

AN INVESTIGATION OF THE STRUCTURE AND MECHANICAL  
PROPERTIES OF SOME COTTON VARIETIES OF  
*Gossypium hirsutum* SPECIES WITH EMPHASIS ON EVOLVING A  
SUITABLE PARAMETER FOR VARIETAL SCREENING

By  
ANIL VISHNU MOHARIR

In fulfilment of the requirements of the degree of  
Doctor of Philosophy

To The  
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TO  
MY MOTHER  
WHO TAUGHT ME  
TO LOVE STORMS IN LIFE

CERTIFICATE

This is to certify that the thesis entitled "An Investigation of the Structure and Mechanical Properties of Some Cotton Varieties of Gossypium hirsutum species with emphasis on evolving a suitable parameter for varietal Screening" being submitted by Mr. Anil Vishnu Moharir, to the Indian Institute of Technology, New Delhi, for the award of the degree of Doctor of Philosophy is a record of the bonafide research work carried out by him. He has worked under our guidance and supervision and has fulfilled the requirements for the submission of this thesis which, to our knowledge, has reached the required standard.

The thesis, or any part thereof, has not been submitted to any other University or Institute for the award of any degree or diploma.



(DR. B.C. PANDA)

Senior Biophysicist  
Division of Agricultural Physics  
Indian Agricultural Research  
Institute, New Delhi-110012, India



(DR. V.B. GUPTA)

Professor  
Department of Textile Technology  
Indian Institute of Technology  
New Delhi-110029, India

## PREFACE

The present investigation originated from the initial objective of providing cotton breeders with a simple yet reliable parameter for screening of cotton varieties for quality breeding. For a specific end-use the cotton fibre must have the required properties and it is known that these properties are related to their physical and fine structural characteristics. The investigation was, therefore, designed to include a study of the physical and fine structure characteristics along with moisture absorption and mechanical properties of twenty-four varieties of Gossypium hirsutum species collected from the 1975 crop. The study has been restricted to one species, so that inter-species variations do not affect the results. Such an investigation was also expected to be of assistance to the fibre technologists in assessing the performance of the varieties in relation to their structural parameters at gross morphological and fine structure levels.

The investigation has led to the suggestion that crystallite orientation may be a suitable parameter for varietal characterization. In addition some interesting results on the origin and growth of reversals and convolutions are presented. It is also seen from the electron microscopic studies that the cellulose microfibrils may be helically disposed. The work is reported in the order in which it was carried out. The thesis is divided into eight chapters as follows.

Chapter 1 is introductory and gives a brief account of the reasons for undertaking the present investigation. It also attempts to project the scope of the thesis.

Chapter 2 is devoted to a review of the existing literature in this field. Since a large amount of literature exists on this most widely studied natural fibre, only that which is most relevant to the present work has been included.

Chapter 3 deals with the experimental aspects, e.g. the experimental procedures used, the properties measured and the instruments employed for these measurements. It also discusses the principles involved in these measurements.

In Chapter 4, the data obtained from studies made on the transmission and scanning electron microscopes on some of the cotton varieties is presented and discussed.

In Chapter 5, the results on physical and structural characteristics are reported and discussed. These include fibre length, fineness, maturity coefficients, moisture regain, number of convolutions, X-ray angles, crystallinity, etc.

Chapter 6 gives the results of mechanical studies and their correlations with physical and fine structural parameters.

In Chapter 7, the findings related to the origin and growth of reversals and convolutions in cotton are reported and analysed. The effect of environmental factors on these features is also discussed.

In Chapter 8, the conclusions derived from this investigation are summarized and suggestions for future work in this area are made.

The publications to which reference is made are listed at the end of the thesis and finally the list of the author's publications is given under the Biodata of the author.

The work presented in the thesis has been carried out in the Textile Technology Department of the Indian Institute of Technology, New Delhi, Cotton Technological Laboratory of the Genetics Division, and Nuclear Research Laboratory of the Indian Agricultural Research Institute, New Delhi.

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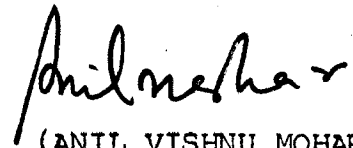
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(ANIL VISHNU MOHARIR)

Indian Agricultural Research  
Institute, New Delhi-110012.

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