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CLONAL MICROPROPAGATION OF *PAULOWNIA TOMENTOSA IN VITRO*

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Abstract. *Paulownia tomentosa is a fast-growing species of wood that has significant economic potential (valuable wood, high biomass production rate, increased resistance to stress, etc.). A tree 15–20 m high, sometimes up to 25 m and a diameter of 0.6 m, sometimes up to 1 m.*

The method of clonal micropropagation is based on the unique ability of plants to regenerate from somatic cells and allows the reproduction of plants with complicated seed or vegetative propagation, to heal the planting material and to increase the rate of its receipt several times. Also, the method of clonal micropropagation allows to renew and stabilize the number of disturbed populations of rare species of plants.

Key words: *Paulownia tomentosa, clonal micropropagation, introduction, nutrient medium*

Clonal micropropagation is an important biotechnological trend that allows the mass reproduction of plants in aseptic culture. This approach is productive for the massive, rapid reproduction of valuable, unique, recruited genotypes or rare, endangered species and varieties for the propagation of plant species or unique plant species for which reproduction in nature as a seed and vegetatively is complicated. The method of clonal micropropagation is based on the induced phytohormones of the extension of the apical and axillary meristems. The essence of the method is to cultivate plants in sterile conditions with controlled parameters of the medium, on artificial nutrient media.

Today there are many different methods of clonal micropropagation. They are based on four principles:

1) activation of the development of plant meristem
2) the formation of an adventitious bud from the tissues of the explant;
3) induction of somatic embryogenesis;
4) differentiation of the adventitious buds in the primary and transversal cullus tissue [Bhojwani, 2013].

Each type of plant requires correction in the classic propagation technique.

Relevance - reproduction with help the method of tissue culture is gaining popularity. For *P. tomentosa* there is no precise mineral composition of the medium, which consistence is the optimal; it has not been determined which medium is the best.

The aim of work was to stude the process of introduction into culture *in vitro P. tomentosa*.

Materials and methods

The work was performed at the department of Microbiology, Virology and Biotechnology of the Odesa I.I. Mechnikov National University. Mechnikov.

For introduction in culture in vitro we take shoots with activated lateral buds of plants. Shoots were taken from a donor plant in February. The material was obtained by cultivating plants in vitro in a nutrient medium of Murashige and Skoog (MS) with addition of 20 g/l of sucrose, 9 g/l of agar, and 1 mg/l of 6-benzylaminopurine (6-BAP). The next step is the growth of initial explants in a media with different consistency (on the solid nutrient media [8.0 g/l] and semi-liquid nutrient media [4.0g/l]). Registration of the explants' survivability, time of the beginning of axillary buds proliferation, and amount of obtained shoots was conducted [Zelenanska, 2009].

Results

The technology of clonal micropropagation of *P.tomentosa*, includes the following main stages [Carmen, 2014]:

1. Selection and sterilization of primary explants.
2. Introduction of explants into culture in vitro (fig, 1,).
3. Rooting and reproduction of microclones on nutrient media (fig,2).
4. Adaptation of plants from in vitro conditions to in vivo conditions.

Fig. 1. Introduction of explants into culture *in vitro*

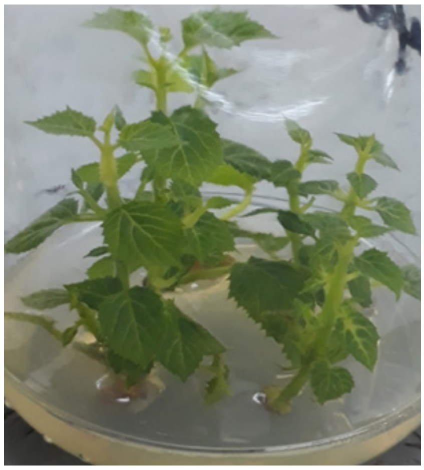

Fig. 2. Rooting and reproduction of microclones on nutrient media

The micropropagation of *P. tomentosa* was carried out through direct morphogenesis, using the shoots with axillary buds, since it is known that the plants regenerated in this way are mostly genetically homogeneous, identical to the parent form.

Semi-liquid nutrient media were used. The advantage of using semi-liquid media in comparison with solid nutrient media is revealed. The search of the optimal nutrient medium for Paulownia tomentosa shoots induction in vitro was successfully done.

Modified semi-liquid MS was determined as the optimal nutrient media. Its application contributed to better survivability, differentiation, and regeneration of *Paulownia tomentosa* shoots (Tabl.1).

Table 1

Average survivability performance of *P.tomentosa* microclones during the introduction process using different consistency nutrient media

Time passed from the planting, days	Consistency nutrient media	Type of explants	Average survivability of the microclones, %
3th	MS(solid)	shoots	90
		Shoots*	100
	MS(semil-iquid)	shoots	80
		Shoots*	100
6th	MS(solid)	shoots	40
		Shoots*	70
	MS(semi-liquid)	shoots	60
		Shoots*	90
10th	MS(solid)	shoots	0
		Shoots*	50
	MS(semi-liquid)	shoots	60
		Shoots*	60

shoots* - plant donor is seedlings obtained by microclone method

Total vitality on MS (solid) is 40%, total vitality on MS(semi-liquid) is 60%. On MS(solid) there was a proliferation of buds for 6 days. On MS(semiliquid) there was only swelling of the buds.

Conclusions

1. *P. tomentosa* is a great choice for greening the cities.
2. The stage of introduction into the culture in the wind and adaptation of the plants grown in vitro to the environment are some of the most problematic stages.
3. On solid nutrient media, the percentage of liveliness is less than that of on semiliquid nutrient media.
4. Proliferation on the solid nutrient media occurred earlier.
5. Use material from the plants obtained by in vitro gave better results.

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SPECIAL FEATURES OF THE USE OF TELEMEDICINE TECHNOLOGIES IN DERMATOLOGY

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Abstract. *The article focuses on the application of telemedicine technologies in dermatology. The usage of telemedicine approach makes it possible to study certain skin pathologies remotely and monitor the progress of the treatment in the dynamics. The use of equipment and telemedicine services for the study of skin diseases is explained. The dermatoscopic telemedicine system is described. The possibilities of using mobile telemedicine in dermatology are analyzed.*

Keywords: *telemedicine, image processing, dermatology, mobile dermatology, dermatoscopy*

Introduction

Due to the Covid-19 epidemic, telemedicine technology is gaining widespread acceptance. In fact, the relevance of screening and teleconsultation in isolation is unusually high. Such technologies can be applied in various fields of medicine, for example, when testing fine motor skills [1, 2], in otorhinolaryngology [3-5], in the analysis of data of radiation research methods [6-10]. With the advent of this approach and appropriate technologies, dermatologists can expand access to health care by reducing the time spent on traditional outpatient care. Dermatological telemedicine services offer reduced waiting time, increased flexibility of the schedule and sufficient patient satisfaction.

It is known that at the moment telemedicine is suitable for realization of remote consultations and monitoring the dynamics of dermatological diseases such as acne, pigment lesions, atopic dermatitis, skin tumours [11, 12]. Of course, the effectiveness of the traditional interaction with the doctor remains effective, but in the context of self-isolation, technology helps to ensure that diagnostic information is recorded and analyzed at a distance and that quality counselling is provided [13, 14].

It is therefore advisable to develop a telemedicine system for video dermatoscopy and to analyze its components.

Materials and Methods

Such a system should contain a digital video dermatoscope, which allows you to record diagnostic images with adjustable optical magnification from 10 to 200 times and a resolution of at least 5 Megapixels with a matrix size of at least 1 / 2.5 inches to provide an acceptable dynamic range, as well as a integrated lighting unit. The device shall be capable of recording digital images on a memory card and transmitting them by means telemedicine services for analysis. The inventive method consists in producing images in formats (for example, TIFF), which are devoid of specific artifacts from compression of images resulting in distortion of diagnostic information. The specialist should have specialized software for storing and processing the obtained diagnostic images, taking into account the analysis of the color components of the areas of interest specific to specific pathologies [15, 16]. At the same time, the processing of recorded dermatoscopic images and the application of already existing approaches to their analysis are of primary importance [17, 18]. For example, in the case of atopic dermatitis, it is relevant in dynamics to observe changes in skin color during treatment [17]. Given that dermatoscopic images are recorded by the patient at home, remote monitoring of the conditions for obtaining diagnostic images and the validity of the method and the repeatability of the measurement results shall be mandatory [19, 20]. The received data should be transmitted through the channels of communication between the patient and the specialist to ensure qualified teleconsultations.

It is also advisable to develop specialized certified equipment and dedicated communication channels for the rapid and safe transmission of not only diagnostic images, but also essential medical information (data of anamnesis, sanitary and hygienic characteristics of workplaces, etc.), which allows a highly qualified specialist to monitor the treatment of patient with dermatological diseases with the help of telemedical consultations. These systems have become particularly relevant in the context of the COVID-19 pandemic, forced quarantine and self-isolation, when it is not recommended to visit diagnostic centers for routine treatment. The possibilities of mobile teledermatology may reduce time and financial costs in the process of monitoring a number of chronic skin diseases.

Conclusions

In the present circumstances, the benefits of using telemedicine services for primary diagnosis and control of treatment of certain dermatological diseases are obvious. The development of the approach is the development of intelligent methods of analysis of dermatoscopic images, which, with additional a priori information, can improve the effectiveness of detection of certain skin pathologies and control the treatment process remotely. The possibilities of mobile teledermatology make it possible to reduce time and financial costs in the process of monitoring the treatment of certain chronic skin diseases.

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