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EXCALIBUR sets out to reshape commercial agriculture

European research team about to unravel key principles for effective pathogen control

Austria, GRAZ. – The multi-faceted research project EXCALIBUR uniting 16 European partners in the mission to promote a sustainable change in commercial agriculture is about to enter its next working activities. Under the lead of Prof. Gabriele Berg from the Graz University of Technology, the scientists will characterise ecological mechanisms behind biocontrol to generate a large database of parameters relevant for its effectiveness. The thereby gained knowledge will be translated into best practise guidelines for farmers and manufacturers so they can maximise crop productivity through improved and long-term sustainable application of bioproducts (i.e. products based on microorganisms).



A mycorrhizal fungus colonizing a fine root

The microbiome defines “all kinds of microorganisms which live together in a confined space and collectively exert important functions”, explains Prof. Gabriele Berg who is one of the project leaders. The relevance of the microbiome for our health is well acknowledged. Similarly, these microscopic creatures play an important part in plant health and productivity. They support the germination of seeds, promote plant growth by producing plant growth hormones and supplying nutrients, and contribute to the floral smell that attracts pollinators.

Aiding plants in pathogen defence accounts as another benefit. By exploiting the functions of the soil microorganisms crop productivity and health can be controlled sustainably.

*“Through novel technologies we now can learn from microbiomes how to effectively control pathogens”, states Prof. Berg, who sees that as “an extraordinary opportunity!” **

*Original quote by Prof. Berg in German:

Mittels neuer Technologien haben wir jetzt die Möglichkeit von Mikrobiomen – Mikroorganismen aller Art, die auf kleinstem Raum gemeinsam wichtige Aufgaben erledigen – zu lernen, wie man Krankheitserreger kontrollieren kann. Das ist eine große Chance!



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The annual yield loss due to plant diseases ranges between 10-20%. Interestingly, pathogens constitute regular microbiome members. Non-pathogenic microbes, thus, ward off invading pathogens and keep coexisting pathogens at bay.

The exact circumstances that allow pathogens to breach through the microbial line of defence remain unclear, although a reduced microbial biodiversity seems to be a key element.

Today's conventional farming practises including many of the employed pesticides and fertilizers affect the natural microbial community. The resulting loss in soil biodiversity not only increases the risk of pest outbreaks, but also effects microbial ecosystem services such as the water, carbon and nitrogen cycles. Additionally, innovation potential which medicine, biotechnology and agriculture draw from microbial biodiversity gets diminished, like the identification of bacterial species as novel biofertilizers and biopesticides.

Due to the multi-faceted importance of microbial biodiversity in soil, EXCALIBUR seeks to promote "a biodiversity-driven change in the soil management of crops", points out project coordinator Dr. Stefano Mocali. Novel biocontrol agents for commercial strawberry, tomato and apple growing will be developed and their synergistic effects with soil biodiversity and the plant assessed in field experiments across Europe.

Starting from May, a whole array of different activities will be launched to conduct a detailed analysis of the plant-soil-microbe interactions. The research will aim to quantify how the different soil management strategies commonly utilized for the three different crops and stress conditions affect the applied bio-products and their effect on crop productivity as well as soil biodiversity and consequently ecosystem services. The analysis will also assess the environmental impact and overall benefits of using these microbial-based products in commercial agriculture.

A decision supporting system developed from the gained knowledge will then assist farmers in obtaining the best results from applying biofertilizers and biopesticides on their fields. The system will further accelerate the development of novel bioproducts. With the growing interest to substitute harmful pesticides and chemical fertilizers with biological alternatives, as recently laid out by the president of the European Commission, Ursula von der Leyen, in the "Farm to Fork"-strategy of the next five years, the better understanding on how to effectively develop and use microbial-based products provided by EXCALIBUR will aid farmers and manufacturers in complying with new regulations and market trends.

About EXCALIBUR:

EXCALIBUR is an international research project financed by the EU Research and Innovation Programme Horizon 2020 which started in June 2019. With the aim to initiate a biodiversity-driven change in agricultural soil management practises the project received 6.995.197,50 € in funds and brings together 16 European partners. Over a five-years timeline, the researchers will explore how crops, soil and microorganisms interact.

The gained understanding will promote a more effective use of biopesticides and biofertilizers for long-term productive and sustainable practises.

If you would like more information about this project, please contact Dr. Stefano Mocali at Stefano.mocali@crea.gov.it, or learn more on [Facebook](#), [Instagram](#), [Twitter](#) and the [EXCALIBUR homepage](#).



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