

are antibiotic resistant and are the causative agents of foodborne infections. The soil microbiome plays an important role in the development and spread of antibiotic resistance in humans. The risk to antibiotic resistance exposure via produce consumption should best be managed by ensuring that practices designed to protect bioproduction from contamination with pathogenic microorganisms are also protective with respect to exposure to antibiotic-resistant bacteria selected for in the digestive tract of animals or humans.

CONCLUSION

Soil microbiome of plants: *Capsicum annuum*, *Vitis vinifera*, *Rubus idaeus* L., *Petroselinum crispum* characterized by high functional biodiversity. The taxonomic structure of microbial community has been determined by biochemical markers and showed significant difference between plant species. The screening of conditionally pathogenic and pathogenic microorganisms of soil microbiome has proved that modern agroecosystems are the source of the spread of pathogenic and opportunistic antibiotic resistant microorganisms. In total from communities of dominating bacteria were isolated 23% of microorganisms characterized by high level of antibiotic resistance. All of them are pathogenic or conditionally pathogenic for human and can cause food borne diseases.

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GEOLOGICAL AND CULTURAL HERITAGE IN GEONATURA KIELCE (POLAND)

The article presents an interesting solution for reclamation in the Geonatura Kielce area, the mining activity of which played or plays an important role. A geotourist product, based on geological and cultural heritage (geoparks), provides ready-made models for the management and use of post-mining areas in accordance with the principle of sustainable development.

Key words: geoeducation, reclamation, post-mining areas

Geopark Kielce (Poland), operating since March 2021 under a new name - Geonatura Kielce, is a unit of the Kielce City Hall, managing the post-mining areas of Wietrznia, Kadzielnia and Ślichowice and the Botanical Garden in Kielce. It is also a formula for the sustainable use and promotion of the local geological heritage operating as part of a larger, area geotourist product called "Geopark Świętokrzyski" covering the area of 526 km², located within the administrative boundaries of five municipalities: Kielce, Chęciny, Morawica, Nowiny and Piekoszów. On March 21, 2021, the Świętokrzyski Geopark was officially recognized as a UNESCO Global Geopark [1, 2].

The basis for the establishment of the Kielce Geopark (now Geonatura Kielce) were the original conceptual studies of a geologist and regionalist - Tymoteusz Wróblewski, created in the 1990s [4].

Geopark as a unit of the Kielce City Hall was officially established on October 1, 2003 [2].

The establishment of this institution focused on the management of post-mining areas and the promotion of the city's geological values was the result of cooperation between the Świętokrzyskie Branch of the Polish Geological Institute and the Environmental Protection Department of the City Hall in Kielce. Initially, the main goal of the newly created unit was to administer the post-mining areas of Wietrznia, Kadzielnia and Ślichowice. Over time, the unit expanded its activities to large investment projects and the management of facilities that were created as a result of their implementation, i.e. the Geoeducation Center in the Wietrznia nature reserve and the Botanical Garden located on the south-eastern slope of Góra Karczówka. The first of these facilities, since its inception in 2012, plays a key role in the functioning of the unit as its administrative seat as well as the main information and education facility. The Geoeducation Center, along with the development and network of educational paths in the Wietrznia nature reserve, are also a model example of the development of the post-mining area, which remained after the opencast mining of carbonate resources, conducted in this area until 1974. The mining of carbonate rocks carried out in three multi-level workings as well as the storage of industrial unusable rocks on external dumps resulted in the creation of the largest post-mining area in Kielce, with an area of over 18 ha. In the years 1974-1978 various conceptual solutions for the development of such an extensive post-mining area were presented. The development concepts at that time took into account the location within the former quarries of a landscape and recreation park with a waterfall and a water reservoir, and in the vicinity of the deepest excavation ("Wietrznia"), a sports and entertainment hall, an Olympic swimming pool and a cycling track. Ultimately, these concepts were never implemented, and the complex of three post-mining workings functioned until 1999 as a poorly developed recreational area subject to renaturalization. In 1999, at the initiative of the scientific community, the entire post-mining area with an area of about 18 ha was protected as a nature reserve, Wietrznia im. Zbigniew Rubiński " [2, 3].

In 2000, a concept for the organization and operation of the Geoeducation Center in Kielce, located in the south-eastern part of the post-mining area (reserve), was created [4].

This concept was implemented in 2012. The design and construction of the Center were an investment task under the EU project "Świętokrzyski Archeo-Geological Trail" implemented in 2010-2012. The result of this project was the creation of a linear tourist product in the form of a trail called the Świętokrzyski Archeo-Geological Trail. The Geoeducation Center in Kielce, along with the surrounding protected area within the Wietrznia nature reserve, has become one of the key elements of this product. The facility was officially commissioned in May 2012, becoming the administrative seat of the Kielce Geopark, renamed Geonatura Kielce in March 2021. It is worth emphasizing that the Geoeducation Center also serves as the seat and main information and education center of the Świętokrzyski Geopark, which has the official status of UNESCO's World Geopark since March 21, 2021.

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ІНТРОДУКЦІЯ ТА АКЛІМАТИЗАЦІЯ ДЕНДРОФЛОРИ РІВНЕНЩИНИ ЯК ЗАСІБ ЗБЕРЕЖЕННЯ ФІТОРІЗНОМАНІТТЯ

Вивчення способів інтродукції та акліматизації дендрофлори в умовах Рівненщини передбачає ознайомлення з деревними видами рослин, які мають декоративне значення і можуть використовуватися у садово-парковому господарстві. Засобами інтродукції можливо та потрібно вирішувати актуальні питання збереження природних екосистем (біорозмаїття), проблеми покращення життєвого простору в умовах сталого розвитку, забезпечення людства сировиною і енергією сьогодні та у майбутньому.

Ключові слова: дендрофлора, інтродукція та акліматизація, деревні рослини.