CONTENTS

Page

1. **INTRODUCTION** 1

2. **REVIEW OF LITERATURE** 4

2.1. Contribution of fiber to yarn physical properties 4

2.1.1. The interrelations between various physical properties of cotton fibers 4

2.1.2. The interrelations between various physical properties of cotton spun yarns 9

2.1.3. The relationships between cotton fiber and yarn physical properties 11

2.1.3.1. Strength of cotton spun yarns 11

2.1.3.2. Elongation of cotton spun yarns 15

2.1.3.3. Evenness of cotton spun yarns 15

2.1.3.4. Yarn imperfections (i.e. number of thin and thick places as well as neps/unit length) 17

2.2. The effect of mechanical processing on the physical properties of cotton spun yarns 18

2.2.1. Mechanical processing 19

2.2.2. Yarn count 20

2.2.3. Yarn twist 20

2.2.4. Cotton combing 24

2.3. Improvements achieved in quality and quantity of Egyptian cottons 26

2.4. End uses of cotton fibers and spun yarns 29

2.4.1. Raw cotton 30

2.4.2. Cotton spun yarns 32

3. **MATERIALS AND METHODS** 34

3.1. Materials 34

3.2. Methods 34

3.2.1. Fiber length measurements 35

3.2.2. Fiber bundle tensile properties 35

3.2.3. Fiber fineness/maturity measurements 35

3.2.4. Production of carded yarns 35

3.2.5. Production of combed yarns 36

3.2.6. Yarn tensile properties 37

3.2.7. The yarn evenness and imperfections 37

3.3. Statistical analysis 38

3.3.1. Simple correlations 38

3.3.2. Multiple regressions between fiber and yarn physical properties 39

3.3.3. The statistical analysis of variance for the effect of processing variables on the physical properties of the spun yard 40

3.3.4. Comparison of new introduced to relatively older commercial varieties 41

3.4. Comparison of the physical carded and combed yarn properties with the world levels 41

3.5. End uses of cotton fibers and spun yarns 42

4. RESULTS AND DISCUSSION 43

4.1. The relationships between physical properties of cotton fibers 43

The coefficient of simple correlations between cotton fibers physical properties 43

4.1.1. The relationships between fiber length parameters 43

4.1.2. The relationships between fiber fineness/maturity parameters 46

4.1.3. The relationships between fiber tensile parameters 49

4.1.4. The relationships between fiber length and fineness/maturity parameters 50

4.1.5. The relationships between fiber length and bundle tensile parameters 52

4.1.6. The relationships between fiber fineness/maturity and fiber tensile parameters 54

4.2. The relationships between physical properties of cotton spun yarns 56

The coefficient of simple correlations between various physical properties of the cotton spun yarn 60

4.2.1. Yarn tensile properties and evenness 60

4.2.2. Yarn tensile properties and imperfections 65

4.2.3. Yarn imperfections and evenness 65

4.3. The relationships between cotton fiber and yarn physical properties 66

4.3.1. Single yarn strength (g/tex) 67

4.3.2. Yarn evenness (CV%) 75

4.3.3. Neps/100 meters of spun yarns 85

4.4. The effect of the spinning mechanical processing on the physical properties of the cotton spun yarns 93

4.4.1. The effect of cotton variety 94

4.4.1.1. Yarn tensile properties *94*

4.4.1.2. Yarn evenness and imperfections *99*

4.4.2. The effect of yarn count 100

4.4.2.1. Yarn tensile properties *100*

4.4.2.2. Yarn evenness and imperfections *104*

4.4.3. The effect of yarn twist 105

4.4.3.1. Yarn tensile properties *105*

4.4.3.2. Yarn evenness and imperfections *109*

4.4.4. The effect of variety x count inteaction 112

4.4.4.1. Yarn tensile properties *112*

4.4.4.2. The yarn evenness and number of imperfections/100 meters *112*

4.4.5. The effect of variety x twist multiplier interaction 116

4.4.5.1. Yarn tensile properties *116*

4.4.5.2. The yarn evenness and number of imperfections/100 meters *120*

4.4.6. The effect of count x twist multiplier interaction 121

4.4.6.1. Yarn tensile properties *125*

4.4.6.2. The yarn evenness and number of imperfections/100 meter *125*

4.4.7. The effect of variety x count x twist multiplier interaction 125

4.4.7.1. Yarn tensile properties *125*

4.4.7.2. The yarn evenness and number of imperfections/ 100 meters *125*

4.5. Improvements achieved in the quality of Egyptian cotton 130

4.5.1. Variation of fiber and yarn physical properties within each length category and within combined categories. 131
4.5.2. Comparison of yarn properties with those of the world levels 135
4.5.3. Comparison of new introduced to relatively older commercial cotton varieties 145
4.5.3.1. Physical fiber properties 145
4.5.3.2. Physical properties of LS and ELS carded yarns 149
4.5.3.3 Physical properties of ELS combed yarn. 155
4.6. Proposed end uses for raw cotton and cotton spun yarns 157
4.6.1. Raw cotton fibers 158
3.6.2. Cotton spun yarns 161
SUMMARY 165
REFERENCES 171
ARABIC SUMMARY .....