

Estd

1958



Shri Shivaji Education Society's
Board for Higher Education Vidyanagar, Karad



YASHWANTRAO CHAVAN COLLEGE OF SCIENCE, KARAD

CRITERION-III

RESEARCH, INNOVATIONS AND EXTENSION

3.3 RESEARCH PUBLICATIONS AND AWARDS

3.3.2 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings

List of Book/Book Chapters/International conference proceedings with website link

Index

Book Chapter Published In 2022

| Sr. No. | Name of the teacher | Title of the book/Chapters Published | ISBN number of the proceeding | Name of the publisher |
|---------|---------------------|--|-------------------------------|-----------------------|
| 1. | Dr. Potdar G.G. | Practical book of botany | 978-93-5451-840-9 | Nirali Publications |
| 2. | Dr. Raut A. V. | Isolation and Characterisation of bacteria from herbal tablets used in the treatment of Rheumatoid arthritis | 1521-3900 | NA |

Co-ordinator,
Internal Quality Assurance Cell (IQAC),
Yashwantrao Chavan College
of Science, Karad



Principal
Yashwantrao Chavan College
of Science, Karad.

As per revised Syllabus (NEP-2020) of Shivaji University, Kolhapur
(with effect from August, 2022)

Practical Handbook of Botany

B. Sc. - I

Prof. Dr. M. B. Waghmare

Dr. S. A. Kirtane

Dr. A. V. Patil

Dr. N. V. Pawar

Dr. S. K. Mengane

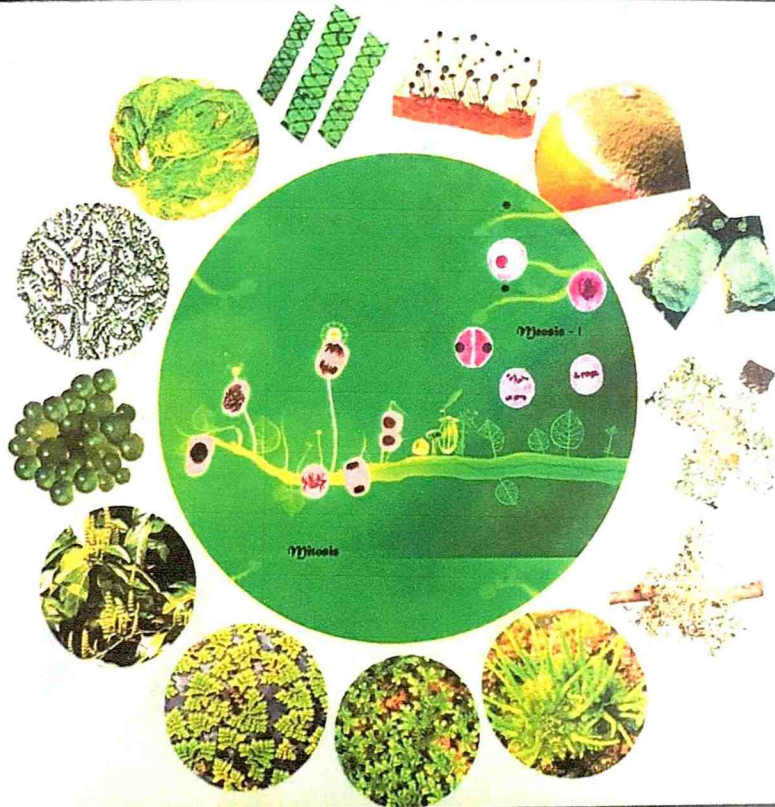
Dr. R. A. Lavate

Dr. B. T. Dangat

Dr. S. S. Jadhav

Dr. S. S. Wadkar

Dr. R. M. Waghmare



SUCCESS PUBLICATIONS



Practical Handbook of Botany

B. Sc. (Part - I)

As per revised Syllabus (NEP-2020) of Shivaji University, Kolhapur (with effect from August 2022)

Authors

Prof. Dr. M. B. Waghmare

M.Sc., B.Ed., NET., Ph.D.

Head, U. G. and P. G. Department of Botany,
The New College, Kolhapur.

Dr. S. A. Kirtane

M.Sc., Ph.D.

Assistant professor
Yashwantrao Chavan College of Science,
Karad.

Dr. A. V. Patil

M.Sc., Ph.D.

Head, Department of Botany, Yashwantrao
Chavan Mahavidyalaya, Halkarni

Dr. N. V. Pawar

M.Sc., Ph.D.

Assistant Professor, Department of Botany,
The New College Kolhapur.

Dr. S. K. Mengane

M.Sc., Ph.D.

Head, Dept of Botany
M.H.Shinde Mahavidyalaya, Tisangi.

Dr. R. A. Lavate

M.Sc., M. Phil., Ph.D.

Head, Department of Botany,
Raje Ramrao Mahavidyalaya, Jath, Dist. Sangli.

Dr. B. T. Dangat

M.Sc., Ph.D.

Head, Department of Botany, Vivekanand
College, Kolhapur (Autonomous).

Dr. S. S. Jadhav

M.Sc., Ph.D.

Head, Dept of Botany
S. B. R. College Mhaswad.

DR. S. S. Wadkar

M.Sc., Ph.D.

Head, Department of Biotechnology, Smt.
Kasturbai Walchand College of Arts & Science,
Sangli.

Dr. R. M. Waghmare

M.Sc., Ph.D.

Assistant professor in Department of Botany
M.H.Shinde Mahavidyalaya Tisangi.

2022

Price : 100/-



SUCCESS PUBLICATIONS



INDEX**First Year B.Sc.
Botany Practical**

| Sr. No. | Practical Title | Page No. |
|---------|--|----------|
| 01 | Study of microscope: Light and Electron microscope (SEM with Photograph) | 1-4 |
| 02 | Electron microphotographs/models of viruses - T4-Bacteriophage and TMV | 5-7 |
| 03 | Forms of bacteria- (Temporary / permanent slides/ photographs) | 8-9 |
| 04 | Bacteria- Gram staining technique | 10-11 |
| 05 | Study of vegetative and reproductive structures of <i>Nostoc</i> | 12 |
| 06 | Study of vegetative and reproductive structures of <i>Spirogyra</i> | 13-14 |
| 07 | Study of different types of Biofertilizers as per theory syllabus | 15-17 |
| 08 | Study of vegetative and reproductive structures of <i>Mucor</i> | 18-19 |
| 09 | Study of vegetative and reproductive structures of <i>Penicillium</i> | 20-21 |
| 10 | Study of forms of lichen - Crustose, Foliose and Fruticose | 22-23 |
| 11 | Study of Mushroom Cultivation (Demonstration) | 24-26 |
| 12 & 13 | Study of plant diseases as per theory | 27-34 |
| 14 | Study of vegetative and reproductive structures of <i>Anthoceros</i> | 35-37 |
| 15 | Study of vegetative and reproductive structures of <i>Selaginella</i> | 38-40 |
| 16 | Study of vegetative and reproductive structures of <i>Gnetum</i> | 41-42 |
| 17 | Study of cell and its organelles with the help of electron micrograph | 43-45 |
| 18 | Study of cell structure in onion peel (cataphylls), it's staining and mounting | 46-47 |
| 19 | Study of effect of organic solvent concentration on membrane permeability | 48-49 |
| 20 | Study of peroxisomes (enzyme activity catalase) | 50-51 |
| 21 | Study of glyoxisome (enzyme activity-malate dehydrogenase) | 52-53 |
| 22 | Study of different stages of Mitosis | 54-57 |
| 23 | Study of different stages of Meiosis | 58-63 |
| 24 | Separation of photosynthetic pigments by ascending paper chromatography | 64-66 |
| 25 | Separation of amino acids by thin layer chromatography | 67-70 |

v





Prof. Dr. M. B. Waghmare
M.Sc., B.Ed., NET., Ph.D.
Head, U. G. &
P. G. Department of Botany,
The New College, Kolhapur.



Dr. R. A. Lavate
M.Sc., M. Phil., Ph.D.
Head, Department of Botany,
Raje Ramrao Mahavidyalaya,
Jath, Dist. Sangli.



Dr. S. A. Kirtane
M.Sc., Ph.D.
Assistant professor
Yashwantrao Chavan College of
Science, Karad.



Dr. B. T. Dangat
M.Sc., Ph.D.
Head, Department of Botany,
Vivekanand College, Kolhapur
(Autonomous).



Dr. A. V. Patil
M.Sc., Ph.D.
Head, Department of Botany,
Yashwantrao Chavan
Mahavidyalaya, Halkarni



Dr. S. S. Jadhav
M.Sc., Ph.D.
Head, Dept of Botany
S. B. R. College Mhaswad.



Dr. N. V. Pawar
M.Sc., Ph.D.
Assistant Professor,
Department of Botany,
The New College Kolhapur.



Dr. S. S. Wadkar
M.Sc., Ph.D.
Head, Department of
Biotechnology, Smt. Kasturbai
Walchand College of Arts &
Science, Sangli.



Dr. S. K. Mengane
M.Sc., Ph.D.
Head, Dept of Botany
M.H.Shinde Mahavidyalaya,
Tisangi.



Dr. R. M. Waghmare
M.Sc., Ph.D.
Assistant professor in Department
of Botany
M.H.Shinde Mahavidyalaya
Tisangi.

ISBN : 978-93-93220-25-7



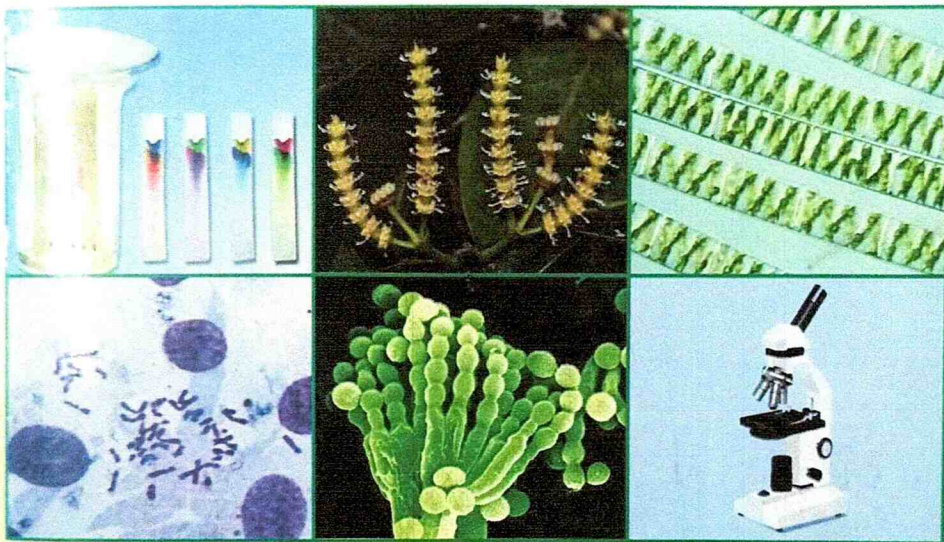
SUCCESS PUBLICATIONS

Address : Radha Krishna Apartment, 535, Shaniwar Peth,
Appa Balwant Chowk, Opp. Prabhat Theatre, Pune - 30.
Ph. No. 24434662, Mobile : 9325315464
E-mail : sharpgroup31@rediffmail.com
Website : www.sharpmultinational.com



As per New Syllabus (CBCS Pattern) of
Shivaji University, Kolhapur
B.Sc. Part-I : Semester-I & II

A PRACTICAL BOOK OF **BOTANY**



Prof. (Dr.) V. B. SHIMPALE
Prof. (Dr.) S. K. KHADE

Prof. (Dr.) N. A. KULKARNI
Dr. G. G. POTDAR

Dr. S. S. KHOT

 **NIRALI**
PRAKASHAN
ADVANCEMENT OF KNOWLEDGE



A Practical Book of BOTANY

ISBN 978-93-5451-840-9

First Edition : November 2022

© 2022 : Authors

The text of this publication, or any part thereof, should not be reproduced or transmitted in any form or stored in any computer storage system or device for distribution including photocopy, recording, taping or information retrieval system or reproduced on any disc, tape, perforated media or other information storage device etc., without the written permission of Authors with whom the rights are reserved. Breach of this condition is liable for legal action.

Every effort has been made to avoid errors or omissions in this publication. In spite of this, errors may have crept in. Any mistake, error or discrepancy so noted and shall be brought to our notice shall be taken care of in the next edition. It is notified that neither the publisher nor the authors or seller shall be responsible for any damage or loss of action to any one, of any kind, in any manner, therefrom. The reader must cross check all the facts and contents with original Government notification or publications.

Published By :

NIRALI PRAKASHAN

Abhyudaya Pragati, 1312, Shivaji Nagar,
Off J.M. Road, Pune – 411005
Tel - (020) 25512336/37/39
Email : niralipune@pragationline.com

Polyplate

Printed By :

YOGIRAJ PRINTERS AND BINDERS

Survey No. 10/1A, Ghule Industrial Estate
Nanded Gaon Road
Nanded, Pune - 411041

DISTRIBUTION CENTRES

PUNE

Nirali Prakashan

(For orders outside Pune)

S. No. 28/27, Dhayari Narhe Road, Near Asian College
Pune 411041, Maharashtra
Tel : (020) 24690204; Mobile : 9657703143
Email : bookorder@pragationline.com

Nirali Prakashan

(For orders within Pune)

119, Budhwar Peth, Jogeshwari Mandir Lane
Pune 411002, Maharashtra
Tel : (020) 2445 2044; Mobile : 9657703145
Email : niralilocal@pragationline.com

MUMBAI

Nirali Prakashan

Rasdharma Co-op. Hsg. Society Ltd., 'D' Wing Ground Floor, 385 S.V.P. Road
Girgaum, Mumbai 400004, Maharashtra
Mobile : 7045821020, Tel : (022) 2385 6339 / 2386 9976
Email : niralimumbai@pragationline.com

DISTRIBUTION BRANCHES

DELHI

Nirali Prakashan

Room No. 2 Ground Floor
4575/15 Omkar Tower, Agarwal Road
Darya Ganj, New Delhi 110002
Mobile : 9555778814/9818561840
Email : delhi@niralibooks.com

BENGALURU

Nirali Prakashan

Maitri Ground Floor, Jaya
Apartments, No. 99, 6th Cross, 6th
Main, Malleswaram, Bengaluru
560003 Karnataka; Mob : 9686821074
Email : bengaluru@niralibooks.com

NAGPUR

Nirali Prakashan

Above Maratha Mandir, Shop No. 3,
First Floor, Rani Jhanshi Square,
Sitabuldi Nagpur 440012 (MAH)
Tel : (0712) 254 7129
Email : nagpur@niralibooks.com

KOLHAPUR

Nirali Prakashan

438/2, Bhosale Plaza, Ground Floor
Khasbag, Opp. Balgopal Talim
Kolhapur 416 012 Maharashtra
Mob : 9850046155
Email : kolhapur@niralibooks.com

JALGAON

Nirali Prakashan

34, V. V. Golani Market, Navi Peth,
Jalgaon 425001, Maharashtra
Tel : (0257) 222 0395
Mob : 94234 91860
Email : jalgaon@niralibooks.com

SOLAPUR

Nirali Prakashan

R-158/2, Avanti Nagar, Near Golden
Gate, Pune Naka Chowk
Solapur 413001, Maharashtra
Mobile 9890918687
Email : solapur@niralibooks.com

marketing@pragationline.com | www.pragationline.com

Also find us on  www.facebook.com/niralibooks



CONTENTS

| | | |
|-----------|--|---------|
| 1. | Study of Microscope: Light and Electron Microscope (SEM with Photograph) | 1 - 8 |
| 2. | Electron Microphotographs/models of Viruses – T-Phage and TMV | 9 - 11 |
| 3. | Forms of Bacteria- (Temporary / Permanent Slides/ Photographs) | 12 - 13 |
| 4. | Bacteria- Gram Staining Technique | 14 - 15 |
| 5. | Study of Vegetative and Reproductive Structures of Nostoc | 16 - 18 |
| 6. | Study of Vegetative and Reproductive Structures of Spirogyra | 19 - 21 |
| 7. | Study of Different Types of Biofertilizers as per Theory Syllabus | 22 - 24 |
| 8. | Study of Vegetative and Reproductive Structures of Mucor | 25 - 26 |
| 9. | Study of Vegetative and Reproductive Structures of Penicillium | 27 - 28 |
| 10. | Study of Forms of Lichen- Crustose, Foliose and Fruticose | 29 - 30 |
| 11. | Study of Mushroom Cultivation (Demonstration) | 31 - 32 |
| 12. & 13. | Study of Plant Diseases as per Theory | 33 - 38 |
| 14. | Study of Vegetative and Reproductive Structures of Anthoceros | 39 - 42 |
| 15. | Study of Vegetative and Reproductive Structures of Selaginella | 43 - 45 |
| 16. | Study of Vegetative and Reproductive Structures of Gnetum | 46 - 48 |
| 17. | Study of Cell and its Organelles with the Help of Electron Micrographs | 49 - 51 |
| 18. | Study of Cell Structure in Onion Peels (cataphyll), it's Staining and Mounting | 52 - 53 |
| 19. | Study of Effect of Organic Solvent Concentrations on Membrane Permeability | 54 - 55 |
| 20. | Study of Peroxisome (Enzyme Activity Catalase) | 56 - 58 |
| 21. | Study of Glyoxisome (Enzyme Activity-Malate Dehydrogenase) | 59 - 60 |
| 22. | Study of Different Stages of Mitosis | 61 - 62 |
| 23. | Study of Different Stages of Meiosis | 63 - 65 |
| 24. | Separation of Photosynthetic Pigments by Ascending Paper Chromatography | 66 - 67 |
| 25. | Separation of Amino Acids by Thin Layer Chromatography | 68 - 70 |



About the Authors

Prof. (Dr.) V. B. SHIMPALE

M. Sc. Ph. D., FIAAT

Former Member of BOS (Botany), S. U. Kolhapur,
Department of Botany, The New College, Kolhapur

Prof. (Dr.) N. A. KULKARNI

M. Sc. Ph. D.

Professor and Head Department of Botany,
Padmabhushan Dr. Vasantdada Patil Mahavidyalaya Tasgaon.

Prof. (Dr.) S. K. KHADE

M. Sc. Ph. D.

Member of Faculty in Science and Technology BOS (Botany),
S. U. Kolhapur, Former BOS and Senate Member, S.U., Kolhapur, Department of Botany,
Padmabhushan Dr. Vasantdada Patil Mahavidyalaya, Tasgaon.

Dr. G. G. POTDAR

M. Sc. Ph. D., FIAAT

Assistant Professor and Head, Department of Botany,
Yashwantrao Chavan College of Science, Karad

Dr. S. S. KHOT

M. Sc. Ph. D., SET (Life Sciences)

Associate Professor, Department of Botany, Yashwantrao Chavan Warana Mahavidyalaya,
Warananagar.

BOOKS AVAILABLE AT

PUNE

Nirali Prakashan

: Sur. No. 28/27, Dhayari-Katraj Road, Near Pari Company,
Dhayari, Pune - 411 041. Ph. (020) 24690204
Fax: (020) 24690316 • Email: bookorder@pragationline.com

KOLHAPUR

Nirali Prakashan

: 438/2, Bhosale Plaza, Shop. No. 3, Khasbag,
Opp. Balgopal Talim, Kolhapur. Mob. 9850046155
Email : kolhapur@niralibooks.com

Mehta Book Sellers

: Bhausinghji Road, Kolhapur- Tel. (0231) 2541881

Best Book Suppliers

: Uchgaon, Kolhapur. Mobile : 9860780143

Granth The Book World

: Rajarampuri 5th Lane, Kolhapur. Tel. (0231) 2535355

SANGLI

Nirali Prakashan

: Ashok Ganpatil Nanaware, C/o. Sunil Dilip Deshpande,
Sena Maharaj Mandir Road, 1088/A, Gaobhag, Sangli 416416
Mobile : 9921516852

G. R. Tamhankar Book Sellers

: Saraf Naka, Sangli. Tel. (0233) 2329966

Sankpal Book Stall

: Near Church, Kapad Peth, Sangli. Tel. (0233) 3226477

MIRAJ

Ratnakar Book Stall

: Deval Talkies, Miraj. Tel (0233) 222564


SATARA

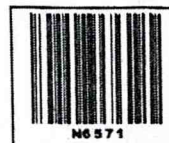
Alankar Book Stall

: Opp. Science College, Satara.
Tel (02182) 220456

Email: niralipune@pragationline.com • Website: www.pragationline.com

Also find us on  www.facebook.com/niralibooks

 @nirali.prakashan



Cost Effective Cultivation of *Spirulina platensis* by Using Fish Waste Hydrolysate

Avinash A. Raut^{1*}, Pratiksha D. Magdum², Aadesh S. Kulkarni²,
Deep N. Thakkar² and Pranay P. Patil¹

DOI: 10.9734/bpi/rpmb/v1

ABSTRACT

The greatest problem in the world today is Global Food Protein Shortage. So, there is an urgent need to find other protein sources. The best potential is seen in Single Cell Protein i.e. *Spirulina platensis*. The purpose of this study was to assess the growth, biomass, and other useful compounds (Protein, Chl-a, Chl-b, Carotenoids Phycocyanin) of *Spirulina* on cost effective alternative medium i.e. Fish Waste Hydrolysate (FH) medium and Zarrouk's medium (ZM) was used as standard. This study showed better growth rate, biomass (protein content), high level of chlorophyll a and chlorophyll b content, carotenoid, phycocyanin pigment production of *Spirulina* cultivated in Fish Waste Hydrolysate medium. It is suggested that FH medium could be used as the alternative and cheap medium than standard medium ZM.

Keywords: *Spirulina*; protein; fish hydrolysate; biomass.

1. INTRODUCTION

Protein is an essential component of diet. The greatest problem in the world today is Global Food Protein Shortage. With the current system of production, agriculture cannot be relied upon to feed an ever increasing world population. Hence, there is an urgent need to find other protein sources. The best potential is seen in microbial protein or Single Cell Protein (SCP), a new source of protein is not dependent of agriculture [1].

Spirulina is multicellular and filamentous blue green algae (cyanobacteria). *Spirulina platensis* has maximum growth rate, division rate, doubling time, biomass, chlorophyll A content, so cultivated worldwide. It has been used as a complementary dietary ingredient for human being as well as used as feed for fish, poultry and aquaculture. One gram of *Spirulina* is equivalent to one kilogram of assorted vegetables. It is very useful for those people who are suffering from diseases like combat hunger and malnutrition [2]. All plants, even microalgae are used for therapeutic, flavoring or coloring purposes classify as herbs. Since *Spirulina* is a greenish- blue micro water plant like the moss growing on a pond, is also classifies as a therapeutic herb. Biochemical composition of *Spirulina* can be summarized as follows, it contains high amount of protein between 55-70%, essential fatty acids, vitamin B1, B2, B3, B6, B12, vitamin C, vitamin D, vitamin E, minerals such as potassium, calcium, copper, iron, sodium, zinc etc. [3] *Spirulina* also contains many pigments including Chlorophyll (Chlorophyll a and chlorophyll b), antioxidant pigments (phycobiliproteins and carotenoids), polysaccharides [4,5] and C-phycocyanin, allophycocyanin. It is the richest algal source of Gamma-linolenic acid (GLA) [6].

The growth of *Spirulina* and the composition of the biomass production depends on many factors, the most important of which are nutrient availability, temperature and light [4,7]. In addition, *Spirulina* requires relatively high pH values between 9.5-9.8 [8].

¹Department of Microbiology, Yashwantrao Chavan College of Science, Karad, India.

²Department of Biotechnology, Smt. Kasturba Walchand College, Sangli, India.

*Corresponding author: E-mail: avinashraut@aol.in;

