


# Chapter 16

## Ensuring Food Security Through Biocontrol in Medicinal Plant Cultivation

**Yulia Myronova**

 <https://orcid.org/0000-0001-7263-4940>

*National University of Life and Environmental Sciences of Ukraine, Ukraine*

**Olena Bashta**

 <http://orcid.org/0000-0003-4682-1595>

*National University of Life and Environmental Sciences of Ukraine, Ukraine*

**Nataliya Voloshchuk**

 <http://orcid.org/0000-0002-9852-734X>

*The Pennsylvania State University, USA*

### **ABSTRACT**

*The chapter demonstrated the ecologically friendly way to obtain safe and high quality of medicinal herbal supplements under environmental changes. Global warming has a significant impact on medicinal plant productivity, including changes in the strategies of disease agents that compromise health and food security. Plant pathogens increase their ability to survive and reproduce intensively, resulting in strengthened plant disease severity, contamination of raw materials with toxic fungal metabolites, and yield losses. The repeated application of biologicals has proven to be effective in addressing this issue. The positive impact of microbial preparations on *Calendula officinalis* L. was observed in various aspects such as field seed germination, plant vegetative mass, and root system development. Treated calendula plants showed*

DOI: 10.4018/979-8-3693-8307-0.ch016

Copyright © 2025, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

*reduced stress during drought periods compared to the control group. Additionally, there was a significant decrease in leaf disease incidence and severity. This led to an improvement in the quality of calendula inflorescence weight and seed mass.*

## **BACKGROUND**

For centuries, medicinal plants and their bioactive compounds have been essential parts of nature, providing crucial support for the health, food security, and well-being of human societies. (Petrovska, 2012; Theodoridis et al., 2023). The demand for herbal medications, natural health products, and secondary metabolites derived from medicinal plants continues to rise that stimulate the necessity in herbal raw materials (Chen et al., 2016). The commercialization of specific medicinal plants and their medicinal properties is steering and guiding research in medicinal plant cultivation that presents opportunities to enhance the purity, quality, consistency, and bioactivity of raw materials, as well as increase biomass production (R. Cruz et al., 2022; Mofokeng et al., 2022; Rizvi et al., 2022; Sharrif Moghaddasi Mohammad, 2012; Silori & Badola, 2000; R. Zhang et al., 2021).

In Ukraine, over 45% of drugs manufactured by the chemical and pharmaceutical industry are derived from herbal raw materials. These medications are employed for the prevention and treatment of various conditions, including cardiovascular diseases, liver disorders, and gastrointestinal tract ailments (Mirzoieva et al., 2021; Sen & Samanta, 2015). Out of 2,219 species of medicinal plants utilized in human, veterinary, and traditional herbal medicine, 244 (10%) are cultivated, while the majority are wild plants. Specifically, 150 medicinal plant species are intentionally cultivated for the purpose of obtaining raw materials used for medicine and food (Basanetc, 2023).

*Calendula officinalis* is among those growing medicinal plants. It is known worldwide for its medicinal properties, boast inflorescences rich in various beneficial substances (Preethi et al., 2006). These include carbohydrates, amino acids, lipids, fatty acids, carotenoids, terpenoids, flavonoids, quinones, coumarins, and other components. These compounds confer a range of therapeutic effects, including wound-healing, immunostimulating, spasmogenic, antispasmodic, hepatoprotective, genotoxic, anti-amylase, anti-inflammatory, anti-edematous, antibacterial, antifungal, antioxidant, antidiabetic, antiteratogenic, hypoglycemic, and gastroprotective properties (John & Jan, 2017; Köberl et al., 2013; Shahane et al., 2023). Calendula is grown in continuous cropping or monocropping systems, which have negative impacts on soil fertility, nutrient balance, and consequently slow plant growth, increase disease incidence, and reduce overall crop yield and quality (Liu et al., 2020; Tkachova, 2018; Y. Zhang et al., 2021). Additionally, the growth and quality of

22 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/ensuring-food-security-through-biocontrol-in-medicinal-plant-cultivation/358445](http://www.igi-global.com/chapter/ensuring-food-security-through-biocontrol-in-medicinal-plant-cultivation/358445)

## Related Content

---

### Social and Environmental Impacts on Agricultural Development

Frances Bekele and Isaac Bekele (2020). *Environmental and Agricultural Informatics: Concepts, Methodologies, Tools, and Applications* (pp. 1299-1334).

[www.irma-international.org/chapter/social-and-environmental-impacts-on-agricultural-development/233015](http://www.irma-international.org/chapter/social-and-environmental-impacts-on-agricultural-development/233015)

### The Use of Augmented Reality in the Food Industry: Enhancing the Dining Experience

Melike mreand Seydi Ykm (2023). *Impactful Technologies Transforming the Food Industry* (pp. 135-155).

[www.irma-international.org/chapter/the-use-of-augmented-reality-in-the-food-industry/329482](http://www.irma-international.org/chapter/the-use-of-augmented-reality-in-the-food-industry/329482)

### Consequences of the Current Conjuncture on World Food Markets

(2023). *Implications of the COVID-19 Pandemic and the Russia-Ukraine Crisis on the Agricultural Sector* (pp. 48-88).

[www.irma-international.org/chapter/consequences-of-the-current-conjuncture-on-world-food-markets/322534](http://www.irma-international.org/chapter/consequences-of-the-current-conjuncture-on-world-food-markets/322534)

### Green Consumption: A Study to Understand Consumers' Organic Food Consumption

Ozan Kaya and Feridun Duman (2019). *Urban Agriculture and Food Systems: Breakthroughs in Research and Practice* (pp. 376-395).

[www.irma-international.org/chapter/green-consumption/222400](http://www.irma-international.org/chapter/green-consumption/222400)

### Market Attitude Towards Genetically-Modified Food Products: A Developing Economy Perspective

Yajeshwar Seetulan Praveen Balakrishnan Nair (2023). *Global Agricultural and Food Marketing in a Global Context: Advancing Policy, Management, and Innovation* (pp. 55-77).

[www.irma-international.org/chapter/market-attitude-towards-genetically-modified-food-products/320563](http://www.irma-international.org/chapter/market-attitude-towards-genetically-modified-food-products/320563)