EFFECT OF SOME PRE-GINNING TREATMENTS ON LINT QUALITY AND GINNING EFFICIENCY IN EGYPTIAN COTTON

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DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in

AGRONOMY

Agronomy Department
Faculty of Agriculture
Ain Shams University

1972

EXAMINATION AND THESIS REPORT

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Major field : Agronomy

Title of Thesis : Effect of Some Pre-ginning Treatments on Lint Quality and Ginning Efficiency in Egyptian Cotton.

Approved by : ...

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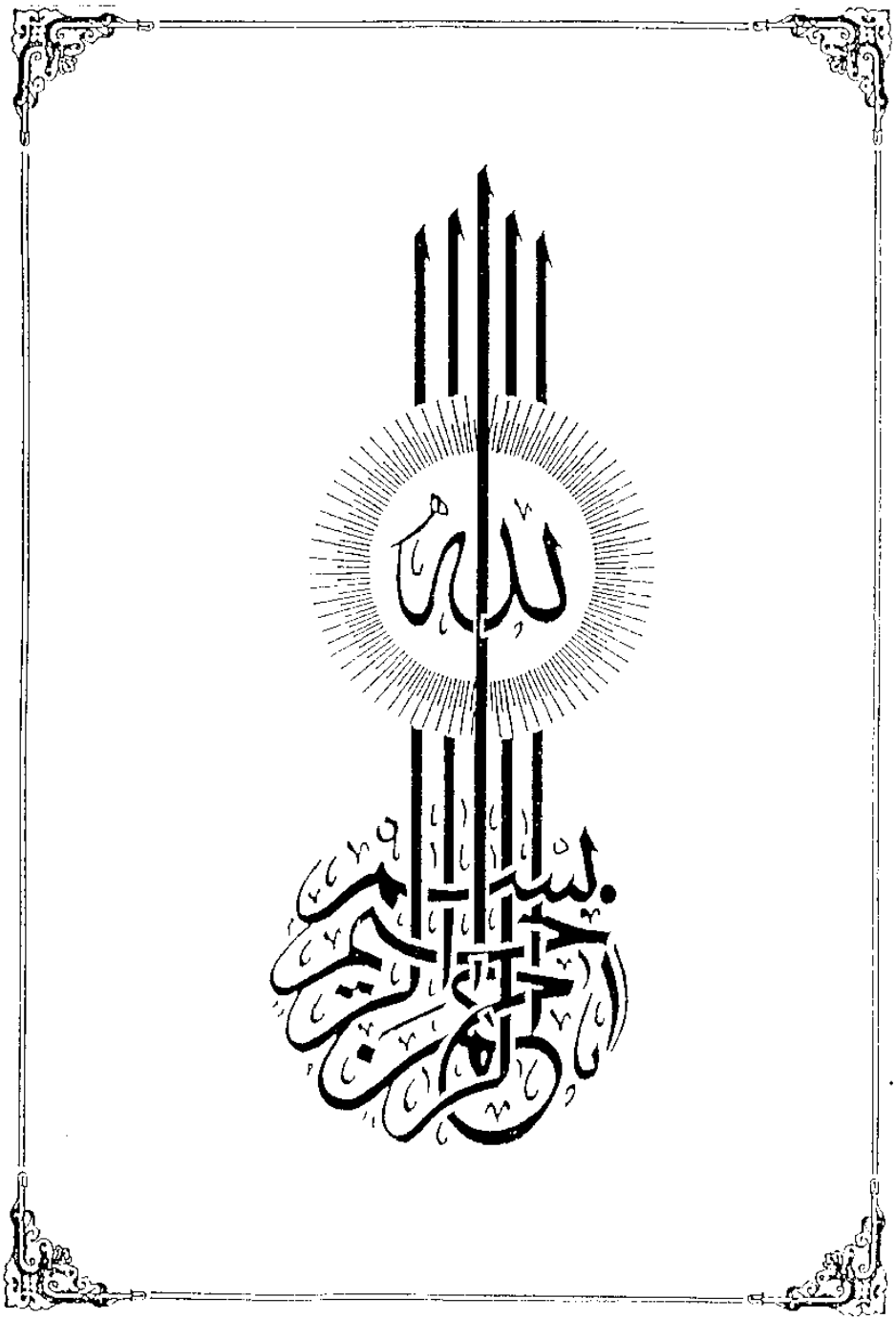
(Committee in Charge)

Date : / / 1972.



A C K N O W L E D G E M E N T

The writer expresses his gratitude to Dr. M.A. Moursi, Professor and Head of Agronomy Department, Faculty of Agriculture, Ain Shams University for his supervision, invaluable criticism and fruitful advice.

Sincere thanks are also due to Dr. A.M. El-Marakby, Lecturer of Agronomy for his supervision, generous help and precious advice.

The writer is greatly indebted to the staff members of The Cotton Technology Research Division for their encouragement and kind help.

Thanks are also due to Egyptian General Cotton Organization for furnishing the materials used in this study.

C O N T E N T S

INTRODUCTION

Cotton possesses its highest fiber quality and best potential spinning performance when it is on the stalk. However, lint quality of the cotton in the bale coming from the gin press depends on a lot of pre-ginning factors that may affect the quality of cotton and the ginning efficiency. These factors can be grouped under the following headings : (1) picking and storing; (2) drying; (3) cleaning; and (4) the cotton moisture content during ginning.

It is noteworthy to mention that moisture is a problem that begins in the fields and follows on through to the textile mills. However, both the farmers and the ginners have their own job in conditioning the cotton moisture and preserving the inherent cotton qualities.

Farmers can participate in minimizing the ginning problems by following the best methods of harvesting, sacking, conveying, and storing seed cotton. They can avoid picking wet and trashy cotton, but in some instances farmers have to pick wet seed cotton. Consequently, the cotton should be partially dried on the farm before being stored. Some farmers neglect the whole matter with or without intention or even add moisture in order to increase the seed cotton weight before delivering it to The Cotton

Cooperative Assembly Center. Therefore, the cotton may reach the specialized ginnery with high level of moisture content which creates serious ginning problems.

The time that elapsed from picking of opened bolls until feeding them into the ginning system is considered a storage period. In Egypt, the storage period may extend to six months in dead storage where cotton is exposed to different environmental conditions that have detrimental effects on the cotton quality.

Most textile fibers are hygroscopic and consequently the moisture content of the textile fibers is a function of air moisture content. Since the air moisture content fluctuates considerably from time to time, the physical characteristic of the material changes remarkably.

Seed cotton drying may be practiced in order to remove excess moisture so that seed cotton can be ginned without harmful effects on fibers qualities. Excessive drying of seed cotton before cleaning increases the cleaners efficiency in the removal of foreign matter. On the other hand, such excessively-dried cotton becomes unsuitable for ginning unless retaining its moisture content to be around the favourable percentage directly before the ginning point.

The Egyptian ginner does not care about the seed cotton moisture content during the storage period, as well as during the ginning process. On the contrary, adding moisture to lint after ginning and before pressing and baling is a common practice in commercial Egyptian gin plants. This is always followed in order to improve the feel of the lint, afford easy and safe bale pressing, retain the moisture lost during the separation process at the ginning point, and minimize bale-weight changes.

Cleaning trashy cotton becomes necessary particularly when the seed cotton is of low grade. The lint foreign matter percentage is the property of quality that is most affected by cleaning. This in turn, affects many lint and yarn qualities such as lint grade, nep count, yarn appearance grade, spinning wastes, ends down, and gin stand capacity.

This study was designed to investigate the pre-ginning factors that affect the ginned lint quality as well as the ginning efficiency. The effect of the following factors on lint quality and ginning efficiency have been given considerable considerations :

I) Storing seed cotton of different picking times.
II) Seed cotton drying. III) Cotton cleaning.
IV) Cotton moisture content during ginning :
  (a) Interrelationship between seed cotton moisture content and ginning efficiency.
  (b) Water spraying at cotton directly before and after ginning.

REVIEW OF LITERATURE

The ginner practices a lot of treatments on the seed cotton in order to accommodate it to be in the adaptable condition prior to the ginning point in which the seed cotton is converted into two saleable products, i.e. lint and seed. The aim of the ginner also is to get smooth and continuous operation for the gin plant, in addition to preserving the inherent qualities of the lint and seed.

I) Effect of storing seed cotton of different picking times :

Seed cotton storing is the holding of harvested seed cotton until it is fed into the ginning system. Storing seed cotton is not a favourable process because of its costs and deleterious effects on cotton qualities. However, storing becomes necessary when the harvesting rate exceeds the ginning rate. Therefore, storing seed cotton of high moisture level causes a lot of deterioration to both the fiber and seed.

Robertson and Campbell (1933) reported that cotton-seed could be stored safely when it contained less than 10 % of moisture. The moisture content after heating began were higher than before storage. This led to the conclusion that

the seeds of the seed cotton were absorbing moisture from trapped air brought to high humidity levels by moisture in or on the fiber.

Bennett and Gerdes (1935) reported that the period of storage needed to dry seed cotton depended on the cotton moisture content, its staple length, its depth and compactness, the temperature and relative humidity of the atmosphere, the rate of air circulation, the number of times the cotton was turned and ventilated, and other factors.

Grimes (1936) found that after one year of storing seed cotton the percentage of fiber strength loss ranged from 7-18 % of the original strength and ranged from 26-33 % after two years of storage.

Guthrie et al (1951) showed that exposure of seed cotton in the field to wet weather following normal openning of the boll resulted in an increase in the pH of aqueous extracts of the fiber. The maximum pH attained was in the range of 9.5 to 10.0, and was sometimes reached within a period of 5 days.

Looney and Speakes (1952) stated that seed cotton containing less than 14 % of moisture could be stored for extended periods without injury to grade, spinning qualities, milling properties, or viability of the seed, but there was

some evidence to indicate that extended storage might slightly decrease staple length.

Ward (1953) subjected the field stored seed cotton to one inch of moisture in a period of less than a week. Seed cotton stored under similar conditions and wet artificially with two additional inches of moisture resulted in no decline in grade.

Wakeham et al (1954) found that the fibers subjected to a localized weakening as a result of the microbial action, either directly or as a result of enzymatic action during storage broke more easily in processing than fibers in normal action.

Ross (1955) found that storing seed cotton containing 15 % moisture content and where atmospheric air was pulled through 5 hours daily for 30 days prior to ginning, showed spotted fiber and the grade preparation was designated as below normal. He found also that cotton containing 12.9 % moisture and placed under the same storage conditions did not show any color deterioration.

Johnes et al (1956) pointed out that 2.27 inches amount of precipitation, did not damage field-stored bur cotton when the cotton was dry and did not contain green bolls.

Berkley (1957) showed that in humid, hot climates, cotton tended to yellow upon aging. Little or no loss in strength was expected, unless the moisture in cotton exceeded 9 % based on the dry weight of cotton.

Montgomery and Wooten (1958) showed that when early morning machine-picked cotton and afternoon-picked cotton were stored in trailers for a period of time before ginning and given equal drying in the gin, the resulting grades were almost a full grade lower associated with loss of color for the morning-picked bales.

Nickerson and Tomaszewski (1958) found that cotton stored under moderate temperature (50°, or even 60°F) accompanied by controlled relative humidity (50 or less) succeeded in holding color change to a satisfactory minimum for at least 2 or 3 years. A control of humidity alone succeeded in reducing the degree of color change in storage.

Cocke (1959) found that the seed cotton could be safely stored one or two months in densities of up to 24 pounds per cubic foot without damage to grade and staple length.

McCaskill and Griffin (1959) referred to some of the salient factors affecting seed cotton storage. These factors were weather conditions during picking, picking

operation, air drying of cotton in the field after picking but before loading and size of load. They added that seed cotton at 14 % moisture content might be expected to heat and deteriorate. In the seed cotton form, pigments from the seed stained the lint to produce a spotted sample. Seed cotton could be safely stored as the seed moisture remained at or below 12 %.

Anderson et al (1961 a) found that the morning-harvested cotton had a higher average yarn break factor than the afternoon-picked cotton. These differences were due to time of day of harvest and the moisture content of the cotton at the time of ginning.

Anderson et al (1961 b) found that the upper half mean length, mean length and uniformity ratio were reduced when seed cotton was ginned without storage. This might be attributed to the fact that the lint moisture increased by approximately 0.75 % during 21-days storage. Yarn break factor decreased as the moisture content of the lint at the ginning time decreased. This decrease was more pronounced on cottons which were ginned without storage than on cottons which were stored for 21-days, and then ginned.

Luscombe (1961) showed that when the moisture content of the mass of raw stock was 12 % or less and the

moisture presented was equilibrated in seed, fiber and foreign matter, then the raw stock exceeded 12 %, then spontaneous damage during dead storage became a function of time and moisture.

Shaw and Franks (1962) pointed out that lots of dried and stored cottonseed, in bulk, for 6 months showed higher grade than lots of undried cottonseed.

Garner (1963) pointed out that forcing air through batches or lots of seed cotton was not satisfactory for lowering moisture content or preventing "hot spots" in the batch.

Griffin (1963) found that seed cotton with seed moisture below 10 % was considered of safe storage risks; cotton with seed in the 11-13 % moisture range might or might not be of safe storage risks; seed cotton with seed moisture above 13 % might be expected to heat, with resulting damage to lint color.

Griffin and Moore (1963) stated that cotton picked when the relative humidity was at or lower than 50 % might be in the moisture content range for safe storage. When this cotton was ginned on the seventh day of storage, lint moisture content was 5 % and showed a decrease in upper half mean length as compared to lint ginned at 6.5 %

moisture before storage. Before storage samples showed lint grade of "Strict Low Middling" in color, while after storage samples showed "Low Middling" in color.

U.S. Department of Agriculture (1963) reported that seed cotton having a moisture content below 12 % was considered safe for trailer storage unless it contained a large amount of green-leaf material.

Colwick (1964) demonstrated that cotton should be picked in the morning when the lint moisture content reached 10 % or less on the plant otherwise it must be dried for safe storage.

Griffin (1964 b) showed that color changes in seed cotton during storage might be of two types "spotting" and "dulling". Spotting while in storage had been traced to transfer of tannins in the seed coat to fibers. Dulling might be due to bacterial action, but spotting during storage had not been traced to this cause except with very wet cottons.

Griffin and McCaskill (1964) found that loss of color due to storing seed cotton in trailers was simple dulling in some cases and in others it was caused by pigments from the seed coat that stained the adjacent fiber.