

COMERCIAL DISORDERS OF TOMATO FRUITS – POSSIBLE CAUSES AND CONTROL

II. DISORDERS DEPENDING OF TECHNOLOGICAL AND PATHOLOGICAL FACTORS

DEFECTE COMERCIALE ALE FRUCTELOR DE TOMATE – CAUZE POSIBILE ȘI REMEDII

II. DEFECTE CAUZATE DE FACTORI TEHNOLOGICI ȘI PATOLOGICI

**LĂCĂTUŞ V.¹, GLĂMAN G.², COSTACHE M.¹,
TUTUIANU V.³, CÂRSTEA Lumița Nicoleta¹**

¹Research and Development Institute for Vegetable and Flower Growing Vidra,

²SC UNISEM SA București,

³NUNHEMS Romania

Abstract. *The main commercial disorders related to ripening, color, shape or firmness of tomato fruits have been presented. The selected disorders are the most common ones, present either in open field or indoors and might cause important losses of yield. Misshaped fruits, cracking, russetting, bronzing, spotted fruits or soft rots of the fruits. These symptoms are analyzed from the perspective of climatic reasons, technological ones (inappropriate irrigation and/or fertilization, use of some plant growth regulators) or pathological ones (attacks of fungi, bacteria or viruses). Prevention and treatment methods have also been described.*

Key words: tomato fruits, commercial disorders, climatic, management, pathologic reasons, prevention, control

Rezumat. În lucrare sunt prezentate principalele defecte de maturare, de culoare, de formă sau de consistență ale fructelor de tomate, întâlnite mai des în culturile din România din câmp și din spații protejate și care reduc uneori sensibil producția comercializabilă. Printre acestea sunt descrise fructele deformate, cu goluri, crăpăte, rugoase, bronzate, pătate sau bolnave. Aceste simptome sunt analizate prin prisma unor cauze posibile cum ar fi cele de natură climatică, tehnologică (irigarea și fertilizarea necorespunzătoare, aplicarea unor regulatori de creștere), și patologică (ciuperci, bacterii și virusuri). Cazurile menționate sunt însotite de măsuri de prevenire și remediere.

Cuvinte cheie: fructe tomate, defecte comerciale, cauze climatice, tehnologice, patologice, prevenire, remediere

INTRODUCTION

Quality of agricultural products in general and vegetables in particular is a complex concept which includes a large number of characteristics and can be appreciated basis on more criteria: the species and the plant part taken into account, the destination of the crop, size, firmness and shape of the fruits, color, taste, symptoms of diseases, nutritive and energetic value, and many other relevant signs and symptoms in

this meaning (Lacatus and colab; 2006; Bissuel Christine 1999). The quality of vegetables in a modern acception includes a perfect appearance, high use value and on the other hand a high level of beneficent constituents, simultaneously with an as low as possible content of dangerous substances (Petitjean Marie-Francoise 2001; Lacatus 1999; Hardh 1982). The changing of some climatic factors, both at the global and at the regional level, in the night and day, low relative humidity, the drought but the cold rains or the hail too, have directly or undirectly affected the plant metabolism and implicitly the ripening way of the tomato fruits (Lacatus and colab 2009; Lacatus 2007; Lacatus and Voican 2006). In this condition, the pressure of different pathogenes and pests were increased and reduced, sometimes considerably, the quantity and the quality of the marketable fruits (Costache and colab. 2007; Lacatus and colab. 2002 a and b; Lacatus and Stoenescu 2002; Blancard 1994; *** 1987). It is equally true that some technological factors such as irrigation, fertilization, and the stimulation or the environmental factors directing in the case of the protected crops have largely affected the commercial and nutritional quality of tomato fruits (Voican and Lacatus 2006; Lacatus and colab 2006; Lacatus and colab 2009; Lacatus and Tutuianu 1998; Blancard 1994; Hobson and colab. 1977).

In this paper are presented the observations, which have been carried out by our staff, both in experimental and in commercial tomato crops, either in the open field or in the greenhouse spaces. To these we add the findings of other experts in this field of activity (Blancard, Lecocq, Laterrot, Hobson and others). The purpose of the paper is to spread our observations among the specialists but also among the farmers, to lighten them the diagnosis, and especially to contribute as far as possible to the prevention of some symptoms which usually depreciate the commercial and nutritional quality of tomato fruit. And last but not least, to update some of the prevention and control measures in the field of mineral nutrition and nutritive solutions.

MATERIAL AND METHOD

The effort has materialized in the description of eight cases in which the commercial quality of tomato fruits was strongly affected. The considered factors through which the tomato crop was kept under observation were the following: **a)** factors of climatic nature (high or low temperatures, great temperature differences between night and day, low or high relative humidity, sunstroke, hail); **b)** factors of technological nature (the cultivation of some inadapted hybrids, discontinuous, insufficient or excessive irrigation, inadequate ventilation and planting densities, excessive defoliations); **c)** factors of agrochemical nature (deficiency of potassium and calcium in the soil, excess soluble salts in the soil solution); **d)** factors of pathogenical nature (virusis, pathogenic fungi, bacteria and pests); **e)** factors of genetics nature. In order to simplify the work, we will synthetically expose the cases using as main procedures the description, the explanation of all causes and as a result of our observations the proposal of various and suitable remedies.

RESULTS AND DISCUSSIONS

1. Fruits heavily ribbed and deformed (fig.1, 2). Here it is about the fruits, which between the parenchymatous tissue around the seeds and the walls from the outside pericarp area have hollows without placental fluid. Sometimes the tissue around the seeds is green and unripe with a drying tendency. These fruits have a low resistance to transport and quickly lose their firmness. The phenomenon is especially

found in protected crop systems, where parthenocarpic hybrids are preferably cultivated, especially on their first inflorescence.

Causes: among the most common situations in which occur fruit hollow and deformed, are those that especially use bioactive substances - hormones - to improve the fruit setting, or in other words, to reduce their flowers abortion rate in unsuitable climatic conditions such as low luminosity. The phenomenon may be an expression of the change ratio of inhibitory and stimulanting substances. Especially when it is using stimulants that have in their composition 2,4 D, or it is only stimulating with this product, an fenoxiclorinat compound, a synthetic auxine which is not approved for this. Another reason is the low temperature, the phenomenon being accentuated in this case by the biostimulators application.



Fig. 1. Fruit with hollows



Fig. 2. Fruit hollow and deformed caused by fruit-settingproduct

Remedies: the increasing of the temperature average at 22°C from case to case, for 5-10 days; the supplement of the potassium quantity in the fertilization program, the increasing of the electrical conductivity (EC) of nutrient solution for fertigary; the avoiding of chemical stimulators; the using of the bumble- bees.

2. Stylar end of fruit pointed (fig. 3). Here it is about the fruits, whose apical part is elongated, sometimes in the shape of a greater or smaller mucron. But there may be other types of deformed fruits, with corky scars of varying sizes – cracked corky scars – or so-called "catface."



Fig. 3. Stylar end of fruit pointed

Causes: also in this case, the main factor leading to deformation fruits is the chemical biostimulators application, and in particular the 2.4 D application and sometimes twice on the same flower. This causes the formation a stylar end of fruit pointed, a "mucron" in the apical part of the fruits, probably due to an imbalance between auxinic compounds, concentrated in the apical area and environmental factors (temperature, water and nutrients supply etc.).

What it should have been a commercial disadvantage, turned in the recent years into an advantage. In this way consumers differentiate the tomatoes produced in Romania, of imported products, determining the farmers to continue to use it. But for some hybrids, such as Precos F1, this phenomenon has an undesirable extent. The phenomenon can be extended in the case of the repeated application of the stimulator on the same flower, or applying it both on the floral buds and the leaves. Also the application of chemical stimulators in the low temperatures conditions. And the cultivation of some hybrids sensitive to stimulation, such as Precos F1 increases the percentage of deformed fruits. To these causes it adds a too early planting, when soil

is rather cold and this condition leads to deficiencies of potassium and phosphorus, a too low light intensity, excess of nitrogen, high relative humidity or too dry atmosphere, the too low or on the contrary too high night temperatures.

Remedies: the use of adequate hybrids, with high binding capacity during the cloudy periods; the avoiding of chemical biostimulators, based mostly of 2.4 D; the bumble-bees using.

3. Cracked fruits (fig. 4). Tomato fruits cracking or splitting includes the radial and concentric cracking, and simply the fruits splitting.



Fig. 4. Cracked fruits

Causes: skin thickness appears to be directly accountable of the resistance to splitting, although its strength and elasticity may play an important role; this character is genetically controlled, but there are many other aggravating factors such as water excess, the abrupt

temperature increase, too large temperature differences between night and day, discontinuous irrigation, nitrogen application through scattering and overripening.

Remedies: the use of a suitable biological material, the avoiding of the large fluctuations concerning the hydric regime practiced in warm periods, the introduction and the development of drip irrigation and its correlation with environmental factors, the guarantee of an adequate calcium nutrition, the foliar fertilization with CaFORTE 0.3-0.5 %.

4. Rugged fruits (fig. 5). Fruits skin is partially or almost entirely circularly furrowed by small cracks, giving a rugged appearance as being like the „scab”. In the case of the wide spider attack, which is manifested in distinct areas, radial cracks may occur due to strong toxins secreted by spider adults. But in this situation, the fruits are all really compromised.



Fig. 5. Rugged fruits

Causes: Excessive application of pesticides under conditions of excessive daytime temperature and relative humidity too low, followed by a too low night temperature; increased and long cloudiness; too low concentration of soluble salts; spider attack, especially that caused by polyphagotarsonemus latus; the cultivation of sensitive varieties.

Remedies: the treatments application on the well-watered plants; the correlation of the ventilation and irrigation with the development of the climatic factors; the fertilizers doses fractionation; the proper choice of biological material suitable to the environmental conditions; the treatment accomplishment against wide spider attack using Vertimec CE 1.8 or Milkbecknok 1 EC 0.1 %, or Enidor 24 SC 0.05 %; the increase of the air relative humidity.

5. Infected fruits with viruses (fig. 6). In such cases the fruits are "tanned", with the brown process of the tissue at the stalk insertion place, with uncolored areas and sunken brown stripes or simply become fruits with a mosaic aspect.

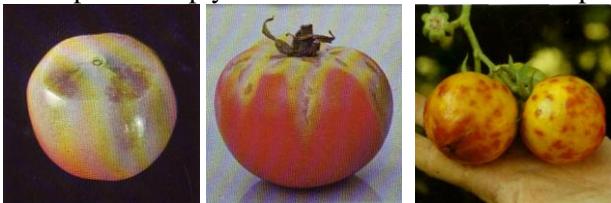


Fig. 6. Infected fruits with viruses

Causes: the use of the unresistant cultivars and varieties; the seeds purchase from unauthorized sources; the seeds growing, which are extracted from the hybrid fruits (F2); attack of the virosis vectors insects.

Remedies: the cultivation of the resistant varieties / hybrids; the vectors control (Confidor SL or Kochinor 20 SL 0.075 %, Confidor 70 WG or Heloprid 70 WG 0.02 %, Confidor Energy 85 OD 0.15 %, etc).

6. Fruits affected by *Phytophthora infestans* or *parasitica* (fig. 7). It is produced by *Phytophthora infestans*, the traditional „air-borne” blight and usually starts at the insertion of the stem in shape of some large brown-olivacee pathes, which afterwards grow and become brown covering the whole fruit; the green fruits are rugged. This disease can be also produced by *Phytophthora parasitica*, the „soil-borne” blight, when on the green fruits appear large green-gray-brown spots with irregular, soft, wet edges; sometimes appears a mould.



Fig. 7. Fruits affected by *Phytophthora parasitica* (left) and *infestans* (right)

Causes: the presence of two pathogenous agents, the low temperature and high relative humidity.

Remedies: treatment with one of the products: Previcur Energy 0.15 %, Melody compact or Aliette 0.2 %, Ridomil Gold MZ 68 or Curzate Manox or Super Champ 0.25 %, or bordeaux mixture 0.75 %.

7. Fruits attacked by *Helicoverpa (Cloridea) armigera* Hbn. (fig. 8). It is observed on the fruit a perforation due to the larva attack, which leaves inside many dejections, making them unfit for consumption.



Fig. 8. Fruit attacked by *Helicoverpa armigera*

Causes: larvae that develop on leaves and flowers then penetrate into the fruit inside where they leave many dejections.

Remedies: Alternative treatments performed before the larvae penetration into the fruit with: Sinoratox 35 CE or Novadim 40 EC 0.15 %, Decis 2,5 EC 0.05 %, Faster Forte 20 CE 0.015 %.

8. Attacked fruits by bacteriosis (fig. 9). It is about the *Pseudomonas tomato*, which usually causes the black colour spots with a rugged-coal-black aspect,

Clavibacter michiganense with spots of type „bird's eye” and *Xanthomonas vesicatoria* - slightly sunken spots, of brown colour, darker at the edges area. All these bacteria specially affect tomato fruits which are to be harvested as green tomatoes.



Causes: the bacteria presence, relative humidity over 85% and temperatures between 19 and 23 °C and in other cases from 26 to 30 °C.

Fig. 9. Green tomato fruits affected by bacteriosis

Remedies: Treatments with Alcupral 0,4 - 0.5 %, bordeaux mixture 0,75 %, Super Champ or Kocide 0.25 %, Melody compact 49 WG 0.2 %.

CONCLUSIONS

1. The irrational use of growth regulators, but also the inadequate irrigation determine the impairment of tomatoes marketable quality.
2. A series of pathogens, viruses and bacteria, significantly reduce the marketing percentage of both mature and green tomato fruits.
3. The cultivation of an inadequate biological material, but also the reuse of the seeds from hybrid fruits (F2) affects the efficiency of tomato crops.

REFERENCES

1. **Blancard D., 1994** - *A color atlas of tomato diseases-observation, identification and control.* Manson Publishing Ltd: 119-148.
2. **Costache M., Roman T., Costache C., 2007** - *Vegetable crop diseases and pests.* AGRIS: 47-55; 51-53, 112, 201-202, 210;
3. **Lacatus V., Costache M., Rodica Badea, 2009** - *And in drought conditions it can cultivate vegetables.* Horticultura, 9-10: 3-5;
4. **Lacatus V., 2007** - *The vegetables flowers abortion in the protected environment.* Horticultura, 11: 31-35;
5. **Lacatus V., Stoenescu A. 2002** - *Tomato wilt spotted virus.* Agr. Român, 8:10-11;
6. **Lacatus V., Costache M., Costache C., 2002 a** - *Wilted tomatoes due to Fusarium oxysporum Schlect f. sp. radicis-lycopersici (Jarvis și Shoemaker) (F.O.R.L.).* Agr. Român, 10: 11-12;
7. **Lacatus V., Costache M., Costache C., 2002 b.** - *Wilted tomatoes due to Pyrenophaeta lycopersici Gerlach.* Agr. Român, 9: 12-13;
8. **Lacatus V., Costache M., Voican V., Scurtu I., Stoian L., Miron V., Florica Gheorghe, Lascu N., Elena Bratu, 2001** - *Techniques and technologies in vegetable growing.* Modern conceptions of horticultural research. Symp.of Agricultural and Forestry Science Academy: 113-142;
9. **Petitjean Marie-Francoise, 2001** - *Quality and Eco-Certification.* FloraCulture International, 30: 26-29.