

України. Серія «Лісівництво та декоративне садівництво». – К., 2010. – Вип. 147. – С. 91–97.

Дана комплексная оценка декоративности культиваров рода PICEA A. DIETR коллекции учебно-исследовательского питомника кафедры лесовосстановления и лесоразведения НУБіП Украины. Научно обосновано использование наиболее перспективных культиваров для озеленения.

Ель, род PICEA A. DIETR, декоративность, культивар, озеленение, коллекция елей, декоративное питомниководство.

The comprehensive assessment of cultivars of PICEA A. DIETR genus decorativeness in Scientific-Research Nursery at the department of reforestation and afforestation of NULES of Ukraine has been given. Using of the most promising cultivars for landscaping was scientifically substantiated.

Spruce, genus PICEA A. DIETR, decorativeness, cultivar, landscaping, collection of firs, decorative nursing.

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THE RAGENARATIVE ABILITY OF THE EXPLANTS OF *TILIA CORDATA* MILL. PLANTS UNDER *IN VITRO* CULTURE CONDITIONS

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The seasonal influence of the selection, and the type and size of Tilia cordata Mill. explants on the regenerative ability under in vitro culture conditions are determined. It was experimentally proved that the shoot-tip fragments with length of 10–15 mm had the high regenerative ability during the spring period. The organogenic response of T. cordata explants isolated from seedlings and mature trees under in vitro culture conditions is shown.

Tilia cordata Mill., in vitro culture, explants, medium, regenerative ability

It is generally known fact that one of the key factors of the negative state of the urban plantation is the planting material quality, namely its origin, age, terms and conditions of planting etc. At present the majority of the street plantings of Kyiv which are represented by the chestnuts and lindens should

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be changed. Unfortunately, the problem is in absence of the high-quality planting material in local nurseries, particularly absence of the linden and chestnut species and cultivars what would be resistant to disease-producing factors and plant pests. The use of the planting material of the woody plants from the other countries in our capital does not bring the positive results due to the harsh influence of the both biotic and abiotic stress-factors of urban environment.

As the result of 5-years lasting monitoring study and conducted inventory of linden plantations in 10 districts of Kyiv, the tolerant exemplars were selected (50 trees in total what are presented by all the species of the genus *Tilia*) [8]. The mother trees can be used as the initial breeding material for the obtaining of the improved and genetically adapted to the urban environment high-quality plant material. Now one of the most effective methods of its obtaining is the propagation under *in vitro* culture conditions which is based on the unique ability of the plant cell to implement its own totipotency [1, 3, 4].

At the first stages of this research we developed the methods aimed at obtaining of the aseptic culture of the most widespread species in Kyiv – *Tilia cordata* Mill.; at the same time, the elements of optimal medium at the stage of the introduction in *in vitro* culture were chosen, the influence of macro- and microelements of the basic medium on the morphogenetic activity of the tissues and organs were determined [7, 8].

The aim of the research – to determine the seasonal influence of the selection, size and type of the explants and the age of the donor plants of *Tilia cordata* on the regenerative ability under *in vitro* culture conditions.

The materials and methods of the research. The research was conducted on the base of the problem research laboratory of the phytovirology and biotechnology of the National University of Life and Environmental Sciences of Ukraine. The donor plants of *T. cordata* were selected in Kyiv urban edaphotops by the complex of the phenotypic features as the resistant to the stress-factors of the urban environment. The initial explants were parts of 1-year-old shoots with 10–20 cm length.

The concentration of the sterilizing agents and duration of surface treatment of explants were determined experimentally taking into consideration the common methods of the culture of isolated cells of the tissues and organs of plants [3, 4]. The explants of *T. cordata*, which were isolated from the donor plants in September-February, were sterilized by the following substances: 70 % C₂H₅OH, 2,5 % NaClO, 1 % AgNO₃. The following stepwise sterilization was used: the explants were immersed in 70 % ethanol for 1 minute; afterwards the explants were kept in 1 % AgNO₃ for 10 minutes; then the explants were thoroughly rinsed in sterile distilled water and afterwards the explants were immersed in 2,5 % NaClO for 20 minutes. Such method of sterilization allowed

obtaining up to 40 % of viable aseptic explants. The explants, which were isolated from the donor plants in March-August, also underwent the stepwise sterilization with the use of 70 % ethanol for 1 minute, 2,5 % NaClO for 10 minutes and 1 % AgNO₃ for 10 minutes. Afterwards, the explants were thoroughly rinsed in order to remove the sterilized substance – the explants were rinsed 3 times (10 minutes each time). This method of sterilization allowed obtaining up to 50 % of the sterile viable explants [7, 8].

The regenerative ability of the explants, which were cultivated in the basic hormone-free plant growth medium, pursuant to the research of Murashige and Skoog (MS) [9] with addition of 1–2 g/l of the active carbon, were studied in October in view of their different types, namely growth apex (0,30–0,35 mm), apical meristems with one (0,50–0,60 mm) and three (1,60–1,70 mm) pairs of primordiums, vegetative buds (2–4 mm), parts of a shoot with one bud (5–7 mm and 10–15 mm). Regenerative ability of the shoot fragments with one bud (10–15 mm) of *T. cordata* was recorded each month throughout the year. In order to determine the influence of the age of the donor plant on the regenerative ability, the explants were selected from 2-year-old seedlings and 40-year-old trees (hereinafter – mature trees) and were cultivated in hormone-free MS medium. The determination of the morphometric characteristics of the shoots was conducted on the 75th day of the cultivation.

The plant material was cultivated according to the standard practice in the thermal room under the temperature $T = 25 \pm 1^\circ\text{C}$, illuminance – 2000–3000 lx, 16-hour photoperiod and relative humidity of the air of the 70–75 % [1, 3, 4].

The results of the research. It is known that the period of selection of the plant material essentially influences on the regeneration of the explants in *in vitro* culture [4, 6, 8]. The study of such influence on the regenerative ability of the *T. cordata* explants is shown on the Fig. 1.

The explants of *T. cordata*, which were isolated in the period of the true dormancy (November-January), have two times less morphogenetic potential than tissues isolated at the beginning of the plant vegetation (March-May). It can be explained by the fact that at the end of the vegetation period there is the accumulation of substances that slow the growth and stimulate dormancy (in particular, abscisic acid which accelerates such processes as plant senescence and maturation) [4]. The maximal regenerative ability of shoots under *in vitro* conditions was observed during the period of March-May – 75–80 %. This period concurred with the active vegetation and growth of *T. cordata* in the natural environment. The less favorable period for the selection of the explants was the period from October to January. The established fact gives the possibility to state that the processes which take place in the culture of the isolated fragments of the shoots substantially depend of the genotype.

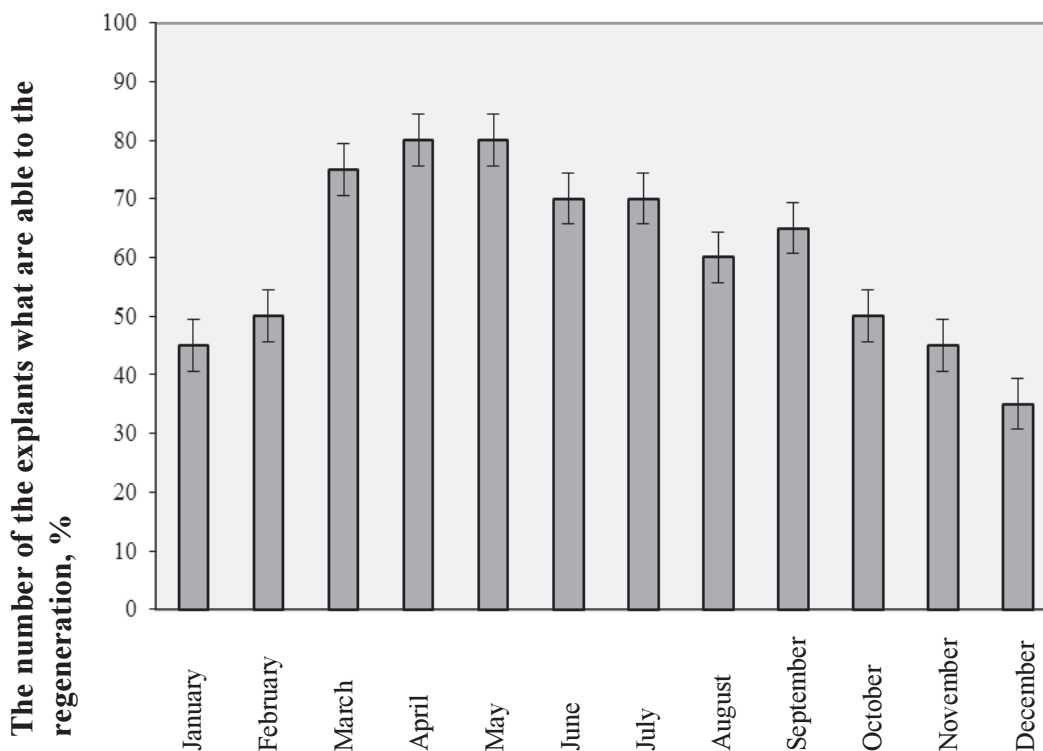


Fig. 1. The regenerative ability of the shoot fragments of *T. cordata* in *in vitro* culture

As the results of the research of the national and foreign authors it was established that the regenerative intensity considerably varies among the different types of the same plant explants [4, 7, 5, 8, 9]. The big explants with parenchyma areas, vascular tissue and cambium may spontaneously induce the morphogenesis regardless of concentration of growth regulators in the medium. At the same time, it was revealed that the small homogenous areas of epidermal and sub-epidermal tissues, which are free from correlative influence of the other tissues, may create some complex structures – buds, shoots, roots. In order to eliminate virus infection, the growth apices 0,1–0,2 mm long and without leaf primordia were isolated [5].

Thus, buds of *T. cordata* plants which had the fragments of the shoots, showed the higher regenerative ability compared to the isolated buds and apical meristems. Growth apex and apical meristems showed considerably low regenerative ability (no more than 10 %). The elongation of the shoot in two times leads to the significant intensification of regeneration processes. For the obtaining of the sufficient number of the explants able to the regeneration it is expedient to use shoot fragments with 10–15 mm length.

In many scientific works on microclonal propagation it was shown that the organogenic response of the explants, which were isolated from the mature trees, is significantly worse than isolated from the juvenile objects, for example seedlings. Rarely the results of response of the mature and juvenile explants are the same. The explants from the mature trees are often highly

demanding to the conditions of the *in vitro* cultivation [3, 4, 5, 6].

In our study for the comparison of regenerative ability between *T. cordata* explants isolated from seedlings and those isolated from mature trees we used 2-year-old and 40-year-old plants as donors. The obtained results are shown in the table below.

The morphometric characteristic of *T. cordata* shoots under *in vitro* conditions, the explants of which were isolated from the seedlings and mature trees

Variant	The age of the donor plant, years	The morphometric characteristics of the shoot	
		The length of the shoot, cm	The number of the nodes, items/ shoot
1	2	4,5–5,1	4–7
2	40	1,1–1,6	1–3

It was established that on the 25th day of the cultivation under *in vitro* condition the shoot length (the shoots were obtained from explants isolated from the seedlings and mature trees) did not significantly differ from each other (1,2–2,1 cm and 0,9–1,3 cm respectively). The changes in their growth characteristics occurred after 30–35 days of the cultivation. It was shown that the regenerative ability of the explants isolated from the seedlings is considerably higher compared to the explants isolated from mature trees. In particular, on the 75th day of the cultivation the shoots from 2-year-old donors were 3–4 times longer compared to the analogous shoots obtained from 40-year-old trees (see the Fig. 2).

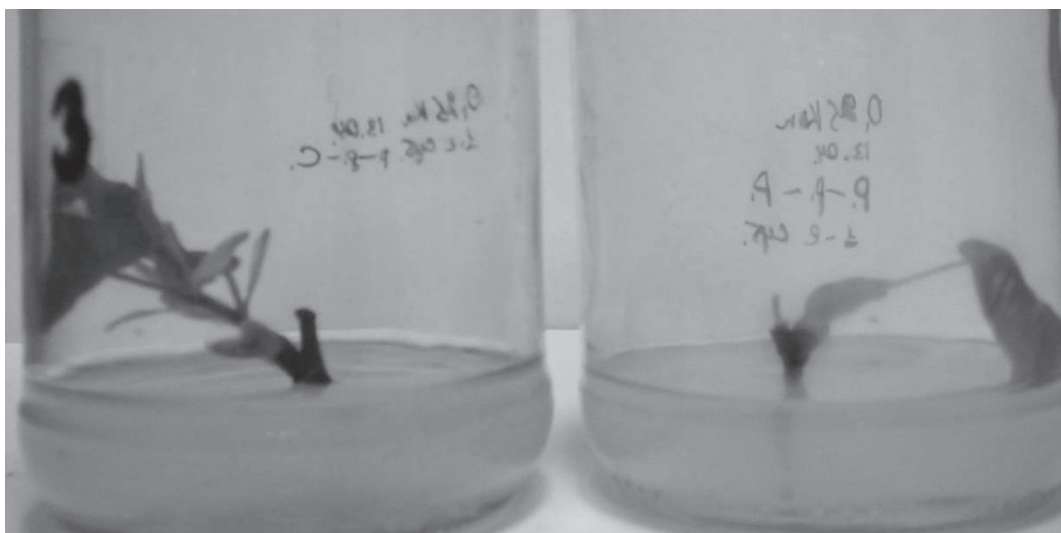


Fig. 2. *T. cordata* shoots under *in vitro* conditions (left – obtained from the seedlings, right – obtained from the mature trees, line scale – 1 cm)

Hence, the conducted research showed that the regenerative processes of the explants from the mature trees take more time compared to those of the explants from the seedlings. Also, as the result of the conducted research, the

seasonal influence on the selection was determined, its length and type as well as the age of the donor plant of *T. cordata* on the regenerative ability under *in vitro* conditions were revealed.

Conclusions

1) It was established that the type of *T. cordata* explant, its size and seasonal selection have the great impact on the regenerative ability.

2) It was revealed that fragments of *T. cordata* shoots 10–15 mm long under *in vitro* conditions had the high regenerative ability in the period of March-May, namely it was 75–80 %.

3) It was shown that regenerative ability of explants isolated from the seedlings is significantly higher compared to the regenerative ability of the explants isolated from the mature trees.

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Виявлено вплив сезонності добору, типу й розміру експлантату Tilia cordata Mill. на регенераційну здатність in vitro. Експериментально встановлено, що фрагменти мікропагонів завдовжки 10–15 мм мали високу регенераційну здатність у весняний період. Показана органогенна реакція експлантатів T. cordata, ізольованих від сіянців та зрілих дерев.

Tilia cordata Mill., культура in vitro, експлантати, живильне середовище, регенераційна здатність.

Виявлено влияние сезонности отбора, типа и размера эксплантатов Tilia cordata Mill. на регенерационную способность in vitro. Экспериментально установлено, что фрагменты микропагонов длиной 10–15 мм имели высокую регенерационную способность в весенний период. Показана органогенная реакция эксплантатов T. cordata, изолированных от сеянцев и зрелых деревьев.

Tilia cordata Mill., культура in vitro, эксплантаты, питательная среда, регенерационная способность.

УДК 712.41

РЕТРОСПЕКТИВНИЙ АНАЛІЗ ТЕРИТОРІЇ ДЕНДРОПАРКУ «ЮННАТСЬКИЙ» НАЦІОНАЛЬНОГО ЕКОЛОГО-НАТУРАЛІСТИЧНОГО ЦЕНТРУ

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Проведено передпроектний аналіз та вивчено сучасний стан озеленення і рівень благоустрою території дендропарку «Юннатський» НЕНЦ. Розроблено проектні пропозиції щодо основних напрямків його реконструкції.

Дендропарк, реконструкція, інвентаризація, ландшафтний аналіз, просторова структура, композиційна вісь, деревні рослини.

Дендрологічні парки створюються з метою збереження і вивчення, у спеціальних умовах, різноманітних видів дерев і кущів та їх композицій для найефективнішого наукового, культурного, рекреаційного та іншого використання [3].

Нині в Україні нараховується понад 60 дендропарків, серед яких – 19 належать до дендрологічних парків загальнодержавного значення, а решта – до дендропарків місцевого значення [8].

Із плином часу елементи благоустрою дендропарку старіють та піддаються антропогенному навантаженню, насадження втрачають свої