SCIENTIFIC PUBLISHERS

# Systematic POMOLOGY

Om Prakash Pareek
Suneel Sharma

# Systematic
# POMOLOGY

## Volume - 1

**Dr. Om Prakash Pareek**
Former Director
Central Institute for Arid Horticulture (ICAR)
Bikaner - 334 006 (Rajasthan)

**Dr. Suneel Sharma**
Prof. of Horticulture
Dept. of Horticulture,
CCS Haryana Agricultural University
Hisar (Haryana)

SCIENTIFIC PUBLISHERS

Published by
**SCIENTIFIC PUBLISHERS (INDIA)**

Jodhpur –

5 A, New Pali Road
P.O. Box 91
Jodhpur - 342 001 INDIA

Delhi –

4806/24, Ansari Road
Daryaganj
New Delhi - 110 002 INDIA



ISBN: 978-93-86237-91-0 (Volume 1)
978-93-86237-92-7 (Volume 2)
978-93-86102-81-2 (Set)

Visit the Scientific Publishers (India) website at
http://www.scientificpub.com

Printed in India

# FOREWORD

Fruits have been an important source of human food ever since the dawn of civilization. Rich in nutrients such as vitamins, antioxidants, soluble fibre and minerals, fruits are considered to be the protective class of food. Globally, around 3000 species of different fruits exist, of which about 250 have considerable nutritional and commercial value and thus are being cultivated. Despite this, presently only around 30 species are commercially cultivated with a global production of 654.4 million tons.

The demand for fruits is likely to increase in view of increasing human population, rising income, overall social prosperity and appreciation for consuming healthy food for nutritional security. This obviously calls for widening of the global fruit basket as well as improving their production, productivity and quality.

In order to achieve this, a systematic documentation on description, identification, standard nomenclature and classification of available genetic diversity is a prerequisite.

In this context, the book 'Systematic Pomology' is indeed a welcome addition. Both Drs. O.P. Pareek and Suneel Sharma have provided a very useful account of nearly 375 fruit species belonging to 4 gymnosperm and 70 angiosperm families into a very systematic framework of phylogenetic system of nomenclature and classification developed in 2009 by the Angiosperm Phylogeny Group following the latest code of nomenclature. The general information on description of plant characters, identification, nomenclature and classification along with fairly exhaustive description of specific characteristics of different species are likely to be very helpful in identification of new genotypes/cultivars. Such a comprehensive account will certainly help in systematic introduction and selection of genetic materials in the fruit breeding programme considering their taxonomic proximities and specific characteristics related to fruit bearing, regularity, nutritive and edible quality including aroma and taste, and above all their resistance to biotic and abiotic stresses.

I am sure the information contained in this book will benefit especially the research workers in establishing/maintaining specific germplasm blocks, research orchards or even herbaria. The book is expected to serve as reference material for teachers, researchers, students and all those concerned with fruit flora, particularly those interested in their genetic resources,

breeding and bioinformatics. Above all, this useful compilation would help the commercial fruit growers in selecting the most suitable fruit species/cultivars, locations for their planting and methods of orchard management for achieving higher productivity and profitability.

**R. S. Paroda**
Chairman, *TAAS*, Pusa Campus, New Delhi
Formerly, Secretary (DARE) and
Director General (ICAR)

# PREFACE

Systematic Pomology is an integral part of the science of fruits. Its knowledge is a prerequisite for improvement as well as sustainable and profitable production of fruit crops. The nomenclature and classification of fruit plants had been traditionally done on the basis of the Bentham and Hooker's natural system of classification published in *Genera Plantarum* (1862-1883). Now after the development of the ordinal classification, using new systematic data especially on DNA sequences, for the families of flowering plants by the Angiosperm Phylogeny Group (APG), updated as APG III in 2009, adoption of the concept of phylogenetic nomenclature and classification in fruit species is more appropriate. Also, the latest Code of nomenclature for the cultivated plants should be adopted. Therefore the authors considered it necessary to put the fruit crops into the more systematic framework of the APG system of nomenclature and classification. This requirement has been felt ever since the authors taught the Systemaic Pomology course to postgraduate students. In fact, this interest has its roots when one of us (OPP) drew inspiration from the lectures of Prof. Ranjit Singh, an authority on citrus taxonomy, who taught the subject in the Horticulture Division of the Indian Agriculture Research Institute, New Delhi during 1962-63, and from the earlier publications from USA by Prof. F A Waugh (1916) and Prof. Q B Zeilinski (1955). The intention was also to consolidate and update the scattered information for those interested in the subject of fruit science.

With continued work on this task the present book has been brought out in two volumes. The subject matter of the book, having 40 chapters, has been presented in three parts. Part A, with 4 chapters, gives general information on methods for (i) description of plant characters, (ii) identification, (iii) nomenclature, and (iv) classification. In Part B and C, nearly 370 species belonging to 72 families have been grouped based on the Phylogenetic System of Classification of the APG. Part B has Gymnosperm fruits in 3 chapters and Part C has fruits of Angiosperms in 33 chapters. In each chapter, the fruits have been arranged giving their taxonomical status from family to the cultivar level with description of important pomological traits. Comparatively brief narrative is given on the characters at the levels of class, subclass, angiosperm clade, order and family. More emphasis has been laid on the description of characters at species level with considerably exhaustive description at the cultivar level. The book is richly illustrated with figures and photographs. Taxonomic keys have also been given for some species groups. This first volume contains 27 chapters; all the chapters of Part A and Part B and 20 chapters of Part C.

The remaining 13 chapters of Part C along with a references list, fairly exhaustive glossary and an index are continued in the second volume.

The book is intended to serve as a reference material for researchers, teachers, students, fruit growers and all concerned with fruit flora particularly those interested in their genetic resources, breeding and bioinformatics. The knowledge will be useful to a gene bank curator to enable him to systematically maintain fruit germ plasm *in-situ* or *ex-situ* and in herbaria including their proper documentation, to the taxonomists for use not only in preparation of keys and correct identification but also in classifying the fruit genotypes into categories and in removing confusion arising from synonimity in nomenclature. Correct knowledge of origin and evolution of the genotypes will be useful in their systematic use in scientific studies based on the information on their relationships and differences (taxonomic proximities) and also in selecting genetic material (considering specific characters) for use in improvement programmes. In addition, the information would be useful to the commercial fruit growers as a guide book for systematic planting and culture of fruits by selection of the right genotype/cultivar considering their suitability for use as rootstock and as scion material to obtain high productivity and quality of fruits in the given environment.

The authors have drawn information from number of published texts, monographs, books and periodicals for compilation of this work. The authors gratefully thank the organizations Biodiversity International, formaly IPGRI Regional Office for Asia, Rome, Italy, ProMUSA, TFNet, Selangor, Malaysia and IITA, Nigeria for using line diagrams/drawings of plant species from their published work. Our special thanks are also due to Dr S.N. Pandey, ex-ADG, ICAR, Dr. Sanjay Singh and Sh Sanjay Patil, CHES, Bikaner, Ms. Monica Lisa, CCS HAU, Hisar, Dr Sunil Pareek MPUAT, Udaipur, Dr. Murlidharan, Date Palm Research Station, Mundra, for providing photographs of cultivars of fruit species used in this publication. Thanks are also due to Dr R.A. Sharma and Dr S. Kathju, CAZRI, Jodhpur for valuable suggestions on portions of the text. Authors are grateful to the Vice Chancellor CCS Haryana Agricultural University, Hisar, and the Director CIAH, Bikaner for the kind encouragement to undertake this task. The task would not have been accomplished without the inspiration, encouragement and support provided by the family members especially Mrs. Kamla Pareek and Mrs. Deepali Sharma.

**O.P. Pareek**
**Suneel Sharma**

# CONTENTS

# CONTENTS

**[MALVIDS : EUROSID II]**

## Annona

Balanagar

Arka Sahan

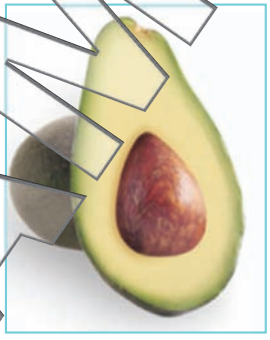
African Pride

Mammoth

Atemoya

## Avocado (Griesbach, 2005 & CHES, Chethali)

Hass



Fuerte

Zutano

Pinkerton

CHES A-1

## Coconut (CPCRI, Kasaragod, Kerala)

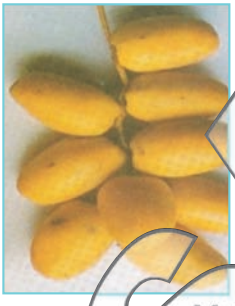
Chowghat Orange Dwarf

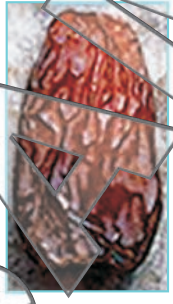
Kalpa Mitra

Kalpa Sankara (CGDxWCT)

VPM 3

## Date Palm (Dr. C.M. Muralidharan, Date palm Research Station, Mundra)





Medjool

Halawy

Barhee

Zahidi

Khuneizi

## Banana

Fe'i

Bluggoe

Grand Naine

Poovan

Robusta

Red Banana

Rasthali

Nendran

## Pineapple (TFnet, 2008)

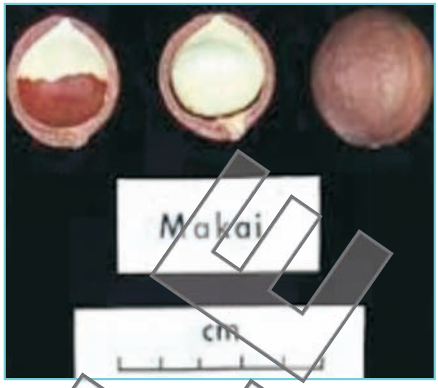
Kew

Mauritius

Queen

Smooth Cayenne

## Macadamia

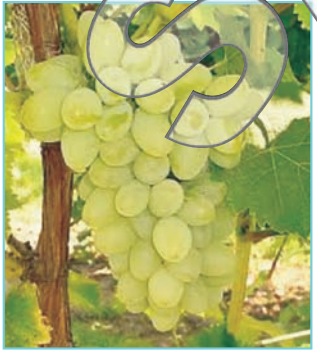



White currant (White Dutch)

Red currant

Strawberry (Camarosa)

## Grape



Thompson Seedless

Ruby Seedless

Sonaka

## Pomegranate (Monalisha Hota and IIHR, Bengaluru)

Bhagwa

Mridula

Arka Ruby

Ganesh

G-137

Wonderful

## Guava (TFNet, 2008)


Allahabad Safeda

Lucknow 49

Apple Colour

Ruby Supreme

Arka Rashmi

Arka Mridula

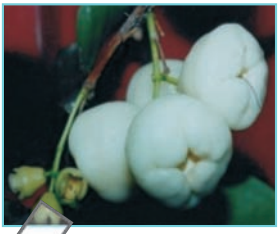
Arka Kiran

Hisar Safeda

## Wax apple (TFNet, 2008)

CHESM- 1

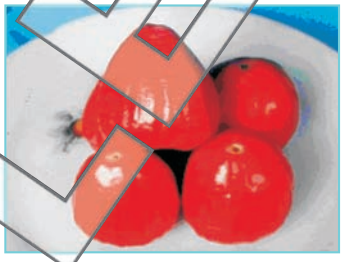
Green Red Wax Jambu



Kong White Wax Jambu

Black Diamond Wax Jambu

Java Wax Apple

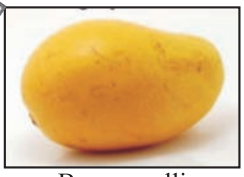


Malay Rose Apple

## Mango (Dr. S.N. Pandey; Griesbach, 2005; IIHR, Bangaluru)

Dashehari

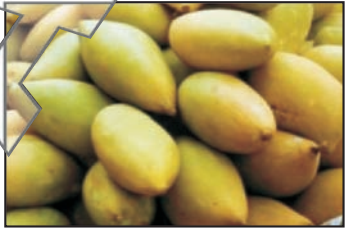

Langra



Banganpalli

Mulgoba

Chausa



Totapari

Alphonso

Alphonso

**Amrapali**

Fazli

## Mango (Dr. S.N. Pandey; Griesbach, 2005; IIHR, Bangaluru)

Gulabkhas

Arka Anmol

Arka Aruna

Arka Neelkiran

Arka Puneet

Anupam

Ambika

Kensington

Sensation

Tommy Atkins

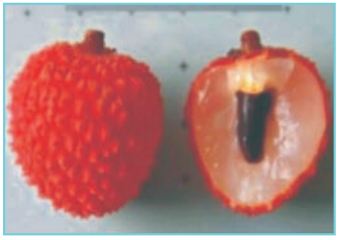
Haden

## Litchi

China

Kwai Mi

Purbi



Early Seedless

Rose

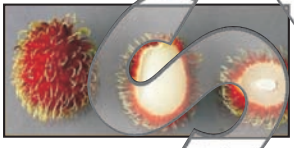

Swarna Roopa

Longan

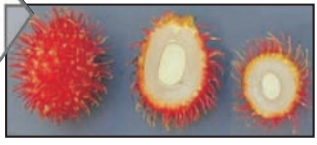
Langsat

*Nephelium ramboutan-ake* (Labill.) Leenh

## Rambutan (TFNet, 2008)



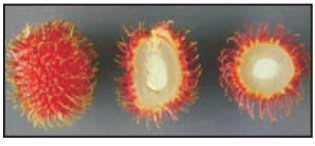
R3 (Gula Batu) from Malaysia



Seematjan

Binjai (from Indonesia)

Arka Coorg Arun



R167 ('Chai Tow Cheng') from Malaysia

CHES- 26