

PLANT TISSUE CULTURE – THEORY AND TECHNIQUES

SHAILESH KUMAR

Rajendra Agricultural University,
Pusa, Samastipur,
Bihar, India

SWETA MISHRA

Sardarkrushinagar Dantiwada
Agricultural University,
Gujarat, India

A.P. MISHRA

N.R.C.R.M., Sear,
Bharatpur, Rajasthan, India



Published by:

Scientific Publishers (India)
5 A, New Pali Road, P.O. Box 91
Jodhpur 342 001 (India)

E-mail: info@scientificpub.com
Website: www.scientificpub.com

Branch Office

Scientific Publishers (India)
4806/24, Ansari Road, Daryaganj
New Delhi - 110 002 (India)

Print: 2016

ISBN: 978-81-7233-602-8 (HB)
978-81-7233-593-9 (PB)

eISBN: 978-93-86102-20-1

© Kumar, Mishra & Mishra, 2009

Printed in India

FOREWORD

This book is an elegant piece of work which combines the research experience in plant tissue culture with the extensive knowledge of the needs of undergraduate and post graduate students for a subject that is increasingly pervading the public and private sector and offers a vast scope for future. This book provides a clearly written, well documented text that covers all the basic and applied aspects of plant tissue culture and enables the students to formulate their experiments independently. The illustrative text and references of this book enables the reader to follow up the points of interest in greater detail.

The coming years will see the spread of plant tissue culture in all the fields of Agriculture, Botany, Genetic manipulations, Environmental science and in varied industrial applications, which requires better understanding of the subject. This book titled “ Plant tissue culture – theory and techniques” by Shailesh Kumar, Sweta Mishra and A.P. Mishra, will undoubtedly contribute significantly by inspiring students in this direction.



Dr. R. C. MAHESHWARI

Vice Chancellor,
Sardarkrushinagar Dantiwada Agricultural University,
Gujarat

PREFACE

The purpose of this book is to introduce a basic experimental method for each of the major areas of investigation involving the isolation and culture of plant cells, tissues and organs. Each chapter is devoted to a separate aspect of plant tissue culture and the chapters are arranged in the order of increasing technical complexity. This book is mainly written for the undergraduates and postgraduate students and also for the research workers working in this area. The book is designed keeping in mind the problems faced by the scientists and research scholars working with plant tissue culture, however, it can be used as a supplementary text for developmental botany and biology.

The opening chapters present a brief historical survey of the field of plant tissue culture, a background in sterilization techniques. Various components of the nutrient medium have been dealt in greater detail. The text deals with the experimental details of each and every technique. Several chapters introduce diverse approaches to plant propagation by in vitro techniques. The protocols have been simplified legibly to include details and notes that we hope will help the user avoid unnecessary errors and confusion. All the applications of plant tissue culture have been very well discussed and the techniques associated with them described in detail. The various sections have been written with safety in mind, but users should ensure that they are fully familiar with all safety requirements of the equipments and media. Plant tissue culture is not without risk to the experimenter.

Tissue culture, however, is still sometimes more art than science. It has been said that the greatest thing that anyone can achieve is to make a difference. We hope that, in writing this book, we will, in some small way, do just that.

The authors acknowledge all the contributions made by the scientists of the present and past era who have been working in the field of plant tissue culture due to which the science has gained such an importance today.

**SHAILESH KUMAR
SWETA MISHRA
A.P. MISHRA**

CONTENTS

<i>Foreword</i>	<i>iii</i>
<i>Preface</i>	<i>v</i>

Chapter 1	Introduction and History of Plant tissue culture	1
Chapter 2	Laboratory Design and management	10
Chapter 3	Good Laboratory Practices	16
Chapter 4	Contamination	19
Chapter 5	Sterilization techniques	25
Chapter 6	Buffers and Solutions	31
Chapter 7	Plant culture media	38
Chapter 8	Plant hormones	56
Chapter 9	Collection and preparation of explants	62
Chapter 10	Micropropagation	68
Chapter 11	Cell suspension culture	75
Chapter 12	Meristem culture	86
Chapter 13	Callus culture	91
Chapter 14	Organogenesis	98
Chapter 15	Somatic embryogenesis	103
Chapter 16	Somaclonal variation	111
Chapter 17	Embryo rescue and Embryo culture	117
Chapter 18	Haploid production	123

Chapter 19	Protoplast isolation, culture and Somatic hybridization	132
Chapter 20	Secondary metabolite production	139
Chapter 21	Cryo-preservation	146
Chapter 22	<i>Agrobacterium</i> -mediated transformation	156
Chapter 23	Micro tuber production in potato	164
Chapter 24	Elementary statistics often used in plant sciences	171
Chapter 25	Design, its layout, analysis and interpretation for the experiment conducted in laboratories	177
	Appendices	186
	Glossary	193
	References	201
	Subject index	208