STUDIA UNIVERSITATIS BABEŞ-BOLYAI BIOLOGIA, LXI, 1, 2016 (p. 59-68)

# 40 Years since the Introduction of Plant Tissue and Cell Culture Techniques in Romania

Dorina Cachiţă-Cosma [1,✉], Constantin Crăciun[2] and Aurel Ardelean[1]

**SUMMARY.** At the beginning of twenties century, based on the discoveries in cell biology in the previous decades, the German botanist Haberlandt (1902) has founded the concept of cell totipotency. The progress registered in biology between the two World Wars has led to the development of a new research field in plant physiology, based on nutrition, biochemistry and cytology that is the culture of plant tissue and cells *in vitro*. After the Second World War the practical applications of those new discoveries has allowed the development, after 1954, of a series of bio-industries at large scale, as clonal micropropagation of ornamentals and economically important crops, as well as the use of biomass in pharmaceutical industry as a source of secondary metabolites.

This new field has raised the interest and enthusiasm of the researchers in Romania as well. In 1975 three researchers from Romania being specialized abroad, i.e. Cachiţă D., Coman T and Brezeanu A., have learned the *in vitro* culture technology. Coming back to Romania those researchers have each developed in their home institutes new laboratories for plant *in vitro* culture. As a result of their research abroad, Cachiţă and Brezeanu did published four papers in European journals (France, Belgium and Germany) as well as one publication in USA.

Starting from 1989 annual symposia were organized in our country, the first being organized by the Biological Research Center and Institute of Agronomy, both from Cluj-Napoca. All presentations were published in the first volume of this symposium. 19th such symposia were organized during the following years but only 12 volumes have been successfully published.

It is also to be mentioned that in 1990 The Romanian Association of Plant Tissue and Cell Culture has been grounded, organization which has been involved in the organization of all national meetings in plant

[1] "Vasile Goldiş" West University of Arad, Institute of Life Sciences.
[2] "Babeş-Bolyai" University, Cluj-Napoca, Faculty of Biology-Geology, Electron Microscopy Centre.
✉ ***Corresponding author:*** *Dorina Cachiţă-Cosma,* "Vasile Goldiş" West University of Arad, Institute of Life Sciences,
*E-mail: dcachita@gmail.com*

biotechnology. From 1975 our country was affiliated at The International Association for Plant Tissue Culture (IAPTC), many Romanian researchers participating to the international conferences and congresses taking place around the globe.

**Keywords:** plant tissue culture, research, Romania

Investigations into the *regenerative capacity* of plant tissues and cells have relied on the theory advanced by *Schleiden* and *Schwann,* in 1838-1839, referring to the structural cellular unity of life forms and to the totipotency of cells. It was also in the 19th century that *Vöchting* and *Rechinger* conducted research on the survival and regenerative capacity of plant fragments (cuttings), whose size was progressively reduced. It may be considered that the period of theoretical speculation came to an end at the time when *Haberlandt* (1902) formulated his hypothesis about the totipotency of plant cells, which contain in their genome the entire hereditary information required for the vegetative "reconstitution" of the organism they originated from.

In the period 1902-1922, a consistent experimental research campaign was targeted – in Germany, France and the United States – at proving the regenerative capacity of organ, tissular or cellular plant explants. However, the first practical attempts in this sense were unsuccessful.

As it was proved later, the simplest way to accomplish a plant vitro-culture consists in using explants that contain *meristematic cells* in their morphostructure. In the case of adult cells, the success of such attempts resides in the experimenter's ability to restore the morpho-physiologically differentiated cell to the status of a *meristematic* cell through a *dedifferentiation* process, based on the manipulation of environmental factors. On the other hand, during the "pioneering" period of such researches, *phytohormones* had not yet been discovered. Moreover, the nutritional requirements of phyto-inoculi were not known, in terms of the necessary substances that are indispensable for plant inoculi and that must be present in the culture substrate. At the same time, it is important to be aware of their nature and optimal concentrations in the cultivation medium, for rekindling and supporting the processes of cell multiplication, regeneration and morphogenesis, both in the *primary culture* and, especially, in the *subculture*.

During the period 1922-1939, the first successes were registered in the field of plant vitro-cultures, more specifically in cultures of *zygotic embryos* (*Hanning*), in cultures of *roots* (*White*), in the genesis of *callus*, as well as in its growth and subcultivation (*Gautheret, Nobécourt* and *White*). This is regarded as a *pioneering* stage in the evolution of plant biotechnology (Cachiţă, 2003, see Note 1 at the end of this article).

The progress registered by the techniques of *in vitro* plant cultivation, especially after World War, facilitated the birth of plant biotechnology, which led to what is generically known as the "*green revolution*". This phenomenon was born also thanks to the discoveries of *Morel* and *Martin* (1952), which enabled the creation – in dahlias and, thereafter, in potatoes (1955) – of plants that were impervious to *virus infections*, through the *in vitro* cultivation of meristematic, cauline, apical inoculi, taken from mother plants that had been exposed to multiple viral infections (see *Cachiţă*, 2003; Note 1). This revolution also targeted the multiple implications of plant cell and tissue vitro-cultures not only for the rapid *cloning* of plants through micropropagation techniques, but also for the valorisation of the biomass resulting from the cultures of cells, calluses, roots, shoots or somatic embryos, in phytoreactors, as raw material for the phyto-pharmaceutical and the food industries (dyes, flavours, purées etc.). Depending on how the vitro-culture is organized and conducted, cell cultures may be used for the *bioconversion* or *biotransformation* of certain organic compounds, precursors, in the preparation or transformation of certain *secondary metabolism products*. Cell cultures, on the other hand, are also useful – through somatic embryos – for the production of *artificial seeds*, or for the transmission and expression of genetic information acquired from outside the plants' own genome, through genetic engineering techniques.

In Romania, this field of activity was launched in 1975, when two researchers, namely *Dorina Cachiţă-Cosma*, holding a PhD in Biology, from the Biological Research Centre in Cluj-Napoca (the present-day Biological Research Institute) and *Tatiana Coman*, a horticultural engineer from the Research Institute for Fruit Growing in Mărăcineni, Piteşti, went to Belgium for a specialization in the field of Plant Biotechnology. After their return to the country in the spring of 1976, they founded plant biotechnology laboratories at the institutes they worked for. The findings Dr. *Cachiţă* obtained from the research she had carried out in Belgium were presented, during that period, at several European scientific events and were published in specialized journals from the organizing countries (in Note 2 – at the end of this article – we list the titles of these scientific papers).

It was also during that period that Dr. *Aurelia Brezeanu* (a researcher at the Institute of Biology in Bucharest) visited the United Stated for a specialization in electron microscopy, where she used wheat cell suspensions as an experimental model. The findings of the research Dr. *Brezeanu* carried out on that occasion were published abroad in 1976 (see Note 3).

In the same period, at the Department of Genetics from the University of Bucharest, at the Faculty of Biology, a plant tissue and cell culture laboratory was set up, headed by Prof. Dr. Eng. *Petre Raicu.* The academics and researchers led by Professor *Raicu*, who was the head of this discipline, started publishing, in 1979, the first findings of the studies conducted by this scientific team.

The laboratory of plant vitro-cultures that was opened at the Biological Research Centre in Cluj-Napoca in the summer of 1976 underwent permanent transformations and modernizations and, in time, it trained a large number of specialists in the field of Plant Biotechnology, with research stages in Romania and abroad. Prior to the revolution of December 1989, the team of researchers from this laboratory – led by Dr. *Cachiţă* – included 10 specialists: *Deliu Constantin, Henegariu Octavian, Osvath Tiberiu*, *Zăpârţan Maria, Rakosy-Tican Elena, Cristea Victoria, Dobrotă Cristina, Halmagy Adela, Cătană Corina*, and *Vicol Armeria*. After the revolution, some of these researchers moved to various other universities in Cluj-Napoca or in the country and founded plant vitro-culture laboratories at their new work places, such as the Agronomy Institute and the Pomological Research Centre in Cluj-Napoca, at Babeş-Bolyai University, the Faculty of Biology-Geography (Department of Genetic Engineering) as well as: the University of Timisoara, the Botanical Garden in Jibou, the Potato Institute, the Sugar Beet Institute, the Pastures and Meadows and the Forestry Institutes in Braşov, the Greenhouse Company in Codlea, Braşov County, the Gene Bank in Suceava, the University of Craiova, etc. Since 1990 many of the researchers trained in the field of plant biotechnology have completed their doctoral theses under the supervision of Prof. Dr. *Cachiţă.* Moreover, a series of foreign BSc or PhD students have specialized themselves in the field of plant biotechnology at the Biological Research Centre in Cluj-Napoca.

In our country, *the first scientific manifestation* dedicated to plant tissue and cell cultures was organized as a symposium in Cluj-Napoca, in 1981, by a team led by the research staff of the Biological Research Centre in Cluj-Napoca, by the Director of this institution, Academician Prof. Dr. *Preda Victor,* by Scientific Researcher Dr. *Cachiţă C. D.,* and by Prof. Dr. *Puia Ioan*, who was, at that time, the Rector of the Agronomy Institute in Cluj-Napoca. The symposium rallied the participation of numerous researchers from across the country, and the papers they presented in plenary sessions were included in a volume published by the Agronomy Institute in Cluj-Napoca. Both the symposium and the volume of proceedings were entitled: "Tissue Cultures – Research Instruments in Theoretical and Applied Plant Biology".

Over the years, namely from 1981 to 2007, the symposia on Plant Tissue and Cell Cultures organized in our country, as shown by the bibliography, were held in different localities and, according to the possibilities, the papers delivered in plenary sessions or those presented as posters were published in volumes of proceedings. 19 such symposia have been organized, but only 16 benefited from the publication of their proceedings, since symposia no. 17, 18 and 19 were part of the manifestations held under the umbrella of the Academic Days of the "V. Goldiş" West University in Arad. The papers communicated on those occasions were published in the review "Studia" of the University in Arad. Moreover, in most cases the publishing of the volumes of proceedings from the symposia on plant vitro-cultures was supported by the Rector of the "V. Goldiş" West University in Arad, Professor Dr. *Aurel Ardelean,* who is currently President of this University.

In many cases, the national symposia on plant tissue and cell cultures were organized in Romania within the framework of the events hosted by the National Society for Cell Biology (SNBC). In what follows, we shall present the list of the National Symposia on Plant Tissue and Cell Cultures organized in Romania in the period 1981-2007. Their proceedings were published in the same year or one or two years after the papers were presented at these symposia. In some cases, the papers from two symposia were collated into a single volume:

1. 15-16 December 1981, C1uj-Napoca: The First National Symposium on Plant Tissue and Cell Cultures, entitled: "Tissue Cultures - Research Instruments in Theoretical and Applied Plant Biology"; organizers of the symposium and editors of the volume of proceedings: Preda, V., Puia, I, Cachiţă, C.D., 1981, Tipo Agronomia Cluj-Napoca, 453 p.
2. 15-16 December 1983, Piteşti: "The Proceedings of the Second National Symposium on *In Vitro* Plant Tissue Cultures", Vol. I and II; the organizer of the symposium and editor of the volumes: Ceauşescu I., Academy of Agricultural and Forestry Sciences; the Pomological Research and Production Institute Piteşti – Mărăcineni; the "Nicolae Bălcescu" Institute in Bucharest.
3. 19-21 December 1985, Bucharest: "The Works of the Third National Symposium on *In Vitro* Plant Cell and Tissue Cultures"; organizers of the symposium: the Society for Biological Sciences; the Institute of Biological Sciences, Bucharest; the University of Bucharest; the Research and Development Institute for the Industrialization and Marketing of Horticultural Products; editors: Ceauşescu I. and Anghel I., University of Bucharest Press, 495 p.
4. 7-9 December 1989, Cluj-Napoca: The Fourth National Symposium on Plant Tissue and Cell Cultures, entitled: "*In vitro*" *Explant Cultures - Present and Perspective*; symposium organizer and editor of the volume: Cachiţă, C.D., Tipocart-Braşov S.A. Ed. I.C.B. Cluj- Napoca, 1991, 159 p.
5. June 1993, Bucharest: "The Works of the Fifth National Symposium on Plant Tissue and Cell Cultures"; symposium organizers and editors of the volume: Anghel, L., Brezeanu, A., Cachiţă, C.D., University of Bucharest Press, 1993, 319 p.
6. 10-11 June 1996, Băile Felix – Oradea: The Sixth National Symposium on Plant Tissue and Cell Cultures, entitled: *Actualities and Perspectives in Plant Biotechnology*; symposium organizers and editors of the volume: Cachiţă, C.D., Ardelean, A. and Crăciun, C., Ed. "V. Goldiş" Arad, 1997, 250 p.
7. June 1997, Arad: The Seventh National Symposium on Plant Tissue and Cell Cultures; symposium organizers: Cachiţă C.D. and Ardelean A.
8. June 1998, Buziaş: The Eighth National Symposium on Plant Tissue and Cell Cultures, organizers: Cachiţă, C.D., Ardelean, A. The papers of the symposia held in Arad and Buziaş were published together in one volume, entitled: *"In Vitro" Cultures in Cormophytes*, editors: Cachiţă, C.D., Ardelean, A. and Crăciun, C., Ed. Risoprint Cluj-Napoca, 1999, 407 p.

9. 11-12 June 1999, Constanţa: The Ninth National Symposium on Plant Tissue and Cell Cultures, entitled: *Actualities and Perspectives in Plant Biology*; organizers and volume editors: Cachiţă, C.D., Bavaru, A. anf Brezeanu, A., Ed. "Ovidius" University Press Constanţa, 2000, 186 p.

10. 10-11 November 2000, Cluj-Napoca: The Tenth National Symposium on Plant Tissue and Cell Cultures, entitled: *Jubilee Anniversary: 25 years of Plant Tissue Cultures in Romania*; symposium organizers and editors of the volume: Cachiţă, C.D., Rakosy-Tican, L. and Ardelean, A., Ed. Risoprint Cluj-Napoca, 2002, 436 p.

11. 6 June 2002, Satu Mare: The Eleventh National Symposium on Plant Tissue and Cell Cultures, entitled *Festschrift for G. Haberlandt (100 years since the launching of the theory on plant cell totipotence) and for Morel and Martin (50 years since the creation of the first virus free vitroculture)*; symposium organizers and editors of the volume: Cachiţă, C.D. and Ardelean, A., Ed. Daya, Satu Mare, 2003, 243 p.

12. 5 June 2003, Jibou-Sălaj: The Twelfth National Symposium on Plant Tissue and Cell Cultures, entitled: *Plant Pathophysiology Studied under a Vitroculture Regime*; symposium organizers and editors of the volume: Cachiţă, C.D., Ardelean, A. and Fati, V., Ed. Daya, Satu Mare, 288 p.

13. 9 June 2004, Sighişoara: The Thirteenth National Symposium on Plant Tissue and Cell Cultures, entitled: *Vitrocultures in Cormophytes*, *Experimental Models in Biological Research*; symposium organizers and editors of the volume: Cachiţă, C.D. and Ardelean, A. Ed. Bion, Satu Mare, 311 p.

14. 9 June 2005, Sibiu: The Fourteenth National Symposium on Plant Tissue and Cell Cultures, entitled: *The Conservation of Plant Vitrocultures*; symposium organizers and editors of the volume: Cachiţă, C.D. and Sand, C., Ed. Alma Mater, Sibiu, 276 p.

15. 7 June 2006, Iaşi: The Fifteenth National Symposium on Plant Tissue and Cell Cultures, entitled: *The Micropropagation of Plant Species*; symposium organizer and volume editor: Cachiţă C.D. Ed. Risoprint, Cluj-Napoca, 2007, 266 p.

16. 8 June 2007, Bucharest: The Sixteenth National Symposium on Plant Tissue and Cell Cultures, entitled: *Plant Biotechnologies for the 21st Century*; symposium organizers and editors of the volume: Cachiţă, C.D., Brezeanu, A., and Ardelean, A; Ed. Risoprint, Cluj-Napoca, 2008, 214 p.

In 1991, the *Romanian Association for Plant Tissue and Cell Cultures* (ARCTCV) was founded in Cluj-Napoca. It is a professional, non-profit, juridical attested association. The Association elected Dr. Dorina Cachiţă as its Chairperson; at that time she was Scientific Researcher, qualification level I, at the Biological Research Centre in Cluj-Napoca. At the time of its foundation, the Association had 130 members. Until 1995, the Association edited its biannual publication – the ARCTCV *Bulletin*. At the same time, the Association was involved directly in the regular organization of national symposia on plant tissue and cell cultures, as well as

in the editing and publication of the volumes of proceedings, including the scientific papers and communications presented in plenary or in poster sessions. The main purpose of this association was, and still is, to ensure, at the national level, closer relations between the specialists in the field of plant biotechnology in the country, with a view to enhancing collaboration between such laboratories in Romania, as well as facilitating contacts with experts from other countries. Because of lack of funds, the *Bulletin* of the Association had a limited number of issues, insufficiently compensated by the success of the publication of the papers presented at the national symposia on plant tissue and cell cultures. Since it was founded, ARCTCV has affiliated itself to its correspondent international association: the International Association for Plant Tissue Culture & Biotechnology (IAPTC & B), whose members we are and whose specialized journals have published reports or informative papers on the studies conducted by the Romanian scientists in the field of plant biotechnology. A part of the Romanian specialists in the field of plant biotechnology have presented their scientific papers at the IAPTC congresses (we should mention here *D. Cachiţă*, *Pamfil*, *Palada*, *Roşu*, *Onisei*, *Ghiorghiţă*, *Toth*, *Zăpârţan*, *Cristea*, *the Corneanus, Petrescu*, *Rakosy-Tican*, and others).

The efforts undertaken at national level for the popularization of this new field of plant biology led to plant biotechnology gaining new followers in our country, assisting biologists in Romania in becoming familiar with this type of literature. Mention should also be made of the monographic works and popularization books published over the course of time in our country, in the field of plant tissue and cell cultures, as well as the undergraduate and graduate courses on this topic that have been published in Romania.

In 1984 Ceres Publishing House in Bucharest printed the first monograph in the field of vitro-cultures, entitled *Culturi de celule şi ţesuturi vegetale – aplicaţii în agricultură* [Plant Cell and Tissue Cultures – Applications in Agriculture], authors: *Cachiţă, Raicu and Badea*. Subsequently, in 1987, Ceres Publishing House in Bucharest printed another monographic work on plant tissue and cell cultures, entitled *Metode in vitro la plantele de cultură – baze teoretice şi practice* [*In Vitro* Methods for Crop Plants – Theoretical and Practical Foundations], author: Dr. Cachiţă, a work that was awarded the "E. Teodorescu" Prize by the Romanian Academy.

In 1985-1986, the "N. Bălcescu" Agronomic Institute in Bucharest organized the first (postgraduate) *course* on plant biotechnology for the purpose of training specialists (biologists and agronomists) in the field of plant vitro-cultures, making available to the students, from the very beginning of the course (1985), the volume entitled *Curs practic de culturi de ţesuturi* "in vitro"*, cu aplicaţii în legumicultură şi floricultură* [A Practical Course on *In Vitro* Tissue Cultures, with Applications in Horticulture and Floriculture], authors: Professors *Cachiţă* and *Petrescu*. To these was added the textbook *Ingineria Genetică – note de curs* [Genetic Engineering – Lecture Notes], edited by Professor *Anghel* and published by the University of Bucharest in 1988.

We should also mention the publication by the *Raicu* and *Badea* team (1986) and, separately, by *Ungureanu* (1990), of booklets for the popularization of plant biotechnology, these works being intended to familiarize especially the lay readers with the subject of plant vitro-cultures, as well as with their theoretical and practical implications in everyday life.

In the sphere of higher education, with a focus on plant biotechnology, we should mention the publication in 1993 of the volume entitled *Curs de Biotehnologie – Culturi de ţesuturi in vitro*, *cu aplicaţii în horticultură* [A Course on Biotechnology – *In Vitro* Tissue Cultures, with Applications in Horticulture], authors: Professors *Petrescu* and *Cachiţă*, a volume edited by the Academy of "Athenaeum" University (the Faculty of Horticultural Science and Bioengineering at the University of Bucharest).

In 1994, Ceres Publishing House in Bucharest published the volume entitled *Înmulţirea vegetativă a arborilor forestieri. Metode convenţionale. Culturi de ţesuturi in vitro* [The Vegetative Propagation of Forest Trees. Conventional Methods. *In Vitro* Tissue Cultures], authors: *Enescu*, *Ioniţă* and *Palada*. This monograph detailed mainly the theoretical and practical aspects relating to the vegetative propagation, both natural and *in vitro*, of woody plants.

Special mention is deserved by the summer courses organized from 1995 to 1998 by the Department of Biology-Geology, "Babeş-Bolyai" University, in Cluj-Napoca, the Department of Genetics (led at that time by Professor Dr. *Nicolae Coman).* Financed through a TEMPUS-PHARE programme and enjoying international participation, these summer courses were focused on the genetic implications of vitro-cultures, in general, and of protoplast cultures, in particular. These courses led to the publication, in 1998, of the volumes *Utilizarea tehnicilor de electrofuziune în hibridarea somatică a plantelor* [Using Electrofusion Techniques for the Somatic Hybridization of Plants] and *Plant Genetic Engineering – Lab Manual* by Associate Professor Dr. *Rákosy-Tican* Elena, at Cluj University Press.

In 1999, Associate Professor Dr. *Ana Roşu* (teaching at the Agricultural University of Bucharest, the Faculty of Biotechnology), published at Amethyst-92 Press in the capital the monograph entitled *Elemente de biotehnologii vegetale, aplicaţii în ameliorare* [Elements of Plant Biotechnologies: Applications in Breeding], which was mainly addressed to students and specialists in the field of plant tissue and cell cultures, as well as to those interested in genetics and plant improvement.

In 2000, Prof. Dr. *Cachiţă* and *Sand* published the monograph entitled: *Biotehnologie Vegetală* [Plant Biotechnology], vol. I, addressed in particular to young university students specializing in this area.

A year later (2001), Dr. *Badea* and Dr. *Săndulescu* (both scientific researchers, qualification level I, from the Biology Institute of the Romanian Academy in Bucharest) published the monograph *Biotehnologii vegetale* [Plant Biotechnologies] with the help of the BIOTECH Foundation.

In 2004, Prof. Dr. *Cachiţă* and her collaborators published at the Cluj-based Dacia Press, in the biology series, the Universitaria Collection, volume I of the monograph: *Tratat de biotehnologie vegetală* [A Treatise on Plant Biotechnology], while in 2009 *Cachiţă* and *Ardelean* published – at the same press – volume II from the aforementioned monograph.

Subsequently, in 2005, Prof. Dr. *Ghiorghiţă* and Dr. *Petrescu* published a treatise entitled "Biotehnologiile azi" [Biotechnologies Today] at the "Junimea" Publishing House in Iaşi, about one-third of the book referring to the biotechnologies used in agriculture.

Information on publications in the field of plant tissue and cell cultures would not be complete if we did not mention the fact that several specialized articles focusing on the issue of plant biotechnology have been published by researchers from Romania in academic journals around the world.

In this category we should mention the publication by Prof. Dr. D. *Cachiţă* and C. *Crăciun* (1990) of a chapter about research on the ultrastructure of hyperhydric phyto-inoculi cells, included in volume 5 of the first encyclopaedia of plant tissue and cell cultures, which was entitled: *Handbook of Plant Cell Culture*, printed in the USA, by the McGraw-Hill Publishing Company, the editors of the aforementioned volume being *Ammirato* et al. The title of the chapter was: "Ultrastructural Studies on Some Ornamentals". This subchapter was mentioned by the editors in the foreword to the treatise. It should be noted that Prof. Dr. *Cachiţă* also published a chapter entitled "The Effect of the Nature and Origin of Explant on Micropropagation" in the encyclopaedia *Biotechnology in Agriculture and Forestry* (vol. 17), edited by Bajaj Y.P.S. at Springer-Verlag Press in Germany in 1991. In 1995, Prof. Dr. *Cachiţă* and *Crăciun* published another chapter entitled "Cryopreservation of Alfalfa (*Medicago sativa* L.) and Clovers (*Trifolium* Species)" in vol. 32 of the same encyclopaedia.

Although in recent years the economic recession in Romania has caused a sharp decline in scientific research, in general, and, implicitly, in research on plant cell and tissue cultures, in the higher education institutions from Bucharest, Cluj-Napoca, Timişoara, Iaşi, Oradea, Craiova, Arad, Bacău and Sibiu, as well as at the *Gene Bank* in Suceava, plant biotechnology laboratories have formed units in which biology, agronomy and forestry students have practised modern vitro-culture techniques, with explants or inocula derived from higher plants, as regards *micropropagation* (the clonal proliferation of valuable species), the steered *genetic modification* of certain plant species, or the *conservation* of phyto-inoculi in *gene banks*, so much so that, gradually, this discipline has been included in the curricula of several higher education institutions in our country.

More details about the beginnings of plant biotechnology research in Romania can be found in the book entitled: *Aniversarea a patru decenii – 1976-2016 – de la inițierea cercetărilor de biotehnologie vegetală* [The Anniversary of Four Decades – 1976-2016 – since the First Research on Plant Biotechnology], co-authors: Prof. Dr. Cachiţă and Prof. Dr. Sava-Sand, published by "Lucian Blaga" University Press in

Sibiu, in 2016, the volume being launched on the occasion of the events that were hosted by Babeş-Bolyai University in Cluj-Napoca on 19 March 2016, at the Faculty of Biology and Geology, the Department of Genetic Engineering, an event organized by Prof. Dr. *Rakosy-Tican* and her team, under the title: *Sesiune Jubiliară și celebrativă 40 de ani de culturi de țesuturi și celule vegetale în România și celebrarea a peste 40 de ani de activitate în domeniu și de președinte al ARCTV*, a d-nei prof.dr. *Dorina Cachiță-Cosma*" [Jubilee Session celebrating of 40 years of plant tissue and cell cultures in Romania and over 40 years of work in the field and of ARCTV presidency, dedicated to Prof. dr. *Dorina Cachiță-Cosma*].

Note 1.

Cachiţă, C. D. (2003) Double jubilee – The 100$^{th}$ anniversary since the launching of *Haberlandt's* theory on plant cell cultures and the 50$^{th}$ anniversary since the publication of *Morel's* and *Martin's* researches on obtaining virus free plants through meristem cultures, In: *The Proceedings of the Eleventh National Symposium on Plant Tissue and Cell Cultures – Festschrift for G. Haberlandt (100 years since the launching of the theory on plant cell totipotency) and for Morel and Martin (50 years since the creation of the first virus free vitro-culture)*, Cachiţă, C. D., Ardelean, A. (Eds.), Ed. Daya, Satu-Mare, pp. 1-9.

Note 2.

1. Homès, J., Cachiţă C. D. (1976) Modifications histologiques induites par la procaine sur des tissus cultivés 'in vitro', *Actes du 101$^{e}$ Congr. nat. de soc. savantes*, Lille, Sci., 1, 557- 562
2. Cachiţă C. D., Homès, J. (1976) L`influence de la procaine sur la croissance des tissusvégétaux cultivés 'in vitro', *Bull. soc. roy. Bot. Belg.*, **109**, 347-353
3. Cachiţă C. D., Gaspar, T., Negruţiu, I., Jacobs, M. (1976) Comparative effects of 2, 4-D and procaine on morphology and peroxidase activity of carrot tissue grown *in vitro*, *Me. Fac. Lendbow. Gent. Belg.*, **41**, 2, 1043-1048
4. Cachiţă C. D., Jacobs, M., Negruţiu, I., Gaspar, T. (1976) Comparative effects of procaine and 2, 4-D on growth and peroxidases of *Arabidopsis* callus, *Med. Fac. Landbow. Rijkuniv., Gent,* **41**, 2, 1521-1526
5. Negruţiu, I., Jacobs, M., Cachiţă, C. D. (1978) Some Factors Controlling 'in vitro' Morphogenesis of *Arabidopsis thaliana*, *Zeitschrift für Pflanzenphysiologie*, **86**, 2, 113-124

Note 3.

Davis, D. G., Brezeanu, A., Shimabukuro, R. (1976) The effects of MPP on the ultrastructure of wheat '*in vivo'* and '*in vitro'*, *Wed. Science*