

**Cytochalasins:  
Incidence and Biological  
Activities**

## **The Authors**

**Dr. S. Kiran**, Assistant Professor, Department of Botany, Satavahana University, Karimnagar. He received his M.Sc and Ph.D degrees in Mycology from Kakatiya University. He has a teaching experience of six years and ten years research experience. He published 23 research papers in reputed national and international journals. He was awarded two fellowships form UGC New Delhi for pursuing Ph.D research work.

**Dr. M. Surekha** received her Ph.D. degree in Mycology and Plant Pathology with the Professor S. M. Reddy, Kakatiya University (1990) and had postdoctoral research experience in fungal toxins. Her primary field of research is mycology and mycotoxins with an emphasis on animal feeds and fodders and has been working in this area for last 25 years. She has guided three students for their Ph.D degrees and presently six are working. She has published 43 research papers in international and national journals of repute. Currently, Dr. Surekha is working as an Associate Professor in the Department of Botany, Kakatiya University and Principal Investigator for the UGC funded project.

**Prof. S.M. Reddy** after a brilliant academic career joined Osmania University and moved to Kakatiya University. He rose to the position of Head, Department of Botany. Successfully guided 40 research scholars for Ph.D degree and completed 24 research projects. He has published more than 520 papers in National and International journals and authored/edited about two dozen books. He is associated with different scientific societies and occupied coveted positions and organized several national level conferences. He is bestowed with Best Teacher award by Govt. of A.P. and Indian Society of Mycology and Plant Pathology. He is a member of different scientific organization such as DBT, DST, CSIR and UGC etc.

# **Cytochalasins: Incidence and Biological Activities**

**S. Kiran**

Department of Botany  
Satavahana University  
Karimnagar, TS, India

**M. Surekha and S.M. Reddy**

Department of Botany  
Kakatiya University  
Warangal, TS, India



Published by

**SCIENTIFIC PUBLISHERS (INDIA)**

5 A, New Pali Road

P.O. Box 91

Jodhpur - 342 001 INDIA

E-mail: [info@scientificpub.com](mailto:info@scientificpub.com)

Website: <http://www.scientificpub.com>

Print: 2019

All rights reserved. No part of this publication or the information contained herein may be reproduced, adapted, abridged, translated, stored in a retrieval system, computer system, photographic or other systems or transmitted in any form or by any means, electronic, mechanical, optical, digital, by photocopying, recording or otherwise, without written prior permission from the publisher. Any breach will attract legal action and prosecution without further notice.

**Disclaimer:** While every effort has been made to avoid errors and omissions, this publication is being sold and marketed on the understanding and presumption that neither the editors (or authors) nor the publishers nor the printers would be liable in any manner whatsoever, to any person either for an error or for an omission in this publication, or for any action to be taken on the basis of this work. Any inadvertent discrepancy noted may be brought to the attention of the publisher, for rectifying it in future editions, if published.

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the editors and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The editors and publisher have attempted to trace and acknowledge the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission and acknowledgement to publish in this form have not been obtained. If any copyright material has not been acknowledged please write and let us know so that we may rectify it.

**Trademark Notice:** Publications or corporate names may be trademarks, and are used only for identification and explanation in bonafide intent without intent to infringe.

ISBN: 978-93-88043-59-5 (Hardbound)  
978-93-88043-82-3 (E-book)

© 2019, Authors

Printed in India

---

## PREFACE

---

Cytochalasins, emerging mycotoxins, are diverse in their structure and biological activities and being elaborated by equally diverse moulds both in taxonomy and ecologically. They live on diverse substrates and in different mode of association. These mycotoxins are unique category by their characteristic of toxicity causing specific inhibition of cytokinesis. They are also reported to cause diverse biological activities related to cell. Because of inhibition of cytokinesis, a multinucleate cells of giant size are formed. Probably due to inhibition of cytokinesis, they act as anticarcinogenic and inhibit tumor formation which is likely to be highly useful as anticancer therapeutic agent. In that cure they are likely to be benguine mycotoxins.

The mycotoxins which are non-antigenic and adversely affect health of animals including man and induce variety of health hazards of chronic to serious nature. Further, under modern living conditions contamination of foods with mycotoxigenic moulds and mycotoxins are investable contaminants of foods and feeds are common rather than exceptions. In spite of scientific and technological developments, contamination of mycotoxins are unavoidable, inadvertent and cannot be avoided. Therefore, one has to minimize the mycotoxin problem.

Thus management of mycotoxins problem in not only problematic but also intricate in view of its multiple dimensions. Therefore, deeper understanding of conditions of foods and feeds and moulds behaviour is of paramount importance. In view of the emerging nature of cytochalasins their incidence, biological activities are little known. No doubt future studies will reveal more interesting facts which may help us to tackle this problem more effectively.

The present book is an outcome our studies during last fifteen years. We tried to cover different aspects of these toxins based on our observations, analysis of problem and existing literature. However, much more in depth studies are needed to unravel many of their biological activities.

We take this opportunity to thank all those who helped us directly or indirectly. We have liberally borrowed the literature from different sources; we gratefully acknowledge their generous gesture. The encouragement provided by the University authorities are gratefully acknowledged. One of the authors (Dr. S.

Kiran) thanks Prof. M. Komal Reddy, Registrar, Satavahana University, Karimnagar for his generous help and encouragement. We are also thankful to Sri Pawan Kumar Sharma and Tanay Sharma of Scientific Publisher (India), Jodhpur for timely bringing out of this book in nice getup.

**Authors**

---

# CONTENTS

---

|  |                |
|--|----------------|
| <i>Preface</i>   | <i>iii</i>     |
| <b>1. Introduction and classification</b>                        | <b>1-4</b>     |
| <b>2. Structure of different cytochalasins</b>                   | <b>5-44</b>    |
| 2.1. Cytochalasins   | 5              |
| 2.2. Aspochalasins   | 21             |
| 2.3. Alachalasins  | 26             |
| 2.4. Chaetoglobosins   | 28             |
| 2.5. Zygosporins   | 33             |
| 2.6. Deoxaphomin, proxiphomin and protophomin                    | 34             |
| 2.7. Flavichalasins  | 36             |
| 2.8. Penochalasins   | 37             |
| 2.9. Epicochalasins  | 40             |
| 2.10. Asperchalasins   | 40             |
| 2.11. Spicochalasins   | 41             |
| 2.12. Rosellichalasin  | 41             |
| 2.13. Ascochalasins  | 42             |
| 2.14. Pyrichalasin H   | 42             |
| 2.15. Periconiasins  | 43             |
| 2.16. Scoparasins  | 43             |
| 2.17. Xylastriasan   | 44             |
| <b>3. Taxonomy of cytochalasins producing fungi</b>              | <b>45-124</b>  |
| <b>4. Isolation and detection of cytochalasins</b>               | <b>125-136</b> |
| <b>5. Biosynthetic pathway and chemical synthetic strategies</b> | <b>137-156</b> |
| <b>6. Biological activities</b>                                  | <b>157-191</b> |
| 6.1. Cytotoxicity  | 157            |
| 6.2. Mutagenicity and teratogenicity                             | 161            |

|   |                |
|---|----------------|
| 6.3. Locomotion and cytoplasmic streaming             | 161            |
| 6.4. Cytophysiology                                   | 162            |
| 6.5. Cell attachment and adhesion                     | 163            |
| 6.6. Cell sorting, aggregation and disaggregation     | 164            |
| 6.7. Morphogenesis                                    | 165            |
| 6.8. Endocytosis                                      | 167            |
| 6.9. Exocytosis                                       | 168            |
| 6.10. Immunological functions                         | 170            |
| 6.11. Viral infectibility                             | 171            |
| 6.12. Blood clot retractions                          | 172            |
| 6.13. Osmotic balance                                 | 173            |
| 6.14. Electro physiological effects                   | 173            |
| 6.15. Axoplasmic transport                            | 174            |
| 6.16. Metabolic cooperation                           | 174            |
| 6.17. Ovulation                                       | 174            |
| 6.18. Pigment granule dispersion                      | 175            |
| 6.19. Interaction with contractile system             | 175            |
| 6.20. Alteration in membrane structure and function   | 176            |
| 6.21. Capping and Agglutination                       | 177            |
| 6.22. Antimicrobial and antiparasitic                 | 179            |
| 6.23. Phytotoxicity                                   | 180            |
| 6.24. Pharmacological properties                      | 181            |
| 6.25. Mycotoxins and food spoilage                    | 183            |
| 6.26. Metabolism and macromolecular synthesis         | 184            |
| (i) Glycolysis  | 189            |
| (ii) Interaction with hormonal mechanisms             | 189            |
| a. Peptide hormones                                   | 190            |
| b. Steroids hormones                                  | 190            |
| <b>7. Ecological significance</b>                     | <b>192-196</b> |
| <b>8. Structure and activity relationship</b>         | <b>197-200</b> |
| <b>9. Management of cytochalasins producing fungi</b> | <b>201-206</b> |
| <b>10. Prospects and Future</b>                       | <b>207-208</b> |
| <b>Abbreviations</b>                                  | <b>209-210</b> |
| <b>Glossary</b>                                       | <b>211-213</b> |
| <b>References</b>                                     | <b>214-235</b> |