BIOLOGICAL CONTROL OF THE ALLERGEN PRODUCER RAGWEED (AMBROSIA ARTEMISIIFOLIA)



Projektträger:
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Forschungsfeld:
Medizinische Biotechnologie

Förderinstrument: Projekte Grundlagenforschung

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Kurzzusammenfassung:
The pollen of ragweed, Ambrosia artemisiifolia L., is five times more allergenic than grass pollen; already ten pollen grains per m3 air can trigger allergy in sensitized patients, including rhinitis, conjunctivitis and asthma. This neophyte from America has extended the season of allergy in European patients to October. Ragweed is currently most frequent in Hungary, France and Italy. In Austria since 2000, ragweed populations alongside of roads have been increasing dramatically everywhere. The effective means to control this weed of the Asteraceae family are limited; a single plant can produce 6000 seed, which stay in the soil and germinate for 40 years. Control using selective herbicides is not possible within stands of the Asteraceae member sunflower. Efforts to use herbivore insects as biological control agents also failed due to the unavailability of insects specializing on ragweed. Here, we propose as a novel alternative the use of plant-associated rhizobacteria and endophytes as bioherbicides. By analogy to experiences from other plant-microbe systems, the chances to find microbes of the desired characteristics are highest when isolating and testing specimens directly from ragweed plants. These organisms often have an extremely narrow host range that permits their use for the control of among several even closely related plant species growing together in a field.
Here, we propose a two-pronged, interdisciplinary approach toward reduction of ragweed-related allergies.
In one clinical investigation, the extent of ragweed affecting human health shall be elucidated to further detail. A large group of pollen allergic patients will be tested for specific sensitivity to ragweed pollen allergen. Associations of sex, age, and degree of allergic response with the genetic composition and geographic density of ragweed populations will be evaluated.
In a parallel set of experiments, we will investigate ragweed associated microbes for their potential to serve as bioherbicide agents. Bacteria will be isolated from both the rhizosphere and tissues of ragweed collected from a wide range of geographic origins, plant communities, and soils. Cultures displaying appropriate characteristics in-vitro will be tested as bioherbicides on ragweed in the greenhouse. To avoid potential adverse, allergenicity-increasing effects through the stress response of plants becoming colonized by microbes the levels of a major allergen Amb a 1 will be monitored on bacterized and clean control ragweed plant populations. The goal is to identify microbes that selectively reduce growth, pollen- and seed production of ragweed and make such strains usable for the biocontrol of ragweed in agriculture and urban land.
The results of this project will be comprised of new insights into the degree of allergies triggered by ragweed and efficient microbe isolates for the selective reduction of allergenic ragweed pollen via organic means.

Schlüsselbegriffe:
Allergie, Bio-Kontrolle, Pflanzen assoziierte Bakterien