

**DICTIONARY OF
PLANT BREEDING
AND
SEED TECHNOLOGY**



L. L. SOMANI



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AGROTECH PUBLISHING ACADEMY :UDAIPUR

Published by:

Mrs. Geeta

Agrotech Publishing Academy

1-G-24 Sector-5, (Gayatri Nagar)

Hiran Magri

Udaipur-313001

First Edition, 1992.

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ISBN 81-85680-01-9

Typeset by:

Apex Computing Centre

34, Gokul Nagar

Udaipur

Printed in India at Jawahar Offset Press, Daryaganj, New Delhi and bound by A.J. Book Binding House, New Delhi (Ph: 3271917).

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PREFACE

Production of food is a problem of major concern in the world today. The world's food supply, grossly inadequate in many countries today, will need to be increased greatly in the years ahead if the basic nutritional requirements of an explosive world population are to be satisfied. Failing which, the spectre of hunger, malnutrition, and famine, will continue to spread and grow.

To increase crop production, four important inputs need major attention: water, fertilizer, plant protection, and crop variety. The first three relate to cultural practices that provide a more desirable environment in which to grow the crop. The fourth—the crop variety—relates to the inherent ability of the plant to produce within the environment provided. More productive plants necessitates improvement in the heredity of a crop which is accomplished by breeding better varieties. Plant breeding is a unique science in at least two ways. First, it uses knowledge and techniques from many basic science areas, and second, its contribution to agricultural progress is measured not only by information, but also by material products such as a crop, varieties, hybrids, clones, etc.

The rapid increase in knowledge of genetics since the discovery of Mendel's Laws of heredity in 1900 and the application of these laws to plant breeding were essential steps in the development of plant breeding as a science. The knowledge in these fields has exploded during the last four decades and has proved immensely useful in ameliorating the miseries of mankind and promises a brighter future. Identification and synthesis of hereditary material, cracking of genetic code, development of high yielding varieties of crop, genetic control of growth, differentiation and phenotypic expansion, understanding the mechanism of organic evolution etc., are some of the examples of our achievements. The knowledge gained so far has opened up the possibility of genetic manipulation at will.

The goal in plant breeding is to develop better varieties. Before the potential benefits from an improved variety can be realised the variety must be distributed widely, and sufficient seed or vegetatively propagated material must be produced so that the variety can be grown on the farms in the area in which it is adapted. While the development of the new variety is the primary function of the breeder, the production and distribution of quality seed requires the art of growing, conditioning and marketing. It is however, clear that if the country is to derive benefit from the breakthrough in the genetic engineering of yield, seeds of new varieties and hybrids have to be produced in adequate quantities as well as of high purity and quality.

Seed is a basic input in modern agriculture. Without good seed, the investment on fertiliser and water will not pay the dividend which ought to be obtained. Therefore, the pace of progress in the field of food production would largely depend upon the

(ii)

speed with which we are able to multiply and market seeds of high quality. There is thus an urgent need to understand seed technology involving all aspects of seed production, processing and marketing.

Deep within the seed are its own development forces, nutritive elements, and mysterious time and place mechanisms that signal the next growth stage. Without seeds, man could not have developed a stable agriculture. Every seed represents a new beginning. It is beginning, yet a link with the past, a bridge between the old and the new—the dreams and heritage and accomplishments of the past recorded in a tiny capsule of hope for tomorrow. The very act of planting a seed represents hope, and indeed faith, that there will be a harvest. In many ways, the study of seeds is a study of life itself. The seed unit provides a neatly wrapped package, inside of which is a living organism capable of exhibiting almost all the processes found in the mature plant.

An appreciation and working knowledge of the science and technology of seeds is fundamental to a well developed agriculture. If the green revolution is to become a reality in the developing countries of the world, the science of plant breeding and technology of seeds will play a key role in it.

An invaluable aid to plant breeding & seed technology would be the availability of a dictionary which brings together all the important and related terms.

Plant breeding & seed technology is certainly one of the most rapidly advancing of the agricultural sciences, and probably no other field has stimulated so many diverse disciplines. The fact that plant breeding and seed technology has attracted scientist from different spheres such as genetics & cytogenetics, genetic engineering, cell & tissue culture, germplasm, plant physiology, plant biochemistry, ecology & environment, biostatistics, seed production, multiplication, processing, testing, storage and marketing and other scientists of diverse background to contribute to its development is one of the chief reasons for its prodigious growth. Such growth is, of course, accompanied by a proliferation in terminology, and this terminology constitutes a problem to the beginning agriculture students. Most of the words and abbreviations are not to be found in a standard collegiate dictionary and many are not present in dictionaries of biology. This is because many of the terms are newly coined. Such subject dictionaries like this Dictionary of Plant Breeding & Seed Technology have fascinated the teachers and the taught everywhere. They stimulate us in knowing the unknown. In fact a dictionary of such a kind has an ocean of information which tries to satisfy us of our unending thirst for knowledge.

The task of selecting the terms to be included in any branch of science offers many difficulties particularly in the case of plant breeding and seed technology which draws upon from several diverse fields of agriculture. How far it is advisable to include terms from those overlapping sciences which lie on the border land is a question on which no two people might think alike. I have given every word an independent examination,

so as to take in all, in fact, which might be fairly expected, and yet to exclude technical terms which rarely belong to another science, which otherwise, would have extended this dictionary to an inconvenient size. I have therefore only enumerated those best known or of more frequent mention in literature, or interesting for special reasons.

While in the process of writing and compilation, I have carefully considered the criticisms of this work which have come under my notice, and have adopted all those suggestions which could be taken up, so far as they did not contradict the plan on which this volume was drawn. Some criticisms were mutually destructive, others were due to insufficient knowledge on the part of the critic, whilst others advocated radical changes, which would have made this, not my book, but some other person's product.

I have tried to furnish the terms in use in various periods, so that a paper or book of any period can be read, and its special expression understood; to cut down the volume would have been therefore unwise, and the attempt would have failed to gain the approval of competent judges, as no two teachers would have agreed upon the exclusion of given term. In more than one case, an obsolete term has been lately revived. Several newly coined terms also find their place in this book.

It has been my duty to condense the definitions, often a difficult matter when a longer explanation would have been easier to draw up. I trust that I have in each case succeeded in setting out the main or central meaning, but many writers have their own modified or restricted meaning of even well known terms. Occasionally where a term was specifically coined by some authority, the name of the authority and the date of original usage are given. It is appreciated that there is still debate about the exact meaning of some terms, notably those which have apparently undergone some evolution of meanings; this dictionary guided by advice from students, teachers and researchers, takes a firm line and proposes in a number of cases a definition which seems to be accepted by reputable authorities. It is hoped that the students, teachers, researchers and all those interested in agriculture in general and plant breeding and seed technology in particular will find many of the terms commonly encountered in the plant breeding & seed technology and allied literature defined in this book, and that it will encourage the development of a vocabulary which will aid him in pursuing further studies in this fascinating field.

In every volume of similar character to this which I have had to consult, I have found errors, sometimes numerous, occasionally serious. This much larger volume offers a greater chance of error, but I trust that comparatively few errors will be found.

ACKNOWLEDGEMENT

Over fifteen years of incessant labour and efforts have gone into the preparation of this work. Over one thousand books, periodicals and publications have been consulted and freely drawn upon in defining the terms. Space does not permit me to acknowledge all authors individually, but I am grateful to them all for the information and assistance provided by their works.

Living languages do not remain unchanged over the years and the subjects dealt with in this Dictionary are essentially dynamic. The agricultural sciences in general and plant breeding & seed technology in particular are indeed growing at a fast rate. This Dictionary is thus not claimed to be complete, much less final and its periodic revisions are anticipated. That I have been guilty of errors and omissions, I expect to learn soon after publication and express my regrets in anticipation. Comments and constructive criticisms as well as suggestions of additional terms and definitions will be greatly welcome from organisations and societies, and interested individuals at large, which will be given the most careful consideration at the time of the revision of the Dictionary.

A dictionary is never an original work, but a collection from the works of others. Most of the material has been derived from text books garnered from far and wide. Should I have quoted inadvertently from other works without acknowledgement, which despite every care may have occurred (since my card index has been built up over a long period of time from a multiplicity of sources), I trust that the authors concerned will accept my apologies and thanks.

The pleasant duty now remains of acknowledging most gratefully the invaluable help I have received from a host of friends during the progress of the work, particularly the members of the advisory board. Their help remains embodied in the text. To all my indebtedness is great, the value of this dictionary being largely due to their ready help.

It is my hope that this volume will be of practical assistance not only to a wide range of students in colleges and universities but also to general public for agriculture in one form or the another is the concern for us all.

I am aware of the possibility of shortcomings and defects in a book dealing with such a broad subject like plant breeding and seed technology. I will appreciate if the readers could bear with them and communicate the same to me so that I can bring out a better edition next time.

July 15, 1992

L.L. Somani

USER'S GUIDE

1. Main Features

- (i) Important relevant terms of local common usage in different countries have been included in the Dictionary for completeness and in order to avoid the inconveniences of having to refer to other sources for their definitions.
- (ii) Where equivalent English terms conveying the intended concept are unknown, terms of other languages in current use have been included.

2. Limitations

- (i) The dictionary is not intended to standardize or "freeze" the usage of terms, and the author, as such, accepts no responsibility for the legal validity of the definitions. It is only a modest first attempt at defining the prevalent concepts of terms in English usage.
- (ii) It is to be recognised that this dictionary is the first tentative effort at giving definitions of terms that are known to have been generally used in the English language so far. It is probable that many terms have been lost sight of, but it is the intention to enlarge and revise the dictionary at intervals of about 2-3 years. The scope would then be widened to cover further terms, particularly with the evolution of new techniques, practices and instruments in the field of plant breeding & seed technology. It is more than probable also that the definitions of terms will be improved, when better definitions are suggested or come to notice

subsequently.

- (iii) In order to economise space, words drawn from the same leading word/term have been grouped into paragraphs, thus obviating the necessity of repeating the leading word with its meaning many times over, and only requiring the additional root to be given; occasionally this has led to the intentional neglect of strict alphabetic sequence.

3. Alphabetization

- (i) Terms are alphabetized on word-by-word basis. Abbreviated term take preference over non-abbreviated ones.
- (ii) Subscript, superscripts, and numbers affect the order of entries only if there is no other difference between the entry; apostrophes, commas and hyphens are ignored for the purpose of alphabetization.
- (iii) When a hyphen connects two complete words, or connects a letter and a complete or incomplete word, the hyphen is regarded as a space.
- (iv) When a Greek letter forms a significant part of an entry heading, it is counted as a word.
- (v) Chemical prefixes, in either abbreviated or unabbreviated form, are disregarded in alphabetization when they are used in the ordinary sense of denoting structure of organic compounds. Such prefixes are, however, included in alphabetization when they form integral part of entries and are used in ways other than for the

indication of the structure of organic compounds. The prefixes mono-, di-, tri-, tetra-, and poly-, which form integral part of the entries are included in alphabetizing.

- (vi) All numbers are disregarded in alphabetization. These includes number denoting chemical structure.

4. Forms of Entries

- (i) All entries are direct entries. However, types of subclass or parts of the main term follow it e.g. the different types of Reproduction viz SEXUAL REPRODUCTION, ASEXUAL REPRODUCTION, VEGETATIVE REPRODUCTION are found under the main term **reproduction**. Similarly NATURAL SELECTION and ARTIFICIAL SELECTION could be found under main term **selection**.
- (ii) The entries are generally in the singular, with the plural indicated only when necessary.

5. Cross References

Cross references are indicated in CAPITAL letters. Information given in any particular entry is seldom repeated elsewhere. In some cases a complete understanding of an entry is dependent on a knowledge of information given in other entries which are indicated by cross reference. In such cases the cross reference(s) frequently forms an integral part of the text, or may be introduced by *See*. In such cases cross references may be used to link one topic with another or to extend the scope of a given

topic. In such cases a cross reference is often placed within the text and is preceded by *See also*. Certain entry headings are followed simply by *See* cross reference. Such references only signify that the meaning of the term is given under the heading indicated.

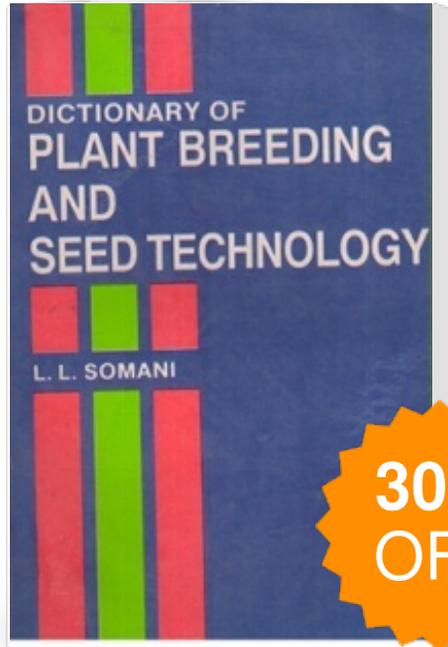
6. Numbered Definitions

In a number of case a term is used with different meanings by different authors. It may also have different meaning in different contexts. For such terms the various definitions are indicated by (1), (2), (3) etc. though all the definitions which can be ascribed to the terms have not necessarily been included. The position in which any given definition appears in the list of definitions is not intended to reflect in any way the appropriateness or frequency of usage of that definition of the term.

7. Statement of Warranty

- (i) The author/editor and members of the advisory board or the publisher are in no way responsible for the legality of the terms and their interpretations. They make no warranty, expressed or implied, as to the accuracy or adequacy of any of the information presented in the writing.
- (ii) Since the Seed Act has been passed observance of the rules and regulation under the act needs a prior check from the original.
- (iii) Errors called to our attention will be rectified whenever possible.

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Publisher : Agrotech Publications ISBN : 9788185680019

Author : Somany LL

Type the URL : <http://www.kopykitab.com/product/8189>



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