Feed Additives

Aromatic Plants and Health

Animal Nutrition and Health

FEED ADDITIVES

AROMATIC PLANTS AND HERBS IN ANIMAL NUTRITION AND HEALTH

Edited by

PANAGIOTA FLOROU-PANERI
EFTERPI CHRISTAKI
ILIAS GIANNENAS



Ν

Academic Press is an imprint of Elsevier
125 London Wall, London EC2Y 5AS, United Kingdom
525 B Street, Suite 1650, San Diego, CA 92101, United States
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom

Copyright © 2020 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Notices. Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material barein

Library of Congress Cataloging-in-Publication Data A catalog record for this book is available from the Library of Congress

British Library Cataloguing-in-Publication Data A catalogue record for this book is available from the British Library

ISBN: 978-0-12-814700-9

For information on all Academic Press publications visit our website at

Publisher: Charlotte Cockle Acquisition Editor: Patricia Osborn Editorial Project Manager: Susan Ikeda Production Project Manager: Prem Kumar Kaliamoorthi Cover Designer: Christian Bilbow

Typeset by TNQ Technologies



Contents

Contributors ix Preface xiii

1. The history of herbs, medicinal and aromatic plants, and their extracts: past, current situation and future perspectives

Ilias Gianneron, E. Suliropoulou, Eleftherics Bonus, E. Christaki, and P. Florou-Paneri

Introduction 1
Worldwide use of aromatic plants throughout history 3
Current situation on the use of aromatic plants and herbs in human and veterinary medicine, plant sustainability, and sofery issues 9
Future perspectives 13
References 15

2. Innovative uses of aromatic plants as natural supplements in nutrition E. Christaki, Bias Giannamas, Eleftherios Bonos, and P. Florou-Paneri

Introduction 19
Bioactive compounds of aromatic plants 20
Biological properties of aromatic plants (functional foods) nutrigenomics 21
Aromatic plants as dietary supplements 22
Conclusions 30
References 31

3. Herbs and aromatic plants as feed additives: aspects of composition, safety, and registration rules Ch M. Fran. K.H.C. Baser, and L. Hahn-Ramad

Introduction 36 Plants and herbal products used as feed additives 37
Chemistry and activity 45 Legal status of feed additives 50 Conclusion 51 References 52 Further reading 56

 Sustainable use of mediterranean medicinal-aromatic plants Katerina Grigoraalou, Nikos Krigas, IXu Eleni Maksupa

Elmi Malwaya

Elmi Malwaya

(MAPs) and herbal medicinal products 57

European market of medicinal and aromatic plants: trends, challenges, and the value chain 59

Mediterranean medicinal and aromatic plants: wealth, uniqueness, and risks 64

From wild to cultivation: conservation and sustainable exploitation of phytogenetic resources of maps 66

Research on propugation of native maps: a key for sustainable exploitation 69

Pilot fields: a step closer to new crops 70

References 71

5. Aromatic plants and their extracts pharmacokinetics and in vitro/in vivo mechanisms of action

Ivana Čabarkapa, Nikola Povača, Sanja Popovač, Dušica Čolović, Ljuljura Kostadinović, Eleanor Karp Tatham, and Jovanka Lević

Introduction 75 Antimicrobial effects of aromatic plants and their EOs 77 Antioxidant effects of aromatic plants 80 Effects on performance, digestibility, and intestinal functions in animals 81
Acknowledgments 85
References 85

vi

6. Distribution of aromatic plants in the world and their properties Amit Kumur Paruley, Peafulla Kumur, M.J. Suxena, and Prabhakar Maurya

CONTENTS

Introduction 89 Introduction 89
Historic preview 90
Definition of medicinal and aromatic plants 94
Classification 96
Destribution pattern in the world market 99
Uses of aromatic plants 106
Present status and conservation initiatives 110
Conclusion and way forward 111
References 113

7. Herbal extracts as antiviral agents A.R. Yamin, S.L. Chia, Q.H. Loos, A.R. Omar, M.M. Noordin, and A. Ideria

Introduction 116 Poultry 116 Swine 121 Ruminants 126 Conclusion 128 References 128

> 8. Functional ingredients derived from aromatic plants

Sonia A. Socaci, Anca C. Fircay, and Maria Tofana

Introduction 133 Essential oils 134 Uses and applications 140 Conclusions 143 Acknowledgments 143 References 143 Further reading 146

Potential adverse principles/traits of aromatic plants in animal nutrition 152 References 156 Further reading 158

10. Application of aromatic plants and their extracts in diets of broiler chickens Li-Zhi Jim, Yoeming Denjame-Li, and Ilias Gia

Introduction 159 Intrusduction 139
Mode of actions of aromatic medicinal plants, spices,
or herbs, their extracts or essential oils in
poultry 161
Future implementations and conclusions 176
References 179

11. Application of aromatic plants and their extracts in the diets of laying hens David Harrington, Hesdi Hall, David Wilde, and Wendy Wakeman

Introduction 187
Aromatic plants in layer well-being 189
Performance 194
Egg characteristics 195
Conclusion 198
References 199

12. Application of aromatic plants and their extracts in diets of turkeys Mehmet Beskurt, and Almet Eprin Türün

Introduction 205 Uses and applications 140
Conclusions 143
Acknowledgments 143
References 143
Purther reading 146

9. Toxic or harmful components of aromatic plants in animal nutrition
Mana Grasia Cappul, and Sahna Aballag
Aromatic plants toxicological properties in view of their ecological function 147
Sensation—selection behavior—co-existence as essentials of the plant—animal interaction 150
References 220
Introduction 205
Artimicrobial action 207
Plant-derived chemicals contribute to food microbial safety 208
Opportunities to naturally improve antioxidant capacity 210
Initial attempts to enhance immunity 213
Specific effect on gut morph-slogy and function 213
Protogenic compounds offer novel strategies to control Histomonas melagridis. 214
Effects on growth performance 215
Conclusions and areas for future research 219
References 220 CONTENTS vii

13. Application of plant essential oils in pig diets

Hong-Kui Wei, Jun Wang, Chuansburg Cheng, Li-Zhi Jin, and Jian Peng

Introduction 227 Introduction 221
Application of EOs in wearing piglets 228
Application of EOs in sows 233
Effect of oregano oil against transportation
stress 234
Conclusions 234
References 235

Further reading 237

14. Application of aromatic plants and their extracts in aquaculture

Ángel Hernández-Contreras, and María Dolores Hernández

Introduction 239
Applications of aromatic plants and their extracts in aquaculture 241
Latest properties discovered and possible uses 252
Current regulatory status and future perspectives 254
References 255

15. Application of aromatic plants and their extracts in dairy animals

Maniangela Caroperse, Maria Giovanna Ciliberti, stul Maria Albertio

Introduction 261
Extraction methods of essential oils and use of abioc in animal nutrition 262
Aromatic plants and their extracts as modifiers of

tumen fermentation 264
Aromatics plant antimicrobial activities: effect on

Aromatics plant antimicrossal activities: effect on runninant immune system 266 Aromatics plant antioxidant activities in dairy animals 268 Aromatic plants and their extracts as enhancer udder health 269

Conclusions and Future Direction 272 References 272

16. The effects of aromatic plants and their extracts in food products Bogana Filipões

Introduction 279 Application of aromatic herbs in food 280 Conclusion 290 References 291

17. The effects of plant extracts on the immune system of livestock: the isoquinoline alkaloids model

Valeria Amuso-Ponne, Arga Pantir, and Manfred Andre

AGP removal and gut health 296 The use of antimicrobials and the risk of antimicrobial resistance 296
The public health concern 297 The role of the mucosal immune system 297 The role of NF-xB 298 Causes and consequences of intestinal inflammation 299 inflammation 299
Plant metabolites with antiinflammatory
properties 300
Nonnitrogen secondary metabolites 300
Nitrogen secondary metabolites 302
Isoquinoline alkaloids 303
Mode of action of isoquinoline alkaloids: inhibition
of NF-xB activation 304

Consequences of reducing inflammation with isoquinoline alkaloids 304 Isoquinoline alkaloids, and gut health and

stress 306
Regulating intestinal inflammation and the effects on animal performance 307
References 308

18. Effects of phytobiotics in healthy or disease challenged animals

Icanem Skoufes, Eleftherics Bonos, Icanem Amatasian, Arantasian Tsmas, and Athina Taora

Introduction 311 Aromatic and medicinal plants, herbs, their extracts and essential oils as feed additives 313

viii civito and in vivo antimicrobial and antipursitic activities of aromatic and medicinal plants, herbs, their extracts and essential oils in poultry 315 no vitro and in vivo antimicrobial activities of aromatic and medicinal plants, herbs, their extracts and essential oils in pigs 322. In vitro and in vivo antitrees activities of aromatic and medicinal plants, herbs, their extracts and essential oils in ruminams 325. Effects of dietary physobiotics in rabbits 327. Conclusions 328. References 328.

CONTENTS

19. Resistance of bacteria, fungi, and parasites to antibiotics or natural substances of botanical origin

Christis Parancorhytou, Bias Guena

introduction 339

Antibiotics target specific cellular processes 341

Mechanisms of antimicrobial resistance 342

Antimicrobial of botanical origin 344

Plant-derived intriguonum sensing compounds 346

Conclusions 349

References 349