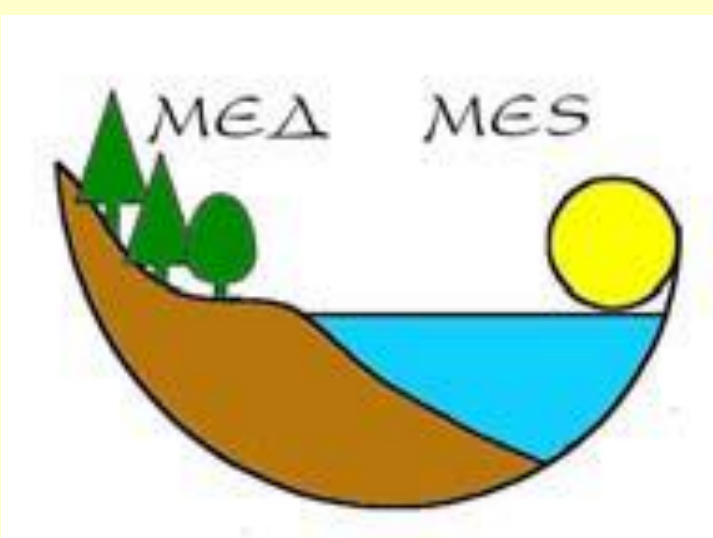




THE ROLE OF PLANT BIOTECHNOLOGY METHODS IN SUSTAINABLE AGRICULTURE



Liljana Koleva Gudeva, Fidanka Trajkova

Faculty of Agriculture, Goce Delcev University – Stip, Krste Misirkov Str., No. 10-A, 2000 Stip, Republic of Macedonia

Email: liljana.gudeva@ugd.edu.mk; fidanka.trajkova@ugd.edu.mk

Introduction

Plant biotechnology is set of different scientific approaches and methods that are utilized to improve and modify plants for human and environmental benefit. Plant biotechnology can be used to meet the increasing need for food by improving yields, improving the nutritional quality of crops and reducing the impact on the environment. This paper presents several *in vitro* methods with successful application results and particular concern for improvement of the biodiversity of crops, important for Republic of Macedonia.

Results and discussion

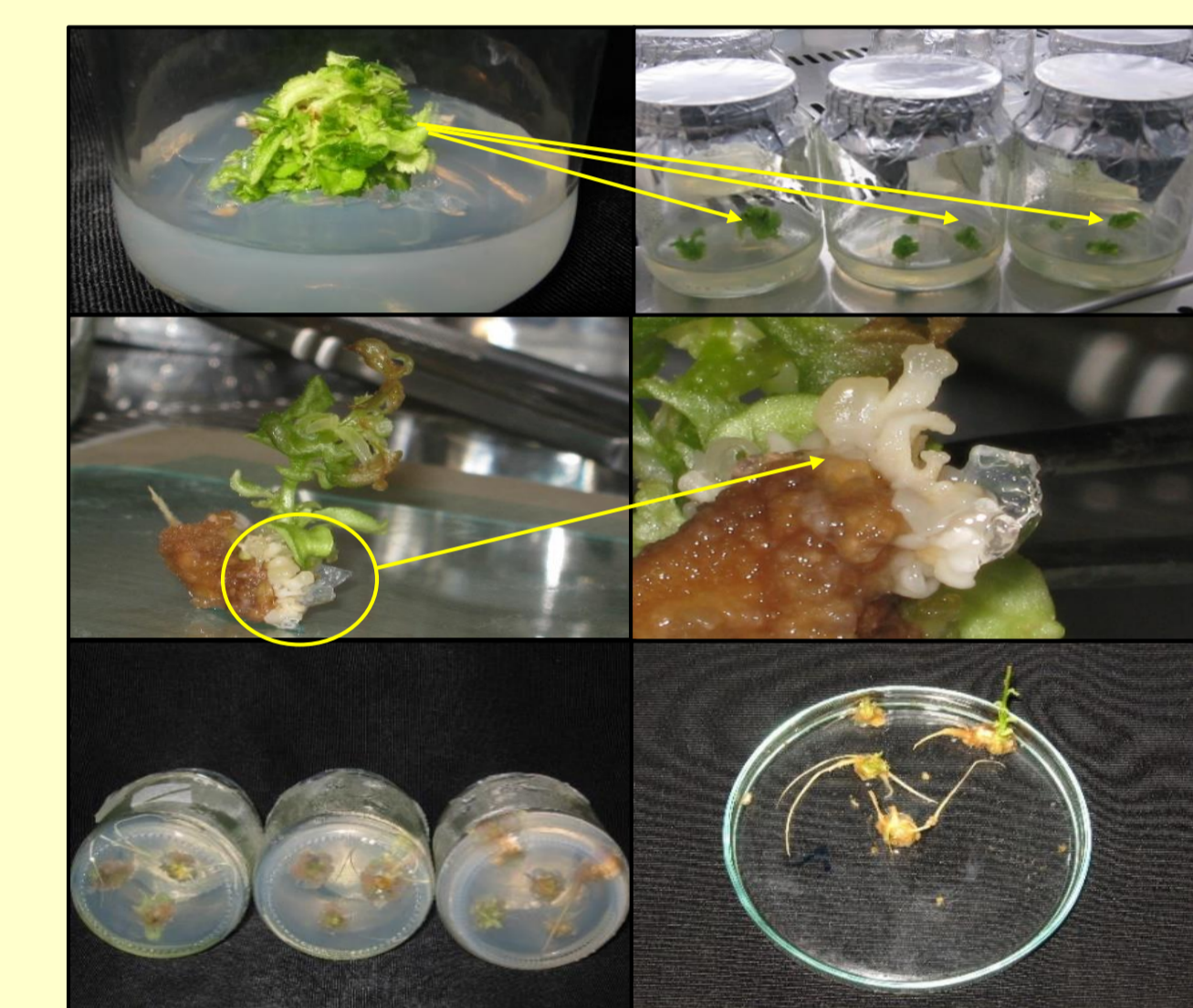


Figure 1. Embryo rescue technique in *Prunus ameriaca* L.

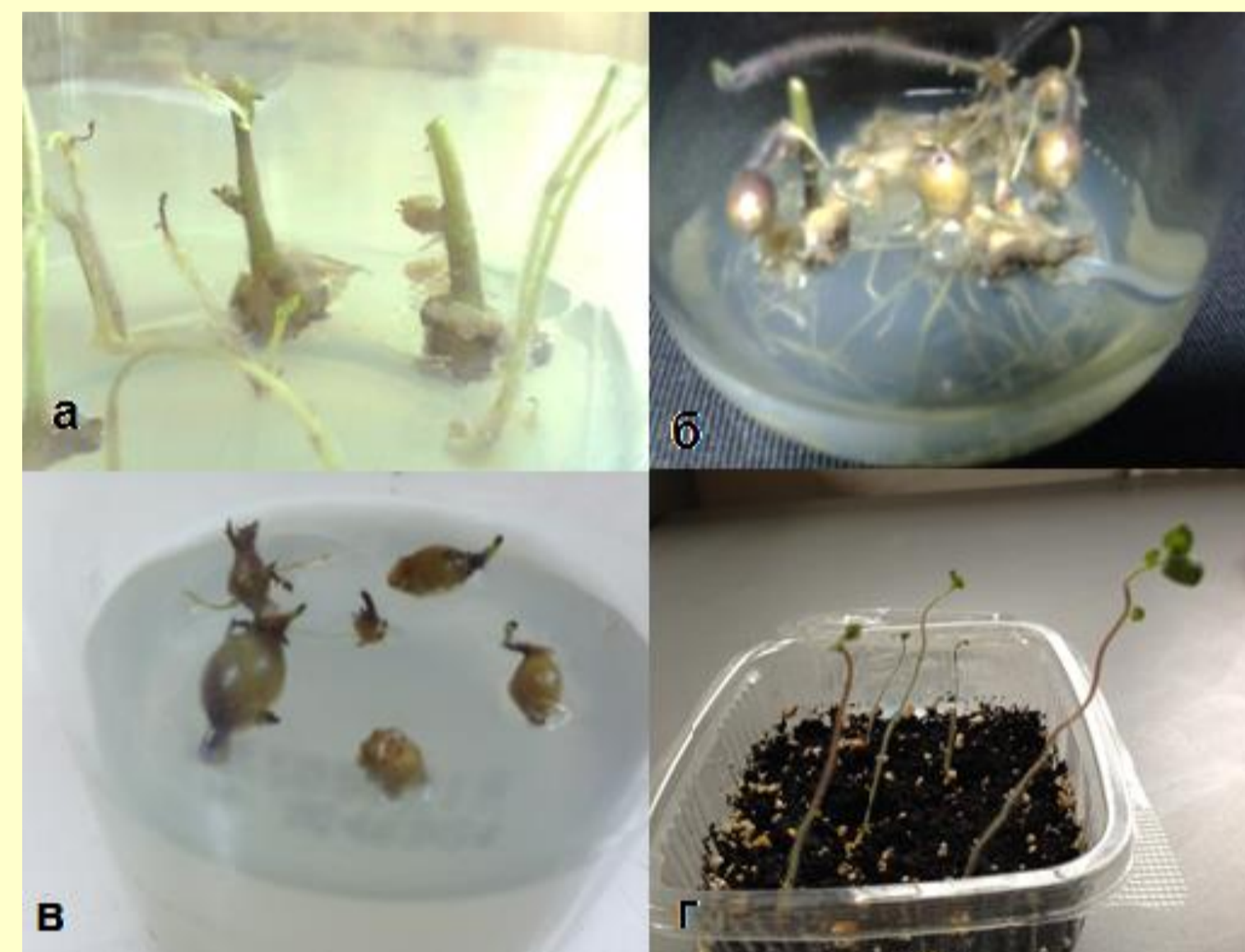


Figure 2. Microtuberisation of *Solanum tuberosum* L.

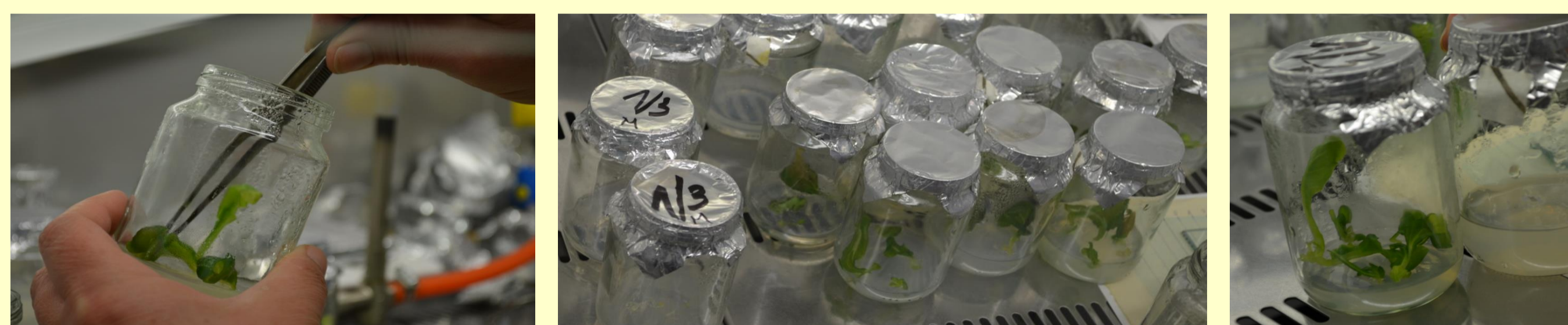


Figure 3. Micropropagation of *Eruca sativa* L.



Figure 4. Micropropagation of (1) *Lycopersicon esculentum* Mill. and (2) *Cucumis sativus* L.

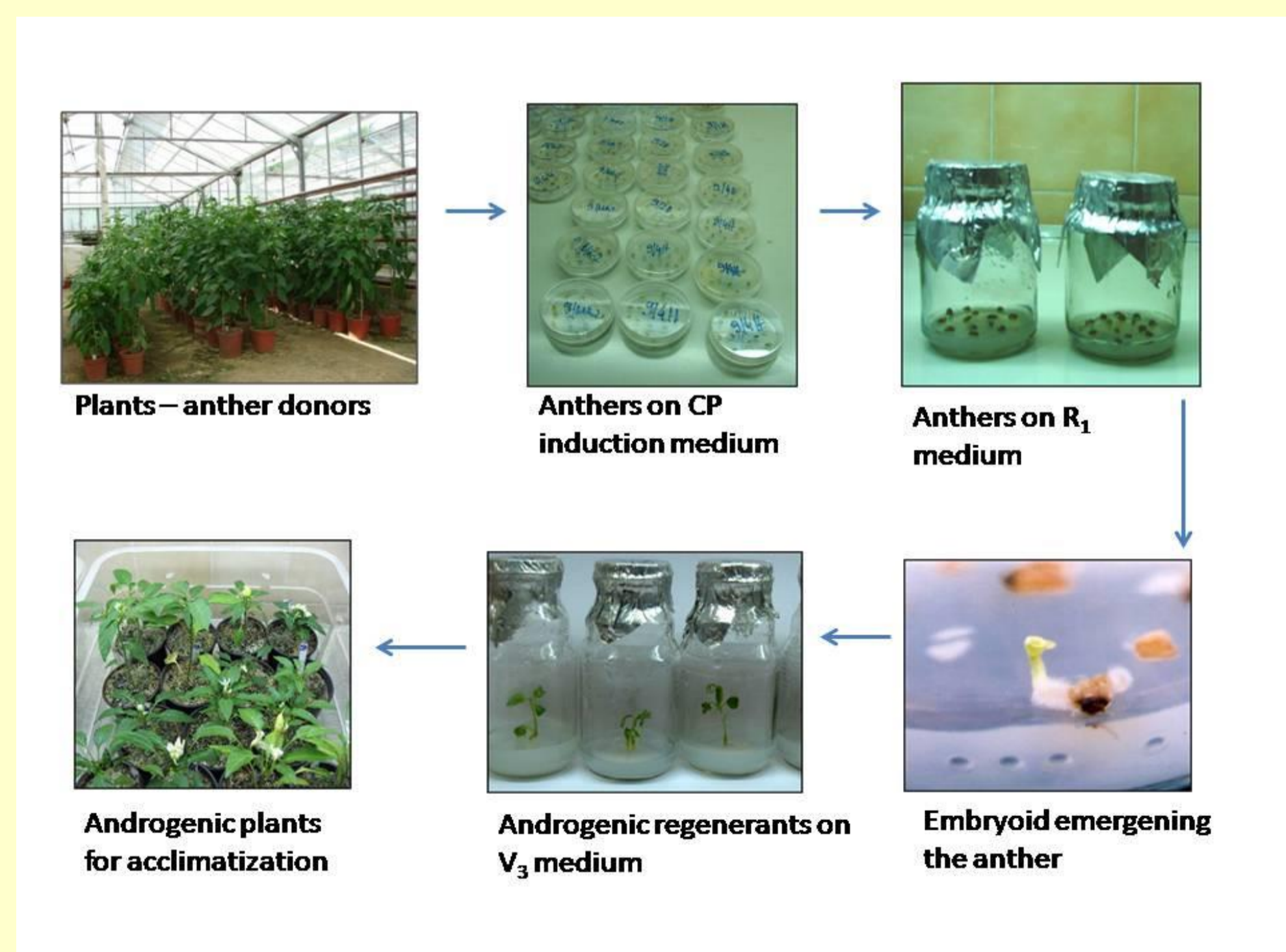


Figure 5. Androgenesis of *Capsicum annum* L.

Conclusions

Presented plant biotechnology methods are applied in production of diseases free propagation material, diversification of agricultural biodiversity and fast multiplication of starting propagation material.

Materials and methods

Different plant biotechnology methods were developed and tested for mostly vegetables crops, but also for important ornamental, aromatic and medicinal crops. All utilized plant species, propagation starting material, and combination and concentration of applied growth regulators are presented in Table 1.

Table 1. Review of different species and their utilization in *in vitro* culture.

Species	Explant	Medium + Growth Regulators (mg·l ⁻¹)	Results
<i>Petunia grandiflora</i>	apical meristem	MS + BAP + 0.1 IAA + 0.1 GA ₃	leaf rosette
		MS + 2 BAP + 0.1 NAA	
		MS + 2 BAP	shoots
<i>Dianthus chinensis x barbatus</i>	apical meristem	MS + BAP + 0.1 IAA + 0.1 GA ₃	
		MS + 2 BAP + 0.1 NAA	shoots
		MS + 2 BAP	
		MS + 5 BAP + 5 NAA	
<i>Lavandula vera</i> L.	apical buds	MS + 2 BAP	callus shoots
<i>Melissa officinalis</i> L.	apical meristem	MS + 2 BAP	leaf rosettes
	hypocotyls		
	leaf rosettes	MS + 1 NAA	roots
<i>Eruca sativa</i> L.	apical meristem	MS + 1 BAP + 0.5 IAA	leaf rosettes shoots roots callus
<i>Coriandrum sativum</i> L.	apical meristem		shoots leaf rosettes callus
	hypocotyls	MS + 1 KIN	shoots
<i>Prunus armeniaca</i> L.	seed embryos	MS + 1 BAP + 1 GA ₃ MS + 2 IBA	leaf rosettes de novo plants somatic embryoids
<i>Solanum tuberosum</i> L.	nodes from initial potato sprouts	MS + 2 BAP + 2 NAA MS + 1 BPA + 0.5 NAA MS + 4 BAP + 2 NAA MS + 6 BAP + 2 NAA	microtubers
<i>Capsicum annum</i> L.	apical buds	MS + 5.0 BAP + 0.5 NAA MS + 10.0 BAP + 0.5 IAA MS + 1.0 ZEA	callus shoots
	anthers	CP + 0,01 KIN + 0,01 2,4D R1 + 0,01 KIN	embryos
	hypocotyls 1/3 cotyledons	MS + 10.0 BAP + 0.5 NAA MS + 30.0 BAP + 1.0 IAA MS + 5.0 ZEA MS + 2.5 2iP	callus
<i>Lycopersicon esculentum</i> Mill.	apical buds	MS + 4.5 BAP + 0.3 IBA MS + 6.0 BAP + 0.4 IBAA MS + 4.5 KIN + 0.3 IAA	shoots
	hypocotyls 1/3 cotyledons	MS + 1.5 BAP + 0.1 IBA MS + 3.0 KIN + 0.1 IAA MS + 6.0 BAP + 0.4 IBA	callus
<i>Lycopersicon esculentum</i> Mill. var. <i>cerasiforme</i> (Dunal)	apical buds	MS + 2.0 2iP + 0.5 IAA MS + 0.5 KIN + 1.0 IAA MS + 2.0 BAP + 2.5 2,4 D MS + 2.5 BAP + 1.5 NAA	shoots
	hypocotyls	MS + 2.0 2iP + 0.5 IAA MS + 2.0 BAP + 2.5 2,4 D MS + 2.5 BAP + 1.5 NAA	shoots
	1/3 cotyledons	MS + 2.0 2iP + 0.5 IAA MS + 0.5 KIN + 1.0 IAA MS + 2.0 BAP + 2.5 2,4 D MS + 2.5 BAP + 1.5 NAA	callus
<i>Cucumis sativus</i> L.	apical buds	MS + 11.0 KIN + 3.5 IBA	shoots
	hypocotyls	MS + 2.0 KIN	callus
	1/3 cotyledons	MS + 6.5 BA + 10.0 2,4 D	callus

Utilization of the benefits of plant biotechnology will bring "economically sustainable" and "environmentally sound" agricultural production that shall be "socially equal".
It is a straight contribution of plant biotechnology to the sustainable agriculture.