SPATIAL LAYOUT OF THE ROOT SYSTEM OF HOP IN CZECH REPUBLIC

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INTRODUCTION

In order to get to know the plants´response to habitat conditions perfectly,the knowledge of the development, morphology and functionality of the root system, among other things, is fundamental. The root system in terms of its anatomy, spatial layout, physiology and chemical composition provides basic information about interactions between the plant and the environment. Soil conditions and characteristics of the soil profile influence the formation of the root system of hops.

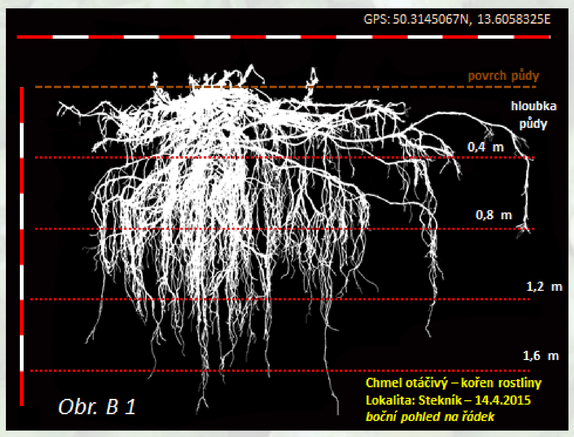
MATERIAL AND METHODS

Between 2015 and 2017 several excavations of the root system of three Czech hop varieties ranging in age from 3 to 14 years were carried out in the Saaz hop growing area (locality Steknik near Žatec, altitude 197-203 m). The soil profile at the evaluated localities was characterized by quaternary sediments from the holocene and pleistocene epochs, consisting of topsoil and brown to red clays. Under the surface layer, the sediment deposits were represented by black-gray clay and sandy clays. Large amount of soil was removed by means of heavy machinery. Preparation of the root system was completed by manual removing of the soil from the root zone. During the preparation of the roots, their spatial layout was recorded in the soil by means of markers placed on the spine roots. The position of the roots was determined based on axial coordinates x /y /z from the center of the crown. After the roots were removed from the ground, their spatial reconstruction and subsequent graphical analysis were performed using infrared images.

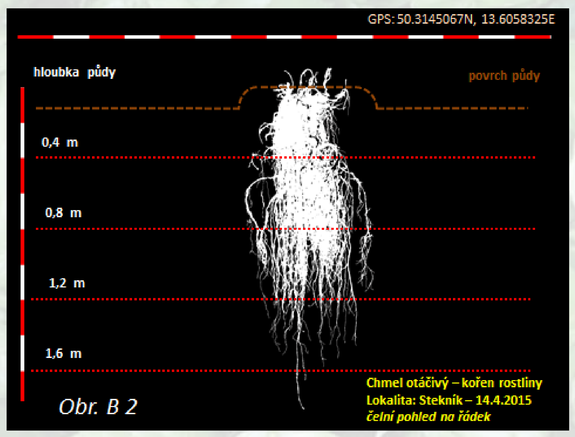
RESULTS AND DISCUSSION

Depending on the age of the hops, the depth of the roots ranged between 100 cm (Saaz, 3 years old plant), 130-140 cm (Agnus, 14 years), 150 cm (Harmony, 4 years) and 220 cm (Saaz, 15 years). The lateral penetration, perpendicular to the line, was limited, mostly to the distance of 50-60 cm, measured from the center of the crown, to the depth of about 50 cm. Capillary roots growing from the stronger ones have been found throughout the root system profile. The limited formation of horizontal roots at the top of the soil profile (perpendicular to the line) is caused by the repeated cultivation of hop gardens to the depth of 10-15 during vegetation. The predominant feature of the 14-year-old root system of the Agnus variety was the mutual proliferation of the roots of adjacent plants in a horizontal direction along the line axis. To disclose the entire root system of 2 plants, it was necessary to uncover the roots of another 2 adjacent plants in the upper layer to the depth of about 30 cm. In the depths of 40-80 cm, dead roots of about 10-15 mm were found. At the transition of the dead and the living plant parts, new weaker thinner and roots were growing out.

Kořen rostliny chmele v roce 2015, Agnus, 14 years old plant - boční pohled na řádek, čelní pohled a pohled shora.



Obr. B 1



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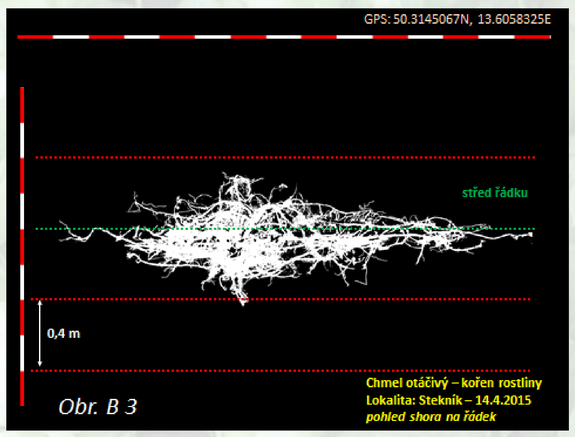
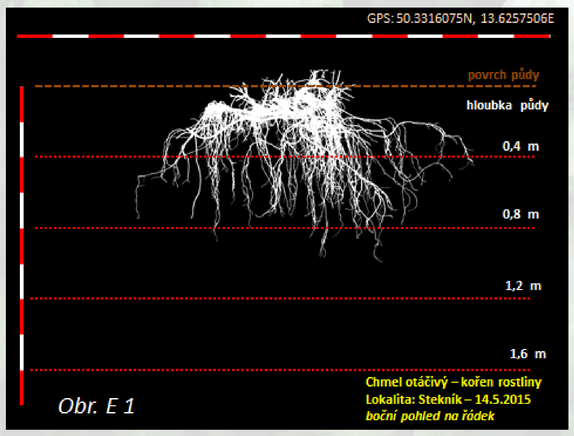


Obr. B 3

Kořen rostliny chmele v roce 2015, Saaz, 3 years old plant - boční pohled na řádek, čelní pohled a pohled shora.



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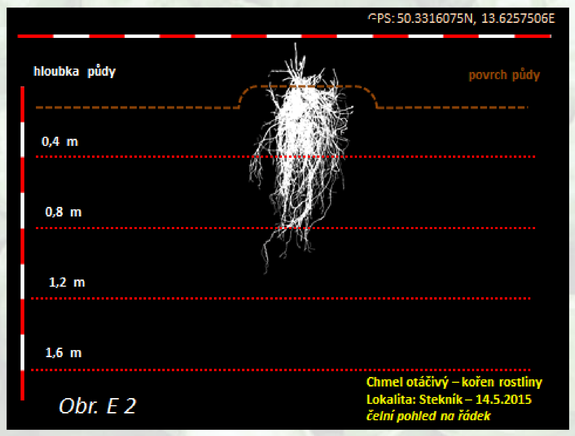

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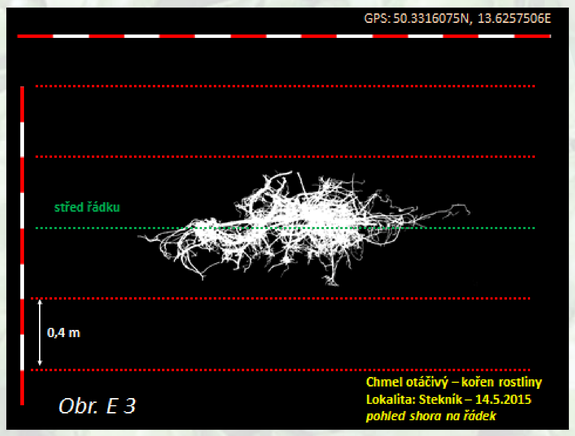

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CONCLUSION

The growing technology, based on the regular cultivation of the interlayer, fundamentally influences the formation of the root system of hop in the Czech hop gardens. The spatial distribution of the root system in the soil is the basic requirement for efficient argotechnical procedures for hop growing. In particular, it enables a targeted application of nutrients in the soil to the rooting zone and creation of conditions for water infiltration (rain and irrigation) to the root system.

Key words. Hop (Humulus lupulus L.), root system, soil,

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References

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Proces analýzy kořenů v roce 2017.

Počátek preparace a značení kořenů.

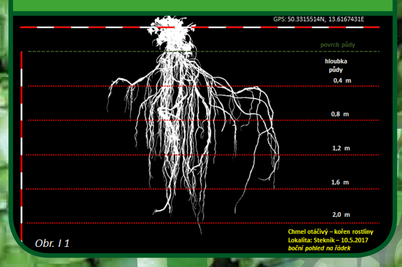
Dosažení hloubky prokořenění.

Proces analýzy kořenů v roce 2017.

Konec rekonstrukce.

Provedení infrasnímku.

Výsledek obrazové analýzy.



Obr. I 1