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Chapter

Introductory Chapter: Plant Roots - Underground Treasure

Ertan Yildirim

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1. Introduction

Since the earliest ages of history, almost everywhere in the world, people have been interested in plants in terms of more utilization. People have learned which plants can be nutrients, which are medicinal and poisonous, and the wood of which trees is suitable for construction or making weapons. Human beings have been using plants and their roots, which are an important part of them, in many areas of their lives since ancient times [1].

In botany, the root, normally part of an underground vascular plant, plays a very important role in plant growth and development. The root is an organ that generally grows into the soil in developed plants that have adapted to terrestrial life, but rarely is found above the ground. The roots have channels to transport nutrients and water to the stem and leaves. They also have channels that allow organic matter to be transported from the above-ground parts of the plant to the roots [2].

Roots also act as a storage organ by accumulating nutrients. Although the root is in the soil, the roots of some plants can also grow in air or water. Roots that grow in air are called aerial roots, roots that grow in water are called water roots [3]. Primitive plants such as mosses and ferns have no real roots, but rhizoid extensions. In general, the difference of the root from the stem in terms of its external appearance is that it does not have leaf-bearing nodes (nodes) and nodes (internodes) and does not appear green because it does not contain chloroplasts. The surface of the root system consisting of roots and lateral roots under the soil is equal to or more than the total surface of the trunk and side branches above the soil.

The root system has important functions: 1. Ensures that the plant anchors to the soil. 2. Absorbs water and minerals dissolved in water. 3. Stores foods (e.g. carrot) 4. Synthesizes hormones and organic compounds [4]. The roots send some signals to the stem in stress conditions such as drought and salt stress to avoid damage to the plant, and provide that the above ground part takes the precautions to adapt to the negative conditions [5].

The root system body forth a significant interface to which plants act and react by the environment. Roots perceive the characteristics of their environment and adjust their development and performance accordingly, so they play an important role in maintaining the growth targets of the plant under abiotic stress which adversely affect plant productivity around the world.

Human being use plant roots as food, clothing, and medicine, and dyes. Some roots like carrots, yam, potato and radish serve the purpose of a storage organ which is used as food by humans. They store carbohydrates and water.

Roots are the source of crucial drugs that have the potential to save life. Herbal remedies such as ginseng, ipecac, rauwolfia, ashwagandha are obtained from the

roots. The use of plants in human therapy started with the history of humanity. Thousands of years ago, people recognized the therapeutic power of plants and took advantage of them to live healthy. Folk medicines are practices that have survived until today after long experiences. Many drugs used in modern medicine are also obtained from plant roots [6].

The usage of natural dyes is increasing significantly due to the quality of the natural dyestuff obtained, the environmental compatibility of the dyes, and the reduction of processing costs significantly. Natural dyes are obtained from various parts of plants such as leaves, roots, seeds and flowers. Madder (*Rubia tinctorum*) is a perennial plant originating in the Eastern Mediterranean and Central Asia. It's the most important source of "true" red in plant dyeing [7].

Hairy and adventitious roots can biosynthesize highly stable secondary compounds in vitro. Nowadays, it is possible to expand the scale of root cultures in bioreactors, making it possible to produce secondary compounds on an industrial scale. Roots can have fiber. Fiber obtained from the roots is utilized to make brooms, baskets and brushes. Roots can prevent soil erosion. Roots also play an important role in preventing desertification by preventing soil erosion [8].

2. Conclusion

Eshel and Beeckman [9] describe the roots as hidden half. They emphasize new understandings about roots gained in the post-genomic era. The genetic and phenotypic variability of the roots will be fully utilized by growers to benefit agricultural productivity and maintain natural plant systems. Studies on roots will provide opportunities to develop food security and environmental sustainability. The challenge is not just to reveal how roots work, but to do so in the soil of all its physical, chemical, and biological complexity [4]. This book explain root-soil interactions, ethnobotanical use of roots, secondary metabolite production and soil resource acquisition from agricultural and ecological perspectives.

Author details

Ertan Yildirim
Faculty of Agriculture, Department of Horticulture, Atatürk University, Erzurum, Turkey

*Address all correspondence to: ertanyil@atauni.edu.tr

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References

[1] Petrovska BB. Historical review of medicinal plants' usage. Pharmacogn Rev. 2012;6(11):1-5. doi:10.4103/0973-7847.95849

[2] McElrone, A. J., Choat, B., Gambetta, G. A. & Brodersen, C. R. (2013) Water Uptake and Transport in Vascular Plants. Nature Education Knowledge 4(5):6

[3] Struik, PC., 2007. Above-Ground and Below-Ground Plant Development, Editor(s): Dick Vreugdenhil, John Bradshaw, Christiane Gebhardt, Francine Govers, Donald K.L. Mackerron, Mark A. Taylor, Heather A. Ross, Potato Biology and Biotechnology, Elsevier Science B.V., 2007, Pages 219-236, ISBN 9780444510181, https://doi.org/10.1016/B978-044451018-1/50053-1.

[4] Ryan, P.R., Delhaize, E., Watt, M., Richardson, A.E., 2016. Plant roots: understanding structure and function in an ocean of complexity. Annals of Botany 118: 555-559. doi:10.1093/aob/mcw192.

[5] Falik O, Mordoch Y, Ben-Natan D, Vanunu M, Goldstein O, Novoplansky A. Plant responsiveness to root-root communication of stress cues. Ann Bot. 2012;110(2):271-280. doi:10.1093/aob/mcs045

[6] Pan, S. Y., Litscher, G., Gao, S. H., Zhou, S. F., Yu, Z. L., Chen, H. Q., Zhang, S. F., Tang, M. K., Sun, J. N., & Ko, K. M. (2014). Historical perspective of traditional indigenous medical practices: the current renaissance and conservation of herbal resources. Evidence-based complementary and alternative medicine : eCAM, 2014, 525340. https://doi.org/10.1155/2014/525340

[7] Michelle, L., 2018. "The Heart of the Madder: An Important Prehistoric Pigment and Its Botanical and Cultural Roots" (2018). Theses and Dissertations. 1854. https://dc.uwm.edu/etd/1854

[8] Wouter, V., Sarah, B., Keeble, J., Yifan, D. Poesen, J. (2017). How do root and soil characteristics affect the erosion-reducing potential of plant species?. Ecological Engineering. 10.1016/j.ecoleng.2017.08.001.

[9] Eshel A, Beeckman T. Plant roots: the hidden half. 2013, Boca Raton, FL, USA: CRC Press.