# ESTABLISHMENT OF TECHNOLOGY FOR ASEXUAL MULTIPLYING BY GRAFTING OF SOME CULTIVARS OF MELONS CULTIVATED IN ROMANIA

## STABILIREA TEHNOLOGIEI DE MULTIPLICARE ASEXUATĂ PRIN ALTOIRE A UNOR CULTIVARE DE PEPENI GALBENI CULTIVAŢI ÎN ROMÂNIA

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***Abstract.*** *The research was carried out in the Laboratory of Protected Cultures of the Horting Institute Bucharest, in the 2013-2014 period, with the goal to establish a technology of asexual multiplying by grafting of some cultivars of melons cultivated in Romania, pointing out on certain technological aspects concerning the phenotypic compatibility between rootstock and scion. The biological material was consist on three rootstocks as hybrids $F_1$: 'TZ148', 'Shintoza' (Cucurbita maxima x Cucurbita moschata) and 'Emphasis' (Lagenaria siceraria) and two melon of scions as hybrids $F_1$: 'Caramel' and 'Brimos'. The grafting was done mechanized, using robot for grafting GR-800CS, realized by Helper Robotech Co, Korea. The plant tissues (cambium, xylem and phloem) had fused in the sectioned area. It was obtained one maximum percentage of the survival rate (100%). The stages of the technological flow were established for obtaining grafted seedlings at the cultivars researched.*
***Key words:*** *Cucumis melo L., grafted seedlings, technological stages*

***Rezumat.*** *Cercetarea a fost efectuată în Laboratorul de Culturi Protejate al Institutului Horting Bucureşti, în perioada 2013-2014, cu scopul de a stabili o tehnologie de multiplicare asexuată prin altoire a unor cultivare de pepeni galbeni cultivati în România, subliniind anumite aspecte tehnologice privind compatibilitatea fenotipică dintre portaltoi şi altoi. Materialul biologic a fost format din trei portaltoi ca hibrizi $F_1$: 'TZ148', 'Shintoza' (Cucurbita maxima x Cucurbita moschata) şi 'Emphasis' (Lagenaria siceraria) şi doi altoi de pepeni galbeni ca hibrizi $F_1$: 'Caramel' şi 'Brimos'. Altoirea a fost realizată mecanizat, folosind robotul pentru altoire GR-800CS, realizat prin Helper Robotech Co, Korea. Ţesuturile plantelor (cambiu, xilem şi floem) au fuzionat în zona secţionată. A fost obţinut un procent maxim al ratei de supravieţuire (100%). Etapele fluxului tehnologic au fost stabilite pentru obţinerea de răsaduri altoite la cultivarele cercetate.*
***Cuvinte cheie:*** *Cucumis melo L., etape tehnologice, răsaduri altoite*

## INTRODUCTION

The grafted vegetable culture on resistant rootstocks at some adverse environmental factors, diseases, pests, salts etc. has become a common practice to

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watermelons in Japan, Korea, China and other Asian countries, but and in several European countries - Spain, Italy (Lee, 1994; King et al., 2008).

Grafting of melons becomes so increasingly popular, a technology in this respect is developing and in Romania.

The soil pathogens are a serious problem in many areas of the world: Turkey, Korea, China, Japan, Palestine (Yetisitir and Sari, 2003) and Romania (Bogoescu et al., 2010). The sensitivity to pests and diseases has imposed the introduction of grafting of cultivars on resistant rootstocks (Bogoescu et al., 2010). Main results of the grafting process are resistance increasing at pathogens, such as *Fusarium* spp., *Verticillum* spp. (Bogoescu et al., 2009) and nematodes, for vigor and production (Tarchoun et al., 2005), resistance at high or low temperatures etc. The grafting is an alternative to the soil fumigation with methyl bromide (Bogoescu et al., 2010; Miguel et al., 2004; Yetisir et al., 2007).

The method is based on the fusion between scion and rootstock (wild variety) (Edelstein, 2004). For successful grafting, the diameters of plants must have same size (Bogoescu et al., 2009; McAvoy, 2005). The scion and the rootstock must be phenotype compatibles and to have same diameter in the area where is made cutting and joining (Doltu et al., 2013).

This agronomic technique is useful and in Romania; the research from the Horting Institute was aimed the establishing of the technological flow at some melon cultivars used in Romania.

## MATERIAL AND METHOD

The plants used for grafting of melons were as rootstocks, three hybrids $F_1$: two hybrids of *Cucurbita moschata* x *Cucurbita maxima* ('TZ148' and 'Shintoza') and a hybrid of *Lagenaria siceraria* ('Emphasis') - (Fig. 1) and as scions, two hybrids $F_1$ of melon ('Caramel' and 'Brimos) - (Fig. 2).

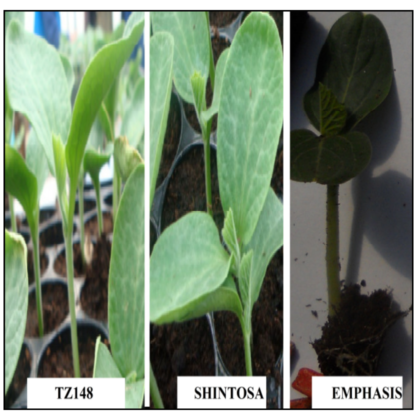


**Fig. 1 -** Rootstocks used in experiment

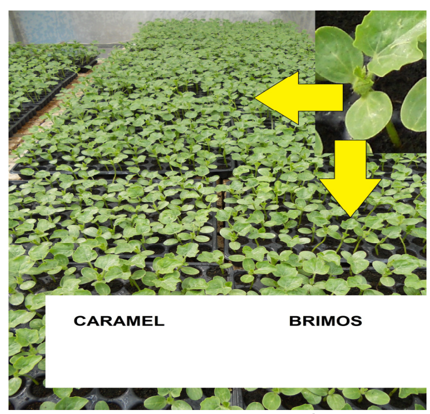


**Fig. 2 -**The two scions of melons

The hybrid rootstocks 'TZ148' and 'Shintoza' are resistant to *F. oxysporum radicis-cucumerinum* 0, 1, 2, *F.o.f.sp. melonis* 0, 1, 2, *V. dahlie* and *Meloidogyne* spp.

'Caramel' and 'Brimos' are cultivars of early melons very appreciated in Romania.

The grafting technique has certain stages: sowing (scion and rootstock), preparation for grafting, grafting itself, introducing of grafted plants in polyethylene tunnel for forming of callus, transferring seedlings in greenhouse for growth and maintenance, accordance with the classic technology (Bogoescu M. et al., 2008).

**Sowing.** The rootstock was sowing after emergence of the scion because it has a vigor and a strong germination energy (Doltu M. et al., 2013). The sowing was classic, in cellular trays (24 ml/cell volume), the nutrient substrate (peat) with grain size 0-10 mm, NPK (1 kg/$m^3$), microelements B, Mg, Cu, Mn, Zn, Fe, S (0.050 kg/$m^3$), limestone (4.7 kg/$m^3$), pH 6 and agent of wetting 100 ml/$m^3$. After sowing and wetting, the temperature was set at $28^0$C (day and night) and the relative humidity (RH) of 100%. The plants were maintained according classical technology.

**Preparing for grafting.** This phase has consisted to supplies the necessary materials (clips for grafting of different sizes, blades, hand disinfectants).

The clips were made of silicone and with ring for to support the plants.

**Grafting.** The phase was realized when the scions had a true leaf and the rootstocks had cotyledon leaves. The grafting by joining was performed in indirect light, with optimum shading when was sun (temperature 21-$22^0$C).

This work was realized mechanically, using the robot for grafting GR-800CS, realized by Helper Robotech Co., Korea. The cutting and the joining of plants was performed mechanically; manual works were sorting of seedlings and placement in robot, collecting of grafted plants in trays and supply in robot with clamps for grafting.

The combinations of grafting (scion x rootstock) were: ‘Caramel’ x ‘Shintoza’; ‘Caramel’ x ‘TZ148’; ‘Caramel’ x ‘Emphasis’; ‘Brimos’ x ‘Shintoza’; ‘Brimos’ x TZ148’; ‘Brimos’ x ‘Emphasis’.

# RESULTS AND DISCUSSIONS

The research has established the phases of asexual multiplication by grafting of two melons cultivars ('Caramel' and 'Brimos') cultivated in Romania (Table 1).

*Table 1*

**Results concerning establish of the technological phases for grafting of melons**

<table>
<tr><th>SCION<br>ROOTSTOCK</th><th>SOWING date</th><th>EMERGENCE date</th><th>GRAFTING date</th></tr>
<tr><td>‘Caramel’<br>‘TZ148’<br>‘Caramel’<br>‘Shintoza’<br>‘Caramel’<br>‘Emphasis’</td><td rowspan="2">28.02.<br>8.03.</td><td rowspan="2">4.03.<br>12.03.</td><td>18.03.</td></tr>
<tr><td>‘Brimos’<br>‘TZ148’<br>‘Brimos’<br>‘Shintoza’<br>‘Brimos’<br>‘Emphasis’</td><td>19.03.</td></tr>
</table>

The quality germination energy was observed at scions and rootstocks; the plants have emerged at four days after sowing, in the conditions a classical technology for production of cucurbit seedlings.

Due a great vigor of plants, the seeds of rootstocks were sown after four days from the emergence of scions.

Operation of grafting was performed to 6-7 days after the emergence of rootstocks, the phase of emergence of the first true leaf and 14-15 days after the emergence of scions, the phase of true leaf and appearance of the two true leaves (Fig. 3).

**Fig. 3. -** Scions in optimal phenophase of grafting

In the plastic tunnel, at the level of sections was performed a process of callusing, respective the formation of a mass of undifferentiated cells, unorganized, capable of division, that have formed up a new vegetal tissue for healing (callus), optimal for the fusion of plants.

The tissues of plants, cambium, xylem and phloem, were matched by overlapping in the area where was performed the cutting and the grafting (Fig. 4).

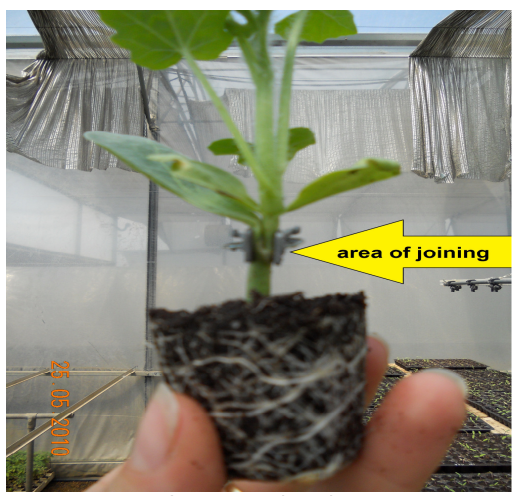


**Fig. 4 -** Seedling of grafted melon

This essential aspect (the compatibility between diameters) is stressed and other researchers (Bogoescu et al., 2009; McAvoy, 2005), (Fig. 5).

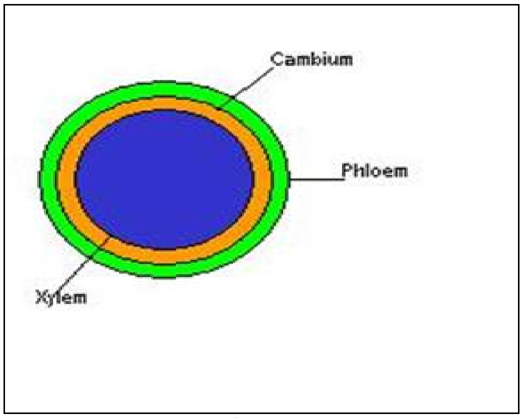


**Fig. 5 -** Schematic representation of the stem (cross-sectional) (Source: McAvoy R., 2005)

The percentage of callusing at the level of the point of grafting is shown in Fig. 6.

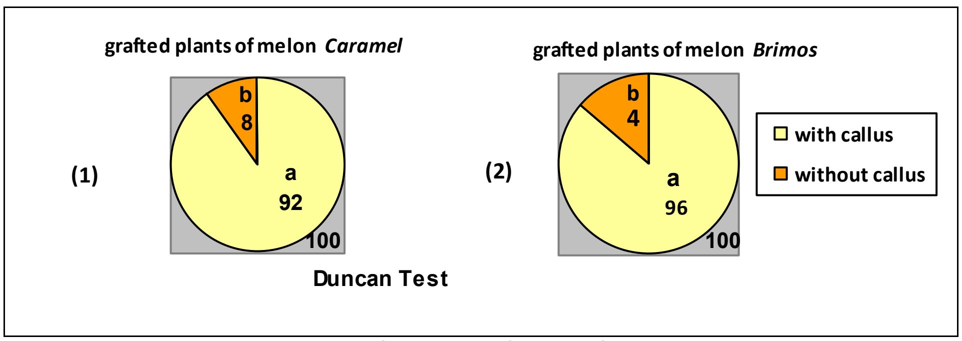


**Fig. 6 -** The capacity of callusing of plants 'Caramel' (1) and 'Brimos' (2)

The difference was not significant among the melon hybrids (scions):

- 'Caramel' - from 100 grafted plants, 92 plants have formed callus;
- 'Brimos' - from 100 grafted plants, 96 plants have formed callus;
- the difference is very significant between the number of plants with callus and the number of plants without callus.

## CONCLUSIONS

1. The technological process was established for obtaining of grafted seedlings of melon at the hybrids 'Caramel' $F_1$ and 'Brimos' $F_1$ by the mechanization of the grafting.

2. The data of the technological phases were correlated for the hybrids researched, so was achieved the phenotypic compatibility scion / rootstock in the grafting moment.

3. When the plants have same diameter, after sectioning the tissues (cambium, xylem, phloem) overlap optimal by joining and they fuse.

4. 'Shintoza', 'TZ148' and 'Emphasis' are rootstocks optimal for grafting of melons ‘Caramel' $F_1$ and 'Brimos' F1.

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