

# **Greenhouse Cultivation of Horticultural Crops**



# Greenhouse Cultivation of Horticultural Crops

N. N. Reddy  
Suresha D Ekabote  
P. Narayanaswamy  
B. Satyanarayana Reddy



**Sri Krishnadevaraya College of Horticultural Sciences**  
**(Dr. YSR Horticultural University, A.P., INDIA)**



**Brillion Publishing**

Taking Science Everywhere



## **Brillion Publishing**

22 B/5 Ground Floor, Desh Bandhu Gupta Road,

Karol Bagh, New Delhi - 110005

Ph. : + 91 (11) 4155-8799

Email: [info@brillionpublishing.com](mailto:info@brillionpublishing.com)

[www.brillionpublishing.com](http://www.brillionpublishing.com)

© Publisher, 2023

ISBN : 978-93-93980-XX-X

e-ISBN : 978-93-93980-XX-X

All Rights reserved under International Copyright Conventions. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior consent of the publisher or the copyright holders.

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

Trademark Notice: Presentation, logos (the way they are written or presented) in this book are under the trademarks of the publisher and hence, if copied/resembled the copier will be prosecuted under the law.

Printed in India

Email : vc@uahs.edu.in  
Web : www.uahs.edu.in

Cell : 9480838999  
9449411434



ಕೆಲದಿ ಶಿವಪ್ಪ ನಾಯಕ ಕೃಷಿ ಮತ್ತು ತೋಟಗಾರಿಕೆ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಶಿವಮೊಗ್ಗ

**KELADI SHIVAPPA NAYAKA UNIVERSITY OF AGRICULTURAL AND  
HORTICULTURAL SCIENCES, SHIVAMOGGA**

**Dr. R.C. Jagadeesha**

Vice-Chancellor

M.Sc.(Agri.), Ph.D.,

Iruvakkki - 577 412, Sagara Taluk  
Shivamogga District, Karnataka, India

## Foreword



Protected cultivation assumes importance in the wake of yield enhancement in limited areas and the production of good quality produce for better climate resilience. The protected cultivation can enable the production of vegetables, flowers and fruits during on and off seasons for fetching premium prices in the market withstanding the vagaries of erratic weather conditions. Intensive cultivation with efficient water utilization can be a suitable crop production practice in Horticulture for commercial viability. However, the complex edapho-climatic conditions and concepts of designing and building of protected structures need a complete understanding of technology under Indian conditions. The involvement of different cladding materials and structures need sound technological innovations. The different types of structures for customized greenhouses and their utility would determine the crops based on the season and market demand. The cultivation of crops and their management in a greenhouse need to be programmed for better efficiency in achieving the best results.

In this direction, the efforts made by Dr. N. N. Reddy., Dr. Suresha D. Ekabote., Dr. P Narayanaswamy, and Dr. B. Satyanarayana Reddy in editing the book **“Greenhouse Cultivation of Horticulture Crops”** are commendable and deserve special appreciations. This book deals with all the aspects of greenhouse cultivation principles, designing, constructing, and cultivation aspects of various time-bound Good Agricultural Practices for export markets following scientific approaches and appropriate technologies. I hope this book would form an essential guide for the scientists, farmers, innovators, entrepreneurs, startups, and others who intend to cultivate horticultural commodities with a high-profit motto in a limited area. I take this opportunity to congratulate the efforts made by the authors in bringing out this valuable publication.



# Preface

The book on theme entitled “**Greenhouse cultivation of horticultural crops**”, brought out the issues to the mankind on the cultivation aspects of crops under greenhouses. Requirement of greenhouses are perceived recently, otherwise the opinion was that greenhouse cultivation was not necessary for Indian conditions. The productions, productivity and quality of the produce are excellent under the cover. Use of greenhouses can double or triple the yield, without affecting the quality, rather with an increment in the quality. The eminent scientists and experts in the area of horticulture, plant protection, plant nutrition, physiology, ecology and architecture have amalgamated and developed a good, handy handbook that can serve as guideline for the cultivation of horticultural crops under greenhouse conditions.

The book clearly and concisely lays out a basic understanding of greenhouses, how to integrate the factors into cultivation and how effectively applied to the local conditions. It focuses on planning, design and construction of greenhouses, intricacies of environmental conditions to be managed while cultivation of several important and commercial flowers, vegetables and fruits, with illustration. The book throws light on cultivation of crops for the export market. One of the highlights is that how to control pest and diseases under special conditions.

It is well written by combining theoretical, technical and practical information, and can be a source of information to the teachers, students and horticulturists.

**Editors**

**N.N. Reddy**

**Suresha D Ekabote**

**P. Narayanaswamy**

**B. Satyanarayana Reddy**





# Contents

<b>Foreword</b>	<b>v</b>
<b>Preface</b>	<b>vii</b>
<b>List of Contributors</b>	<b>xi</b>
<b>1. Introduction</b>	<b>1</b>
Narayanaswamy P., Chandu Singh & Nayan Deepak G	
<b>2. Greenhouse Planning, Design and Construction</b>	<b>9</b>
Reddy N N, Sreenatha A, Harshitha B S and Aditya V Machnoor	
<b>3. Environmental Control Devices in Protected Cultivation</b>	<b>21</b>
Sreenatha A, Pradeepkumara N and Pooja A.	
<b>4. Sensors and Equipments for Greenhouse Environment</b>	<b>31</b>
Sreenatha A, Nayan Deepak G and S Gayathri	
<b>5. Growing Media</b>	<b>39</b>
Suresha D Ekabote, Ramesh A N and Nayan Deepak G	
<b>6. Integrated Nutrient Management</b>	<b>51</b>
Satyanarayana Reddy B, Jeevan U and Karthik Nayaka V S	
<b>7. Microbial Inoculants in Protected Cultivation</b>	<b>57</b>
Suresha D Ekabote, Yattapu Prasad Reddy and Pooja Kumari	
<b>8. Micro Irrigation and Fertigation</b>	<b>65</b>
Narayanaswamy P, Vikram H C and Bhavishya	
<b>9. Physiology of Protected Crops under Greenhouse</b>	<b>79</b>
Reddy N N, Poornima R and Chandu Singh	

<b>10. Soilless Cultivation in Greenhouse</b>	<b>91</b>
Shivananda T N, Surya Krishna G K, Chaitra T S and Sachin A J	
<b>11. Greenhouse Cultivation of Capsicum</b>	<b>111</b>
Shilpashree N, Anilkumar G S Raghunandan K and Timmanna	
<b>12. Greenhouse Cultivation of Rose</b>	<b>123</b>
Sangama, Jeevan U, Pooja A, Anilkumar G S and Timmanna	
<b>13. Greenhouse cultivation of Carnation</b>	<b>141</b>
Shivakumar S, Jeevan U, Karthik Nayaka V S, and Hemanth Kumar P	
<b>14. Greenhouse cultivation of Gerbera</b>	<b>159</b>
Jeevan U, Sachin A J, Nataraj S K and Bhargavi H A	
<b>15. Greenhouse Cultivation of European Cucumber</b>	<b>173</b>
Padmanabha K, Shilpashree N and Hemavati Ranebennur	
<b>16. Cultivation of Fruit Crops</b>	<b>181</b>
Reddy N N, Nagaraja A, Nayan Deepak G and Muralidhara B M	
<b>17. Nematode Management under Greenhouse Cultivation</b>	<b>191</b>
Manjunatha T Gowda, Yerasu Suresh Reddy, Hare Krishna and Abhishek Gowda A.P.	
<b>References</b>	<b>197</b>