actual situation worldwide. An important part deals with the presence and the use of the transgenic plants in our country, rejection of the GMO by the market, the social-economic impact of GMO and the awareness of the people. All these aspects are approached regarding our country compared to others worldwide and in the EU.

Transgenic plants and their new properties

The obtaining and, after this, the production with commercial aim of the transgenic plants determined a lot of enthusiasm within the researchers. The initial enthusiasm was then followed by the opposition of the skeptics, who tried, during the time, to argue against the cultivation of the transgenic plants.

The supporters of the transgenic plants cultivation base their arguments on the new properties of the transgenic plants. Among these, the most important are: resistance against the herbicides (more than half of the tries), followed by the resistance against the illnesses (mostly the viral ones) and against the insects. Nowadays are made tests regarding the quality and the male sterility (to create hybrids)

We will shortly describe now the properties of the transgenic plants already cultivated on a large scale (Cristea S., 2004).

### a) Resistance against the herbicides

It is manifested by the capacity of plant to live and to develop after it was sprayed with a strong insecticide substance. This property is due to the transfer of the Bar gene which determines different enzymatic actions materialized by the transformation of the herbicide into a non toxic element. In the case of the transgenic plants, the resistance against the herbicides is uni-specific, so the plant is resistant only against the herbicide for which it was created and for this reason the producer of the transgenic plant delivers also the characteristic herbicide for each transgenic plant.

### b) Resistance against the insect pests

The plants having this property are permanently synthesize in their tissue an insecticide protein that determine the death of the phytofage insects. The gene codifying the resistance against the insects originates in a soil bacteria - *Bacillus thuringiensis*

### c) Resistance against the illnesses

By transferring the gene codifying the protein of the viral

capsid there were obtained plants resistant against the illnesses produced by some viruses because it blocks the propagation of the viruses in the transgenic plant.

### d) Resistance against freezing

Even not on a large scale, but there were obtained GMO resistant against freezing. This type of resistance was obtained by two methods. First, the conventional cultures (especially strawberries) were treated with transgenic "antifreezing" bacteria. The second method consisted in insertion of some gene obtained from fishes living in cold water, as *Hippoglossus hippoglossus*, a fish living in the North Sea, transferred into strawberries.

### e) Delayed maturation

This property was first conferred to tomatoes. In this case, were also used two main methods:

- insertion of a gene that blocks the galacturonase, an enzyme producing the fruits softening;
- blockage of the maturing hormone synthesis; the maturation is then started by treatment with ethylene before transferring on the market.

Due to the new properties of the transgenic plants, their supporters have valid commercial arguments to support their production, cultivation and trading.

## Advantages of the transgenic plants presented by their producers and supporters

The supporters of transgenic plants producing and trading say that these have a lot of advantages both for producers, for farmers, for industry, for consumers and for the environment and the human future.

### a) For the producers of the new varieties (Apostu S., 2006).

A high efficiency in plants amelioration is obtained. The techniques of gene transfer are more precise because they allow the insulation and the propagation of the interest gene, while the classical hybridization techniques use the entire parental genomes and for this reason are needed backcrossings to emphasize the manifestation of a parental gene or to eliminate some secondary unwanted effects determined by the action of the gene in the genome. Furthermore, the number of the new characters susceptible to be conferred by gene transfer is much higher because the entire genetic information could be used despite its origin (viral, bacterial, vegetal or even human).

### b) For farmers (Johnson T., 1999)

First of all the process of pests destroying is simplified due to the elimination of herbicides in the pre-emergent period and in the vegetation period. For the GMO only one total herbicide is necessary.

On the other hand, the production output is increasing

Table 1. Cultivation of the genetic modified plants worldwide  
 Tabel 1. Cultivarea plantelor modificate genetic în lume  
 (James, 2003 *quo.* Malschi Dana, 2007)

| Country<br><i>Țara</i> | Surface cultivated with<br>GMO<br><i>Suprafața cultivată cu<br/>OMG<br/>(million ha)</i> | Percentage in the<br>total cultivated<br>area<br><i>Procentul față de<br/>total suprafețe<br/>cultivate</i> | Cultivated genetic<br>modified plants<br><i>Plante modificate genetic<br/>cultivate</i> |
|------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| USA                    | 42,8                                                                                     | 63%                                                                                                         | maize, soy, cotton, rape                                                                |
| Argentina              | 13,9                                                                                     | 21%                                                                                                         | soy, maize, cotton                                                                      |
| Canada                 | 4,4                                                                                      | 6%                                                                                                          | rape, maize, soy                                                                        |
| Brazil                 | 3,0                                                                                      | 4%                                                                                                          | soy                                                                                     |
| China                  | 2,8                                                                                      | 4%                                                                                                          | cotton                                                                                  |

as well as the profits of the transgenic cultures, even the obtaining cost of the GMO is rather high.

c)For industry

Due to the new properties of the transgenic plants, their processing could be also improved, as is the case of the modified starch, of low lignin content wood (in this case the paper manufacturing is less pollutant), of bio-plastics, of some human protein production (easier and in higher quantities, for therapeutic aim) (Nicholl D., 2002; Vlaic A., 1997).

d)For consumers

Nowadays the fruits and the vegetables with delayed maturation are easier stored, with minimum losses. The maturation moment can be controlled according to the demands of the market.

In the future it is considered that the transgenic plants can determine an improved human health due to the higher content of vitamins, minerals, essential aminoacids, by using the vaccine plants, the rice enriched in pro-vitamin A, etc.

e)For the environment and human future

First of all, transgenic plants imply a lower pollution due to lower quantities of pesticides. Then, higher agricultural productions are obtained and people hope to eliminate the starving in the world (by extension of the areas cultivated with GMO resistant against salted soils, acid soils, lower temperatures, etc.)

#### **Risks related to the cultivation of the transgenic plants**

Despite of their advantages, it seems that the obtaining and mostly the cultivation of the transgenic plants also imply some risks. The most important risks are the followings:

a) Risks related to the nowadays techniques of vegetal

gene transfer.

- Secondary unwanted effects. The first obtained transgenic tomato with delayed maturation was floury, with metallic taste and difficult to be transported due to its very fragile skin. Due to these reasons, the American consumers rejected it.

- “weaknesses” in the transgene expression (Desmond N., 2002). For example, in USA, in 1996, the fields with transgenic cotton were destroyed in proportion of about 60% by some insects against which the plants were considered to be resistant. Similar, also in cotton, after the second treatment with herbicide it was noticed a deformation of the capsule. This could happened because the producers have had no enough time to check the stability of the transgenic character on an enough great number of experimental fields.

b) Ambiental risks

- Limitation of the risk evaluation by experimental cultures

- Risks related to the health, materialized by some allergies and resistance to some antibiotics.

- Risks related to the biodiversity of the ecosystems by: (Cristea S., 2004)

- dissemination of the transgenic pollen to the similar spontaneous plants;

- crossings between transgenic and conventional varieties of species;

- apparition of some pest plants resistant against total herbicides

- Risks related to plants resistant to the insects attack:

- apparition of some pests resistant against the insecticide-protein of the Bt maize;

- intoxication of other insects by the transgenic plants

- toxicity for the enemies of the pest insects.

- Risks regarding the circuit of the insecticide toxins in soils and in the trophic chains;
- Risks determined by the cultivation techniques of the plants resistant against herbicide, insects, viruses.
- Risk of destruction of the spontaneous flora and of the plants in the neighborhood of the cultivated fields, by the total herbicides.

#### **Cultivation of the genetic modified plants worldwide**

The first commercial transgenic plants cultures started in the middle of 1990 years, in USA, where they have the fastest evolution.

Immediately after followed Argentina and Canada, where the increasing of the surfaces cultivated with transgenic plants stabilized beginning with 1999. Both countries were followed by Brazil and China (Table 1).

After only 7 years from their official start, the commercial cultures of transgenic plants reached a total surface of 60 million ha at which we could add the illegal GM soy cultures in Brazil of about 1 million ha.

There are also commercial cultures in other countries as: South Africa, Australia, Mexico, Portugal as well as in the Central-East Europe, in countries as Ukraine and Romania, but in these cases the surfaces are small, or their size and localization are not publicly recognized ([www.aabiotech.org/resources](http://www.aabiotech.org/resources)).

The worldwide market of transgenic plants consists almost exclusively, in four species: soy, cotton, maize and rapeseed. The other transgenic plants (potato, papaya, tobacco, pumpkin) are cultivated only on small surfaces, non-relevant for the total cultivated ones.

The global impact of the genetic modified plants presents the following aspects ([www.biotech-gmo.com](http://www.biotech-gmo.com)): the additional brut margin realized by the farmers by cultivation the genetic modified plants is of 22 billion USD, and the reduction of the pesticides quantities applied on the soil for the modified plants is about 172 million kg, resulting an impact coefficient on the environment of 14%.

#### **Cultivation in Romania of the genetic modified plants**

Romania has a relative long history regarding the cultivation of the genetic modified plants. Tacking into account that the first genetic modified soy and maize plants were cultivated in North America in 1996, Romania started their cultivation only after two years later. According to the Ministry of Agriculture, in the official list of the cultivated plants for the year 1998 were introduced 12 genetic modified hybrids of potato, soy, sugar beat and maize.

#### **CONCLUSION**

1. The scientific progress could be not stopped by anyone and by nothing. Some countries tried to stop the genetic modified plants using (ex. Argentina, during the 1990 decade), but the Government cancelled this decision. In this case it is very important to use the scientific progress for the whole humanity to be in concordance with the actual and the future generations' interest, without supporting the interests of only certain groups. This was the starting point of sustainability strategy which, in its essence, stipulate that the development is made for people and is realized by people.

2. The ecologic, geographic and antropic assemblies realize the landscape, with very important functions of general interest at the cultural, ecological, social level, also being an important resource of the human economic activities. In this context, it should be mentioned that we don't know yet all the potential risks that the GMO could have, by long term accumulation, upon the environment.

3. The achievements of the genetic engineering have nowadays considerable benefits, but now we don't know the price we, or the future generations, will have to pay in the future for this benefits. The long term risks of the GMO are not entirely known today.

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2. <http://www.aabiotech.org/resources>