

AGROSYM

BOOK OF PROCEEDINGS



*XV International Scientific Agriculture Symposium
"Agrosym 2024"
Jahorina, October 10-13, 2024*

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“AGROSYM 2024”**



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PREFACE

Dear colleagues,

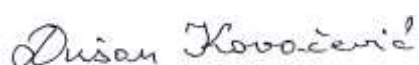
It is with great pleasure that I introduce the *Book of Proceedings* for the 15th International Scientific Agricultural Symposium “AGROSYM 2024.” I trust that you will find it a valuable resource in your work. This year, around 800 contributions have been accepted for inclusion in the *Book of Abstracts*. The themes of AGROSYM 2024 span the full spectrum of agricultural sciences, divided into seven key sessions: 1) Plant Production, 2) Plant Protection and Food Safety, 3) Organic Agriculture, 4) Environmental Protection and Natural Resource Management, 5) Animal Husbandry, 6) Rural Development and Agro-Economy, and 7) Forestry and Agroforestry.

There is growing consensus among scholars and practitioners that technological innovations have the potential to boost agricultural production, enhance supply stability, and reduce the environmental impact of farming. Technology has been especially pivotal in increasing the productivity of annual crops such as maize, rice, soybeans, wheat, and cotton. However, with trees having longer growth cycles, breeding programs for these crops require more time. New plant breeding techniques promise improvements in productivity, but they have sparked an ongoing academic debate regarding their advantages and drawbacks.

While much of the focus in the past has been on the production side of agriculture (e.g., productivity and efficiency), there is an increasing emphasis today on the consumption side and the intermediate stages of the food chain, such as processing and distribution. This shift is driving the transition toward a “farm-to-fork” approach. Globally, consumers are sending clearer signals about their preferences for higher quality, healthier, safer, and more flavorful products. In response, many agri-food companies are exploring innovative ways to gain greater control over production processes and ensure the quality and safety of final products. Furthermore, changes in investment strategies hold the potential to reduce the environmental and social costs of agriculture. It has become increasingly clear to investors that companies that prioritize sustainability and social responsibility tend to yield better long-term returns.

Agri-food systems are at the heart of global discussions surrounding sustainable development and the achievement of the United Nations Sustainable Development Goals (SDGs) by 2030. These systems are deeply connected to numerous global challenges, including climate change, poverty, food insecurity, biodiversity loss, resource depletion, and ecosystem degradation. A key goal of the sustainable agriculture movement is to create farming systems that mitigate or eliminate the environmental harms associated with industrial agriculture. Additionally, it is critical to improve the resilience of food systems to crises, shocks, and pandemics.

I would like to extend my heartfelt thanks to all the authors, reviewers, and colleagues who contributed to the editing of the *Book of Abstracts*. Special thanks are due to our co-organizers and partners for their unwavering collaboration and comprehensive support throughout this endeavor.



East Sarajevo, 10 October 2024

Prof. Dušan Kovačević, PhD

Editor in Chief, President of the Scientific Committee of AGROSYM 2024

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Abstract

The "Jozića Koliba" memorial is located within the "Obrenovački Zabran" forest complex, which also includes the "Jozića Koliba English oak group", which is a level III protected monument. This natural monument consists of six English oaks (*Quercus robur* L.) with an average age of 250 years. Due to the effects of climate change and anthropogenic activities, all trees require intervention to maintain the overall attractiveness of the area. The tree number 1 requires immediate action to slow down its ageing and decay. The aim of this study was to analyse the state of health and the degree of deterioration of the protected tree number 1. Based on the results obtained, measures were defined to remedy the damage caused by biotic and abiotic factors. The investigation included recording the habitat-ecological conditions, dendrological parameters and the health of the tree. Boot damage was determined by visual inspection, sampling for laboratory tests and the use of an increment borer from inside the boot. The vitality and decorative value of the tree were assessed on the basis of these analyses using a modified VTA method. The analyses showed that the tree is dying due to its age and that this process is accelerated by ecological and, above all, anthropogenic factors. Based on the measurements, a cross-sectional model of the tree was created at the root collar and at a height of 1.5 metres. The percentage of the healthy part of the tree is between 10-85% of the total cross-section. The rehabilitation of the tree included cleaning the rot in the boot, disinfecting the cavity and filling it. Finally, a crown reduction was carried out by removing damaged branches. Support pillars were designed to improve and ensure the stability of the tree. The proposed restoration measures will extend the life of the tree and allow the area around the protected tree to be used safely.

Keywords: English oak, arboriculture, Obrenovački Zabran, VTA.

Introduction

The "Jozića Koliba" memorial is located within the "Obrenovački Zabran" forest complex on the left bank of the Kolubara River, near the village of Veliko Polje, and covers an area of 2 hectares. By the decision of the City Assembly of Belgrade, the area "Group of English oaks in Jozića Koliba" was designated as a natural monument and declared a protected natural area of protection level III - significant natural area (No. 501-8/96-XIII-01 of 1 February 1996, Official Gazette of the City of Belgrade, No. 1/1996) (Veselinović et al., 2014; Veselinović et al., 2015). The maintenance of this natural asset has been entrusted to the Public Enterprise for the Protection and Improvement of the Environment in the Municipality of Obrenovac. The natural monument consists of six English oaks (*Quercus robur* L., syn: *Quercus pedunculata* Erh), which are on average about 200 years old, with their horizontal crown projections. The protected area covers 16.25 ares. The main objective of the protection is to preserve these English oaks as important components of the native forest communities of oak and ash (*Querceto-fraxinetum serbicum*) that were once widespread in Serbia (Gajić, 1984;

Tomić and Rakonjac, 2012). The site "Group of English oaks near Jozića Koliba" is under level III protection, which allows selective and limited use of natural resources as well as controlled interventions and activities, provided that they are consistent with the functions of the protected natural area or are associated with traditional forms of economic activity and housing, including tourism development (Veselinović et al., 2014; Veselinović et al., 2015). These activities must not jeopardise the authenticity of the flora and fauna, hydrographic, geomorphological, geological, cultural and landscape values, unless they maintain or create a natural balance and fulfil the functions of the natural area in accordance with the established protection regime and its significance. The protected oaks are located on the cadastral parcel Veliko Polje No. 1571/1 and are marked with numbers from 1 to 6. The observed damage and decay of the protected trees require interventions to preserve the trees themselves (Gruber, 2008) and thus maintain the authenticity and attractiveness of this place (Mitrović et al., 2023). The protected tree with the number 1 is the subject of this study.

Materials and methods

In order to achieve the restoration and conservation of the protected tree No. 1 in the natural monument "Group of English oaks in Jozića Koliba", a methodology was applied that included the recording of habitat ecological conditions in the study area, a detailed analysis of the tree's health and degree of damage, mapping of damage, recording of dendrological parameters and assessment of the tree's condition (Zorzenon and Campos, 2014; Suchocka et al., 2022; Suchocka et al., 2023). Based on the results obtained, measures were defined to remedy the damage caused by insect pests and pathogens to the oak (Bond, 2006; Matheny and Clark, 2009). Basic data on the habitat-ecological conditions of the site were collected using climate data for the town of Obrenovac and laboratory analyses of soil samples. Samples with characteristic disease symptoms were taken to analyse the health status of the tree in order to identify the cause of the disease in time and make a diagnosis. A laboratory analysis of the available data on the prevalence and presence of insect pests and pathogens was carried out.

All symptoms recorded were categorised as follows:

- Changes in the morphological appearance of the entire plant or individual plant organs;
- Changes in the colour of the plant organs (chlorosis, spotting, redness, etc.);
- Changes in the content of the plant tissue (destruction), manifested by the appearance of rot or exudate; and
- Presence of foreign bodies on plants (vegetative organs of fungi, fruiting bodies of fungi, reproductive organs of fungi).

The identification of the saprophytic and parasitic fungi present was carried out using standard phytopathological methods: microscopic analysis of fruiting bodies and reproductive organs or isolation from plant parts in the case of fungi that do not form fruiting bodies in nature. Identification was based on the appearance, growth rate and pattern of the mycelium, the formation of fruiting bodies in culture, sporulation, appearance of hyphae, etc. The identification of the fungi was based on the descriptions in the following publications: Breitenbach and Kranzlin (1986); Hagara (2014); and Stalpers (1978). For each pathogen and pest, the sensitivity of the plant to the pathogen, characteristic symptoms and possible protective measures were listed. To evaluate the condition of the crown, a five-point scale was used, where: 0 - healthy tree with no dry branches in the crown; 1 - tree with single dry branches in the crown; 2 - drying has affected the top of the crown (dieback); 3 - tree with more than 50% dry branches in the crown; and 4 - dead tree. Damage to the boot was determined by visual inspection, taking samples from the surface of the tree and using a drill

inside the boot. Based on the analysis of the samples, the degree of damage was determined and a model of the boot decay and a cartographic representation with the positions of the recorded damage were created. The vitality and ornamental value of the protected oak were assessed on the basis of the VTA (Visual Tree Assessment). The vitality and ornamental value were determined using the VTA (Visual Tree Assessment) method (Mattheck and Breloer, 1994; He et al., 2022) and a rating from 1 - poor to 5 - excellent was assigned on the basis of all analyses.

Based on the analysis of the extent of tree damage, the vitality of the trees and the ecological influences (wind, etc.), measures to improve stability were proposed. Based on all the information collected and the analysis carried out, proposals were made for specific measures and conditions to protect and improve the condition of protected tree No. 1.

Results and discussion

The basic climatic characteristics of "Jozića Koliba" are characterised by a temperate continental climate with warm summers and cold winters. Due to its complete openness to the north and north-west, it is often influenced by cold air masses. The valleys of the Drina and Kolubara rivers play an important role in the direction of the air currents. The wind usually blows from the south-east, while it blows less frequently and with less intensity from the north and south. The primary substrate at the Jozića Koliba site is black meadow soil – semigley. This is a hydromorphic soil formed under the influence of groundwater. Here, black meadow soil is formed on alluvial deposits, which makes the soil predominantly clayey and very well supplied with plant assimilates. The humus and total nitrogen content is high. A close C/N ratio indicates that the mineralisation of organic nitrogen and its conversion into mineral and plant-available forms is good. The soil is very well supplied with potassium, which is easily accessible to plants. The once widespread native forest community of English oak and ash (*Querceto-fraxinetum serbicum*) at this site is an indicator of a high groundwater table. The disappearance of this community and the state of its remnants are clear indicators of the retreat of water to greater depths. In addition to climate change as the main cause, the construction of a dam upstream on the Kolubara River (after the major floods in 2014) on the one hand and the raising of an embankment for the Miloš Veliki motorway on the other have further contributed to the lowering of the groundwater level. The analysis of the health status of English oak No. 1 revealed the presence of several pathogens and pests that threaten the survival of the entire tree. Among other things, pathogenic fungi were found: *Ganoderma adspersum* (Schulz.) Donk (Figure 1), *Stereum hirsutum* (Willd.: Fr.) S.F. Gray and *Microsphaera alphitoides* Griff. and Maub. The greatest damage to this tree was caused by *G. adspersum*, which causes white rot in the wood. Insects present include: *Microsphaera alphitoides* Griff. and Maub., *Parthenolecanium rufulum* Chll., *Pulvinaria betulae* (L.), *Asterodiaspis variolosa* (Ratz.), *Coroebus bifasciatus* Ol., *Cerambyx cerdo* L., *Clytus arietis* (L.), *Curculio glandium* L., *Archips xylosteana* L., *Cydia splendana* Hbn., *Cydia amplana* Hbn., *Ancylis mitterbacheriana* Den. Schiff., *Tischeria complanella* Hbn., *Caliroa varipes* (Klug.), *Andricus quercuscalicis* (Burg.), *Andricus collari* (Htg.), *Andricus hungaricus* (Htg.), *Andricus caputmedusae* (Htg.), *Neuroterus quercusbaccarum* (L.) and *Vespa crabro* L..



Figure 1. *Ganoderma adpersum* (Schulz.) Donk, *Microsphaera alphitoides* Griff. And *Neuroterus quercusbaccarum* (L.)

On the basis of the analysis of the extent of damage to the examined tree, it was established that the tree is very old and is gradually dying due to its age, with the process being considerably accelerated by the pathogens and pests present. A visual inspection of the tree revealed damage to the bark and cavities spreading inwards towards the centre of the tree, with a large opening on the south-east side. The most significant damage was found at the root collar and just above the soil surface. Examination of cores taken from the tree at a height of 1.50 metres shows that the hyphae of the rot fungus have not yet penetrated to a depth of 20 cm from the surface in this part of the tree, with the exception of part of the tree on the north-west side, where bark damage was found at a height of 1.60 metres.



Figure 2. Damage to the tree

The observed cavities are a direct consequence of the tree rot caused by *G. adpersum*. These areas in the tree (cavities, damaged bark, etc.) are ideal places for various animals and birds to settle and further damage the already diseased tree (Figure 2).

The measurements taken within the squares placed in the field enabled the creation of a damage model inside the tree that predicts the necessary remedial measures (Figure 3). The squares were positioned at the base of the tree, with a side length of 230 cm, orientated in the following directions: a – north-east, b – north-west, c – south-west, d – south-east. Using this model, it was found that the degree of damage at the base of the tree reaches up to 90%, while the central part of the tree is completely affected by the rotting process. The percentage of rotten wood decreases as the height of the tree increases, so that already at a height of 1.80 m this type of damage is no longer significant.

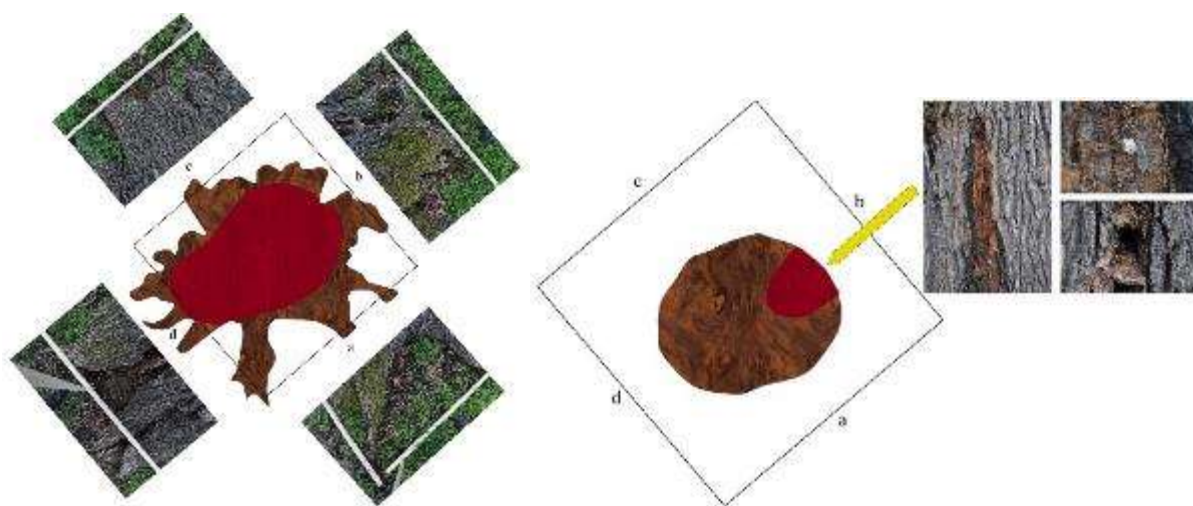


Figure 3. Schematic representation of the damage (rot) in cross-section at the root collar (left) and at a height of 1.50 metres (right). Arrows indicate the areas where the rot has affected the tree directly under the bark. Red color represents the area of rot in cross-section of trunk.

Based on the analysis of the core samples and the shape of the tree, the decay model inside the tree resembles a truncated cone with a base area of 2.07 m², a surface area of 0.12 m² and a height of 1.80 metres.

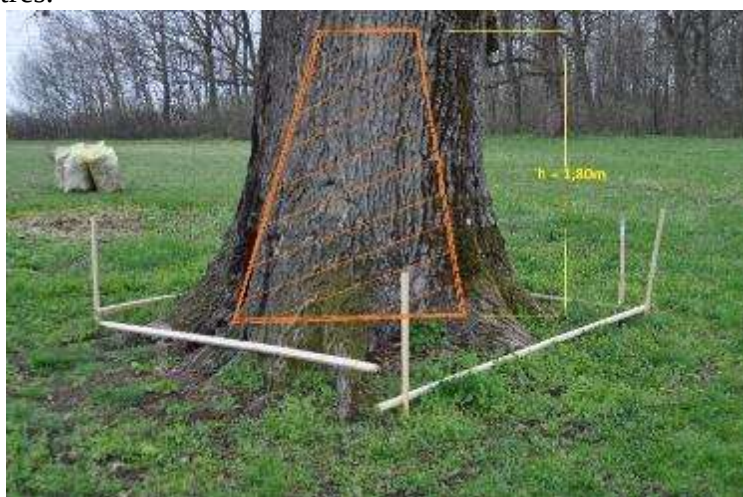


Figure 4. Schematic representation of damage in the shape of a truncated cone

According to the formula $M = \pi(R+r) \cdot \sqrt{H^2 + (R-r)^2}$ the surface area of the truncated cone is 5.73 m², increased by the upper surface area (0.12 m²), i.e. a total of around 6 m². According to the formula $V = \pi H/3 \cdot (R^2 + rR + r^2)$, the volume of the truncated cone is approximately 1.5 m³.

The tree is damaged up to a height of 1.8 m, which corresponds to about 52%. According to the investigations carried out, the condition of the tree above this height is satisfactory. In this area, movements of ants were observed, which have settled in the decayed part of the tree and do not contribute to further destruction, but are a consequence of the condition of the tree. The decayed part of the tree has lost both its physiological and mechanical properties, thus jeopardising the stability of the entire tree. Apart from the sporadic occurrence of thin, dry branches and occasional broken branches in the tree crown, no major mechanical damage was observed. The health of the tree crown is satisfactory. The tree crown is asymmetrical, which also affects its stability. Most of the branches are orientated to the north-west, west and south-west.

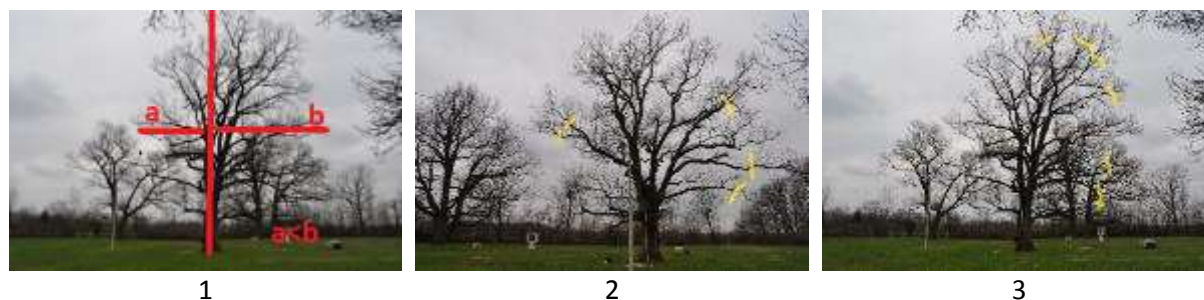


Figure 5. Schematic representation of the reduction of the asymmetric canopy of oak tree No. 1 (1) and the planned corrections of the canopy on the northeast side (2) and northwest side (3).

Fumigation was carried out to eliminate the insects present in the boot. The tree was treated with a fumigant and wrapped in plastic for 24 hours. After removing the plastic, the area was observed for several days to see if the pests would reappear. The rot in the heartwood of the tree was then tackled in the following stages: Removal of the rotted and insect-damaged wood, formation of the cavity, disinfection of the cavity walls and coating of the cavity walls with waterproof materials (grafting wax). Aesthetic corrections were then made to the boot, including closing the cavity. The gap remaining after removal of the rotten wood was filled with expanding foam. In order to preserve the aesthetic features of the tree and blend it harmoniously into its surroundings, the outer surface of the opening was treated to make it look as natural as possible. It was painted with environmentally friendly paint that matches the colour of the tree bark. In addition to the crown reduction, support pillars were installed under certain branches to withstand lateral wind loads and prevent large branches in the tree crown from breaking off.



Figure 6. Repaired tree damage caused by *Ganoderma adspersum* (Schulz.) Donk

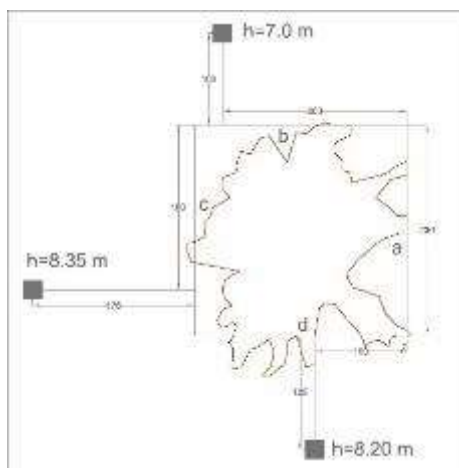


Figure 7. The position and spacing of the supports in relation to the base of English oak no. 1



Conclusion

The damage and decay of the protected tree no. 1 required urgent measures to preserve the tree. This ensured that the authenticity and attractiveness of this site was preserved. The proposed measures are in line with the protection conditions of this area and take into account the conservation and preservation of the biological integrity of the tree through the application of all available biological and technical care and protection measures. Considering the current

satisfactory ecological factors, the measures taken to restore the condition of the protected oak will help to slow down the process of deterioration and extend its lifespan. This will allow the tree to exist safely at the "Jozića koliba" excursion site without jeopardising the safety of space users in the immediate vicinity of the tree.

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