

Sudan University Of Science And Technology

College Of Graduate Studies

**Sudanese Cotton specifications
(Barakat-90 & Acala Varieties)**

Submitted in Accordance With the Requirement for the
Degree of Master Science in Textile Engineering

By:

Bader Eldin Barbary Ali

Supervisor:

Dr. Salah A. Latief

August 2004

Acknowledgement

Thanks are firstly to Allah and secondly to my dear supervisor Dr. Salah A.Latief for his guidance and advice during the course of this research work, to Mr.Gafar Elshiekh for his valuable information and to all members and staff of the Fibre Spinning and Stickiness Laboratory at Agriculture Research and Technology Corporation (ARTC) at Wad Madane. My thanks are also due to Dr. Hasab Elrasol A.Bagi for his assistance.

Thanks are also due to Sudanese Standard and Metrology Organization for awarding this valuable chance; Thanks are due to Entesar M.A and to Nada Arafat. M, and finally to my dear friend Mohammed Osman Bellow, my mother, father, and family.

تجريد

يمتاز القطن السوداني بخصائص غزلية وتجارية عالية لذلك فهو يعتبر واحد من أهم المنتجات التي تدر علي البلاد عملة حرة.

في هذه الدراسة تم سرد تاريخي وإحصائي لاهم الدول المنتجة للقطن في العالم من ناحية الانتاج والتصدير والاستيراد والاستهلاك المحلي والمخزون .

تناولت الدراسة الأنواع المختلفة للاقطن السوداني والمحاولات البحثية المختلفة لتوليد سلالات جديدة مقاومة للآفات, وللأنواع التي تنتج حاليا وكمياتها ومواقع إنتاجها في المشاريع المروية والمطرية خلال العشر سنوات الماضية .

تعرضت الرسالة بتفاصيل التركيبات الكيميائية والمورفولوجية لشعرة القطن والمتطلبات البيئية الأساسية لمراحل نموها.

شملت الرسالة علي تأثير العمليات المختلفة من جني وترحيل وتخزين وحليج علي جودة القطن .

الرسالة تحققت من مدى الارتباط بين الدرجات المختلفة لاقطن بركات -90 وأكالا وخصائصهما من حيث طول الشعرة والنعومة والنضوجة والمتانة والعسلة.

Abstract

Sudanese cotton is characterised by high spinnability and market value, it is considered as one of the main source of hard currency.

In this study a brief historical background and trade of cotton world wide has been given. The Sudanese cotton varieties, the production areas, the production and export of irrigated and rainfed, and export were discussed.

The study also discussed in details the morphological, chemical structures and the environmental requirements of cotton growing and the impacts occurs during production processes, such as harvesting ,planting picking, storage and ginning.

The objective of this work is to show how the grades and sub grades of Baracat –90 and Acala varieties are related to their physical properties such as fibre length, fibre tensile strength, fibre micronaire, maturity and honeydew.

List of Contents

Acknowledgment
Arabic Abstract
English Abstract
List of content

Chapter one

page

1.0 Introduction	1
1.1 Back ground	1
1.2 The nature of the fibre	2
1.3 Cotton production in the world	3

Chapter two

2.0 Cotton Growing and Structure analysis	
2.1 Introduction	11
2.2 Climatic conditions	11
2.3 Growth	11
2.4 Structure analysis	12
2.4.1 Amorphous structure	12
2.4.2 Morphological structure	14
2.5 Fibre content	19
2.5.1 The cuticle	19
2.5.2 The primary wall	19
2.5.3 The secondary wall	19
2.5.4 Convolution	19
2.5.5 The lumen	20
2.5.6 Fuzz fibre (cotton linters)	20
2.6 Chemical structure	22
2.7 Physical properties	25
2.8 Scope and objective of the present project	25

Chapter three

3.0 Cotton in Sudan, Production, Varieties and Classification	
3.1 Introduction	26
3.2 Sudan Cotton Production	26
3.3 Sudanese Cotton Varieties	33
3.3.1 Extra fine count	33
3.3.2 Fine count cotton	34
3.3.3 Medium count cottons	34
3.3.4 Coarse count	35
3.4 Classification	35
3.4.1 Grading system	36
3.4.1.1 Grading system in Sudan	36
3.4.2 Steps of classification in Sudan	36
3.4.2.1 Classification of seed cotton	36

3.4.2.2 Classification of cotton as lint	38
3.4.3 Port Sudan Grading factors	38
3.4.4 Standard boxes and pulling types	40
3.4.5 Photograph of standard grade box	41
3.4.6 Lighting condition in the classing room	41
3.4.7 The procedure followed to compare samples with standard grades	41

3.5 Discussion	42
----------------	----

Chapter four

4.0 Factors Affecting cotton Production and Quality	
4.1 Introduction	43
4.2 Weather condition	43
4.3 Soil	43
4.4 Humidity and temperature	44
4.5 Irrigation	45
4.6 Diseases	45
4.7 Stickiness contaminant	46
4.8 Harvesting and picking	47
4.9 Preparation process	48
4.9.1 Drying	48
4.9.2 Moisture restoration	49
4.10 Ginning process	52
4.10.1 Objectives	52
4.10.2 Ginning machinery	52
4.10.2.1 Gin stand	52
4.10.2.2 Feed control	52
4.11 Seed cotton storage and handling	54

Chapter five

5.0 Study of Factors and Parameters Affecting cotton Production and Quality in Sudan	
5.1 Introduction	55
5.2 Planned cultivated areas	55
5.3 Irrigation	55
5.4 Pesticides	56
5.5 Planting date	56
5.6 Diseases and pests	56
5.7 Stickiness	56
5.8 Picking	58
5.9 Ginning	58
5.10 Financing	59
5.11 Cotton trade in Sudan	59
65.12 Summary and Discussion	62

Chapter six

6.0 Experimental Work for determining Sudanese Cotton Fibre Properties

6.1 Introduction	66
6.2 Fibre condition	66
6.3 Types of fibres tested	66
6.4 Fibre length measurement	66
6.4.1 Equipment	67
6.4.2 Determination of 2.5% span length	67
6.4.3 Result and analysis	67
6.5 Cotton fineness	70
6.5.1 Maturity Equipment	70
6.5.2 Determination of cotton fineness and Micronaire value	73
6.6 Fibre maturity(cell wall thickness)	74
6.6.1 Result and analysis	75
6.7 Fibre tensile strength	78
6.7.1 Fibre bundle strength test	78
6.7.2 Determination of fibre strength	78
6.7.3 Result and analysis	78

Chapter seven

7.0 Conclusion and Recommendations	
7.1 Conclusion	104
7.2 Recommendations	105

References

- (1) Joseph Nasmith, Students Cotton Spinning, London, 1958.
- (2) John P. Menally, Frank A. Mcord, Cotton Quality Study, Textile Research Journal, Oct, 1960, Volume 30, No.10, P715.
- (3) Cotton: World Markets and Trade, Feb, 2003, [http:// w.w.w.fas. USDA: gov/ cotton circular/2003/02.toc.htm](http://w.w.w.fas.usda.gov/cotton/circular/2003/02.toc.htm).
- (4) E. Lord, B.sc. The Characteristics of Raw Cotton, The Textile Institute, Butterworths, Manchester and London, 1961, Volume 11, part 1, p 2- 4, 6-18 and 61- 93.
- (5) A.Elrahman H. A.Latief, M.Sc. Thesis, Gezira University, 1989, P 4
- (6) Cotton, Text Book, P 384, 386.
- (7) International Cotton Advisory Committee, Attachment 11 to Sc-n-455 June25, 2001, P 1, 2, 6 and 7.
- (8) Omer O. Yassin, M.Sc. Thesis, Sudan University, 1997, P 13-38.
- (9) Omer M.A., Available Areas of Irrigated schemes in Sudan, Workshop, Sudanese Cotton Company (S.C.C), Khartoum, Mar. 2002.
- (10) A. Saleh Fadul Allah, Varieties Development and Cotton Production, Workshop, S.C.C, Khartoum Mar.2002.
- (11) A.Elgador M. A.Elgador, Report about Sudanese cotton honeydew, Conference, France, Lail, June, 2001, P 1.
- (12) T.V Ratnam, K.N. Seshan, Quality Control in Spinning, Textile Research Association Ciombator, The South India, 1987, P 9.
- (13) Hasab Elrasool A.Bagi M. PH.D thesis, Sudan University, 2003, P143.