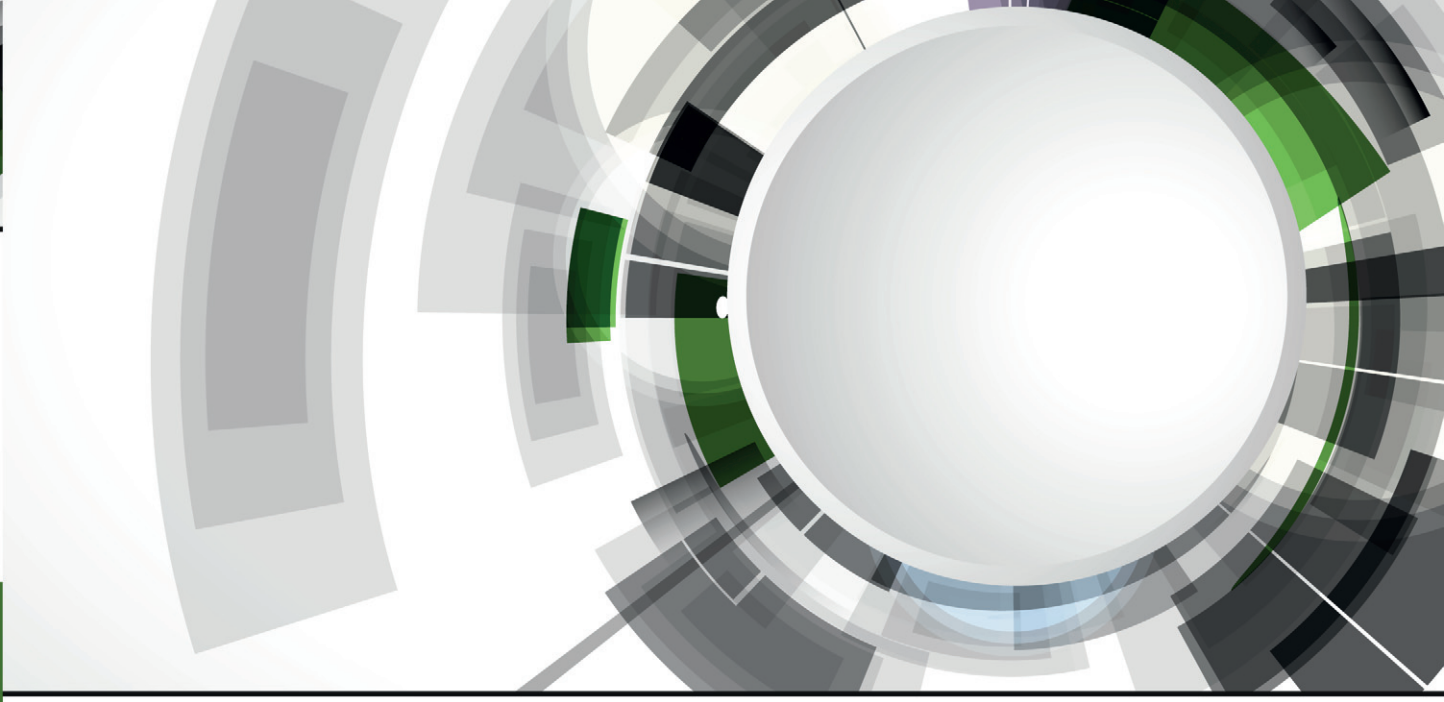

Natural Remedies for Pest, Disease and Weed Control

EDITED BY
CHUKWUEBUKA EGBUNA
BARBARA SAWICKA

Natural Remedies for Pest, Disease and Weed Control

This page intentionally left blank

Natural Remedies for Pest, Disease and Weed Control

Edited by

CHUKWUEBUKA EGBUNA, BSc, MSc BIOCHEMISTRY
Research Biochemist
Department of Biochemistry
Faculty of Natural Sciences
Chukwuemeka Odumegwu Ojukwu University
Nigeria

BARBARA SAWICKA, PHD
Full professor
Department of Plant Production Technology and Commodities Science
Faculty of Agrobioengineering
University of Life Sciences
Poland

ACADEMIC PRESS
An imprint of Elsevier

Natural Remedies for Pest, Disease and Weed Control ISBN: 978-0-12-819304-4

Publisher: Charlotte Cockle
Acquisition Editor: Charlotte Cockle
Editorial Project Manager: Laura Okidi
Production Project Manager: Kiruthika Govindaraju
Cover Designer: Alan Studholme

List of Contributors

Yusuf Abubakar
Department of Biochemistry
Natural Product Research Laboratory
Bauchi State University
Gadau, Bauchi State, Nigeria

Charles Oluwaseun Adetunji, PhD
Applied Microbiology
Biotechnology and Nanotechnology Laboratory
Department of Microbiology
Edo University Iyamho
Auchi, Edo State, Nigeria

Dickson Adom, PhD
Department of Educational Innovations in Science and Technology
Kwame Nkrumah University of Science and Technology
Kumasi, Ashanti, Ghana

Amrish Agarwal
Formulation Division
Institute of Pesticide Formulation Technology (IPFT)
Gurugram, Haryana, India

Muhammad Akram, PhD
Department of Eastern Medicine
Directorate of Medical Sciences
Government College University Faisalabad
Faisalabad, Punjab, Pakistan

Hakiye Aslan, PhD
Bingöl University
Engineering Faculty
Food Engineering
Turkey

İmran Aslan, Assoc. Prof.
Bingöl University
Health Sciences Faculty
Occupational Health and Safety Department
Turkey

Temitope Banjo, PhD
Department of Biological Sciences
Crawford University
Igbesa, Ogun State, Nigeria
Department of Biological Sciences
Covenant University
Ota, Ogun State, Nigeria
Institute for Human Resources Development
Federal University of Agriculture
Abeokuta, Ogun State, Nigeria

Madhvi Chawan, MSc
Assistant Professor
Haffkines Biopharmaceuticals
Mumbai, Maharashtra, India

Intan Soraya Che Sulaiman, BSc, MSc, PhD
National Defence University of Malaysia
Centre of Research & Innovation Management
Kem Sungai Besi
Kuala Lumpur, Malaysia

Muhammad Daniyal
TCM and Ethnomedicine Innovation & Development International Laboratory
Innovative Materia Medica Research Institute
School of Pharmacy
Hunan University of Chinese Medicine
Changsha, Hunan, P.R. China

Dominika Skiba, PhD
Department of Plant Production Technology and Commodities Science
University of Life Science in Lublin
Lublin, Poland

Chukwuebuka Egbuna, BSc, MSc
Research Biochemist
Department of Biochemistry
Faculty of Natural Sciences
Chukwuemeka Odumegwu Ojukwu University
Uli, Anambra State, Nigeria
Nutritional Biochemistry and Toxicology Unit
World Bank Africa Centre of Excellence
Centre for Public Health and Toxicological Research (PUTOR)
University of Port-Harcourt
Port Harcourt, Rivers State, Nigeria

Ayten Ekinci, PhD
Cumhuriyet University
Gemerek Vocational High School
Chemistry and Chemical Processing Technologies Department
Sivas, Turkey

Shahira M. Ezzat, PhD
Professor
Department of Pharmacognosy
Faculty of Pharmacy
Cairo University
Cairo, Egypt
Department of Pharmacognosy
Faculty of Pharmacy
October University for Modern Sciences and Arts (MSA)
Cairo, Egypt

Ajay Kumar Gautam, PhD
Department of Plant Sciences
Central University of Punjab
Bathinda, Punjab, India

Rohan Gavankar, MSc, BEd, PhD
Assistant Professor
Department of Botany
VIVA College
Virar, Maharashtra, India

S. Zafar Haider, PhD
Centre for Aromatic Plants (CAP)
Dehradun, Uttarakhand, India

Jonathan C. Ifemeje, PhD
Department of Biochemistry
Faculty of Natural Sciences
Chukwuemeka Odumegwu Ojukwu University
Uli, Anambra State, Nigeria

Agnieszka Jamiołkowska, PhD
Professor
Department of Plant Protection
Faculty of Horticulture and Landscape Architecture
University of Life Sciences in Lublin
Lublin, Poland

Jaison Jeevanandam, PhD
Department of Chemical Engineering
Curtin University Malaysia
Sarawak, Malaysia

Smriti Kala, PhD
Formulation Division
Institute of Pesticide Formulation Technology (IPFT)
Gurugram, Haryana, India
Center for Rural Development Technology (CRDT)
Indian Institute of Technology (IIT)
Delhi, India

Marek Kopacki, PhD
Habilitated Doctor
Department of Plant Protection
Faculty of Horticulture and Landscape Architecture
University of Life Sciences in Lublin
Lublin, Poland

Toskë L. Kryeziu
Department of Pharmacy
Faculty of Medicine
University Hasan Prishtina
Pristina, Kosovo

Jitendra Kumar
Formulation Division
Institute of Pesticide Formulation Technology (IPFT)
Gurugram, Haryana, India

Shashank Kumar, PhD, MSc, BSc
Assistant Professor
School of Basic and Applied Sciences
Department of Biochemistry and Microbial Sciences
Central University of Punjab
Bathinda, Punjab, India

Colin B. Lukong, PhD
Department of Biochemistry
Faculty of Natural Sciences
Chukwuemeka Odumegwu Ojukwu University
Uli, Anambra State, Nigeria

Mohammad Mehdizadeh, PhD
Weed Science
Department of Agronomy and Plant Breeding
University of Mohaghegh Ardabili
Ardabil, Iran

Rana M. Merghany
Department of Pharmacognosy
National Research Centre
Giza, Egypt

Azham Mohamad, BSc, MS
Lecturer
Centre of Foundation Studies for Agricultural Science
Universiti Putra Malaysia
UPM Serdang
Selangor, Malaysia

Waseem Mushtaq, PhD
Allelopathy Laboratory
Department of Botany
Aligarh Muslim University
Aligarh, Uttar Pradesh, India

S.N. Naik
Center for Rural Development Technology (CRDT)
Indian Institute of Technology (IIT)
Delhi, India

Keshavi Nalla
Jawaharlal Nehru Technological University
Kakinada, Andhra Pradesh, India

Ashish Kumar Nayak, PhD
Department of Microbial Genomics and Diagnostic Laboratory
Regional Plant Resource Centre
Bhubaneshwar, Odisha, India

Jaweria Nisar
Department of Eastern Medicine
Directorate of Medical Sciences
Government College University Faisalabad
Faisalabad, Punjab, Pakistan

Onyeka Kingsley Nwosu, BSc, MSc, PGDE
National Biosafety Management Agency
Abuja, FCT, Nigeria

Alloysius Chibuike Ogodo, BSc, MSc, PhD
Department of Microbiology
Faculty of Pure and Applied Sciences
Federal University Wukari
Wukari, Taraba State, Nigeria

Valentina V. Onipko, Doctor of Sc.
Professor
Poltava National Pedagogical University named after V.G. Korolenko
Poltava, Ukraine

Olumayowa Vincent Oriyomi, Msc
Institute of Ecology and Environmental Studies
Obafemi Awolowo University
Ile-Ife, Osun State, Nigeria

Chandan Kumar Panda, PhD
Assistant Professor-cum-Junior Scientist
Department of Extension Education
Bihar Agricultural University, Sabour
Bhagalpur, Bihar, India

Sunil Pareek, PhD
Department of Agriculture and Environmental Sciences
National Institute of Food Technology Entrepreneurship and Management
Sonepat, Haryana, India

P.K. Patanjali
Formulation Division
Institute of Pesticide Formulation Technology (IPFT)
Gurugram, Haryana, India

Kingsley C. Patrick-Iwuanyanwu, PhD
Department of Biochemistry (Toxicology unit)
University of Port Harcourt
Port Harcourt, Rivers State, Nigeria
Nutritional Biochemistry and Toxicology Unit
World Bank Africa Centre of Excellence
Centre for Public Health and Toxicological Research (PUTOR)
University of Port-Harcourt
Port Harcourt, Rivers State, Nigeria

Sergey V. Pospelov, PhD
Professor
Chair Agriculture & Agrochemistry
Poltava State Agrarian Academy
Poltava, Ukraine

Anna D. Pospelova, PhD
Associated Professor
Chair Plant Protection
Poltava State Agrarian Academy
Poltava, Ukraine

Seshu Vardhan Pothabathula, PhD
Assistant Professor
School of Basic and Applied Sciences
Department of Biochemistry and Microbial Sciences
Central University of Punjab
Bathinda, Punjab, India

Narashans Alok Sagar, PhD
Department of Agriculture and Environmental Sciences
National Institute of Food Technology
Entrepreneurship and Management
Sonepat, Haryana, India

Arvind Saroj, PhD
Department of Plant Pathology
Central Institute of Medicinal and Aromatic Plants
Lucknow, Uttar Pradesh, India

Barbara Sawicka, PhD
Full Professor
Department of Plant Production Technology and
Commodities Science
Faculty of Agrobioengeenering
University of Life Sciences
Lublin, Poland

Maxim V. Semenko
Bachelor of Biology
Poltava National Pedagogical University named after
V.G. Korolenko
Poltava, Ukraine

Aamir Sharif
Department of Pathology
University of Sargodha
Sargodha, Punjab, Pakistan

Nisha Sogan, PhD
National Institute of Malaria Research (NIMR)
Delhi, India

Laith Khalil Tawfeeq Al-Ani
School of Biology Science
Universiti Sains Malaysia
Minden, Malaysia

Nikhil Teli, MSc, PhD
Department of Botany
VIVA College
Virar, Maharashtra, India

Habibu Tijjani, PhD
Department of Biochemistry
Natural Product Research Laboratory
Bauchi State University
Gadau, Bauchi State, Nigeria

Kingsley Ikechukwu Ubaoji, PhD
Department of Applied Biochemistry
Nnamdi Azikiwe University
Awka, Anambra State, Nigeria

Krishnan Umachandran, BE, MS, MBA, PhD
General Manager
Organization Development
Nelcast Ltd.
Chennai, Tamil Nadu, India

Deepa Verma, MSc, BEd, M.A, M.PhiL, MBA, PhD
Head of Department
Assistant Professor
Department of Botany
VIVA College
Virar, Maharashtra, India

Parisa Ziarati, PhD
Assistant Prof. of Chemistry
Nutrition & Food Sciences Research Center
Tehran Medical Sciences
Islamic Azad University
Tehran, Iran

Contents

CHAPTER 8

Fungistatic Properties of Lectin-Containing Extracts of Medicinal Plants

SERGEY V. POSPELOV, PHD • ANNA D. POSPELOVA, PHD •
VALENTINA V. ONIPKO, DOCTOR OF SC. • MAXIM V. SEMENKO

INTRODUCTION

Agricultural practice is associated with the loss of yield due to biotic factors, such as plant damage by pests, diseases, and competing weeds. It is proved that the losses on the average make up 30%–50%, but can reach 100%. Pathogenic microorganisms that develop on plants cause infectious diseases, the treatment of which by pesticides mainly leads to the development of resistance of pathogenic microflora and the accumulation of metabolic products in plant production and the environment. To avoid such negative moments, the search for substances of plant origin with antimicrobial activity is being carried out. Natural biologically active substances that have such an effect include plant antibiotics, phytoncides, essential oils (see Chapter 6 for details), balsams, resins, tannins, organic acids, alkaloids, and glycosides. All of them are formed during the life of different groups of plants from the simplest to the highest to protect their living tissues from the reproduction of microorganisms in them. In addition, they activate vital functions of plants, destroy insects, frighten rodents, stimulate the growth of some plants, and inhibit the growth of others. This is evidenced by the numerous experimental materials of recent decades [1–3].

Prospects for the Use of Medicinal Plants in Plant Protection

Natural plant compounds—a source of biopesticides

A review of various studies suggests that in many scientific centers, there is a systematic screening of plants—producers of compounds, which would have the inherent antimicrobial and antiviral properties. It should be noted that in this plan, there are results that give hope that in the next decade new products with such properties will appear on the market of biological products.

According to Lesnikov [4], the flora of Europe is extremely rich in medicinal plants, which contain natural antifungal components. More than 879 species of higher plants from 128 families are producers of fungicides. The list of plants is constantly updated and increased, especially in recent decades.

In Germany, experiments were conducted to study more than 250 extracts derived from different parts of the plant (leaves, buds, flowers, fruits, roots, bulbs, etc.) for fungicidal activity. As a test object for experiments, *Fusarium nivale*, *Phoma lingam*, *Botrytis cinerea*, *Pythium ultimum*, *Rhizoctonia solani*, and others were used. In climatic chambers, extracts of 0.03%, 0.1%, 0.3%, and 1% concentrations were used on cucumbers against powdery mildew, beans against rust, and potatoes against phytophthora. In field experiments, they were tested on apple with scab, fruit rot, powdery mildew of wheat and roses, gray rot of strawberries, and others. The author has shown that some extracts have a high (up to 80%) fungicidal activity, not inferior to commercial drugs. However, it is noted that the technology of preparing on plant basis can be quite expensive [5].

The activity of 24 extracts from 131 species of plants in relation to the burn agent *Erwinia amylovora* was studied using the diffusion method in agar. The potency of suppression of *Juglans nigra*, *Berberis vulgaris*, and *Rhus typhina* at concentrations of 5.2% and 1.25% was comparable to that of streptomycin inhibition (17 mg dm^{-3}) [6].

In Slovakia, in the Petri dishes, the effect of extracts from 500 species of 280 genera and 74 families on

Natural Remedies for Pest, Disease and Weed Control. https://doi.org/10.1016/B978-0-12-819304-4.00008-7