

Cotton Grades and Quality Parameters as Affected by Boll Position

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ABSTRACT: The objective of this study is to investigate grades and quality parameters of cotton as affected by boll position. The study was conducted for two consecutive seasons 2015/2016 and 2016/2017. Variety under consideration is Acala (*Gossypium hirsutum*). The Plant was divided into three zones; upper zone (A), middle zone (B) and lower zone (C). Every zone was picked separately and subjected to grading according to Sudan Classification System. Fiber tests were carried out under standard conditions (R.H 65±2%, temp. 25±2 C°). The results showed that, seed cotton yield obtained from A-zone had better grades than B and C-zones. Grade 1 constituted 40% and 58% of the total for the two seasons, respectively. For C-zone, grade 1 equal 2% and 16% of the total for the first and second season respectively. Other quality parameters of seed index, lint index, fibre length, micronaire value, maturity ratio, and fineness were better at C-zone.

Keywords: cotton grades, boll position, fiber length, micronaire, maturity ratio

INTRODUCTION

Cotton crop is one of the most important cash crops in Sudan. Its contribution in the export earnings varies between 30-40%. Therefore, great care should be given to factors that affect the final product to enhance homogeneity, grades and other quality parameters which have an important impact on cotton marketing. Bowman (1990) showed that staple length, Micronaire value and strength have statistically significant impacts on cotton prices.

Ethridge and Neeper (1987) found that fiber strength and length uniformity had significant effects on the price of cotton, Furthermore, producer prices were most responsive to color and strength.

Wang *et al.* (2009) indicated that fiber strength varied among the boll inserted location. Also, a study was done by Zhao *et al.* (2012) showed that boll weight and fiber strength were affected by boll position. They also stated that the cellulose content and sucrose transformation rate changed with boll position, and consequently resulted in the change of boll weight and fiber strength. Also, fiber length varies among fruiting sites (Bradow *et al.*, 1997).

The objective of this study was to investigate seed cotton grades and fiber quality parameters as affected by boll position.

MATERIAL AND METHODS

This study was conducted at the Gezira Research Station Farm for two consecutive seasons 2015/2016 and 2016/2017. The experiment was designed as Randomized Complete Block Design (RCBD) comprising one variety Acala, with a plot size of 22.4 square meters replicated three times. Sowing date was first August, and the recommended cultural and agronomic practices were applied. Fifteen samples of cotton seeds were taken, and each sample consisted of fifteen rows. One pick of seed cotton samples were taken from the

top part (A), middle part (B) and lower part (C) of the plant. Each zone was separately picked and subjected to grading according to Sudan Seed Cotton Classification System which consist of six grades (1 to 6) based on staple, appearance, cleanness, yield component, and fiber quality parameters tests were performed on seed cotton samples taken. Data were collecting for the following traits:

Measurements obtained during the first season 2015/2016: -

1. Seed Index: weight of one hundred seeds in grams. (Hegab *et al.* ,1985)
2. Lint Index: weight of lint obtained from one hundred seeds in grams.
3. Fiber Length(mm) measured as 2.5% span length using the 530 Digital Fibrograph Instrument
4. Micronaire value test using the portar instrument.
5. Maturity ratio, obtained by the Finess/Maturity Tester (F.M.T).
6. Fiber fineness test (millitex) obtained by the (F.M.T) Instrument.
7. Fiber bundle strength (g/tex) using the stelometer instrument.

Measurements undertaken during the second season included:

1. Seed index: weight of 100 seeds in grams
2. Lint index: weight of lint obtained from one hundred seeds in grams
3. Fiber length (mm) measured using the High Volume Instrument (H.V.I).
4. Micronaire value obtained by the H.V.I.
5. Fibre bundle strength (g/tex) using the H.V.I.

RESULTS AND DISCUSSION

Table .1 showed that, high grades of cotton (clean cotton) were obtained from upper part of the plant (**A-zone**), Grade (1) constituted 40% and 58% of the total for cotton grades of the two consecutive seasons 2015/2016 and 2016/2017, respectively. Grade (2) constituted 54% and 42%, respectively. Grade (3) constituted 6% and 0% of the total for cotton grades in the same seasons, respectively.

At the middle part of the plant (**B-Zone**), Grade (1) constituted 13% and 29% of the total for cotton grades. Grade (2) constituted 69% and 69%, respectively. However Grade (3) constituted 18% and 2% of the total for cotton grades the two seasons, respectively. Table 1

At the lower part of the plant (**C-zone**), Grade (1) constituted 2% and 16% of the total for cotton grades the two consecutive seasons. Grade (2) constituted 82% and 71%, respectively. Grade (3) constituted 16% and 13% of the total for cotton grades the two seasons, respectively. This was mainly attributed to the seed cotton obtained from lower branches was contaminated with trash and soil which resulted in lint discoloration and poor appearance. On the other hand, cotton obtained from lower part had better quality measurements of seed index, fiber length ...etc. as shown in Tables 2 to 9.

The results pointed out to the significance of the quality parameters when seed cotton classification was based only on colour and trash content. Seed cotton obtained from middle part of plant (B-Zone) was more homogenous (less C.V %) than upper and lower part of plant (Table 10).

RECOMMENDATIONS

1. Open cotton should not be left too long time in the field, and more frequent pickings should be practiced.
2. In case of delaying picking date, plant should be divided to three zones and every zone should be separately picked.
3. Classification should include fiber characteristics beside grade.
4. Cotton should be sold on the basis of grade and quality parameters at a time.

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Table (1). Samples Grades in Percentage, 1st 2015/2016 and 2nd 2016/2017 season, Variety Acala

Boll Position Grade%	Upper zone (A)		Middle zone (B)		Lower zone (C)	
	1 st season	2 nd season	1 st season	2 nd season	1 st season	2 nd season
1	40	58	13	29	2	16
2	54	42	69	69	82	71
3	6	0	18	2	16	13
Total %	100	100	100	100	100	100

Table (2). Cotton quality parameters, upper zone (A), 2015/2016 season, Variety Acala

Sample	Seed index (g)	Lint index (g)	Fiber Length(mm)	Mic. value	Mat. ratio	Fin. (m/tex)	Fiber Str. (g/tex)
1	10.67	5.77	27.83	3.87	1.02	145	19.93
2	8.58	5.00	26.57	3.90	0.95	159	21.07
3	10.13	5.73	27.13	4.13	0.96	164	20.47
4	11.47	5.83	26.77	4.00	0.92	176	19.50
5	10.50	5.50	26.90	3.77	0.88	175	21.17
6	11.00	5.77	27.37	3.90	0.90	172	19.77
7	12.00	6.33	27.27	3.77	0.92	162	20.40
8	10.07	5.87	26.60	2.67	0.91	159	20.70
9	10.50	5.53	26.93	3.73	0.89	174	18.73
10	9.83	5.30	26.13	3.83	0.91	172	20.00
11	10.57	5.30	26.43	4.03	0.90	190	19.67
12	10.70	5.37	26.23	3.83	0.93	162	20.17
13	9.63	5.10	27.30	3.60	0.94	150	18.87
14	9.60	4.47	26.50	3.37	0.83	169	19.20
15	9.90	5.70	27.13	3.47	0.92	169	18.93
Average	10.34	5.50	26.87	3.79	0.92	167	19.90
C.V%	9.51	10.41	2.39	10.11	6.25	11.72	4.86

C.V%: Coefficient of variation

Table (3). Cotton quality parameters, middle zone (B), 2015/2016 season, Variety Acala

Sample	Seed Index (g)	Lint Index (g)	Fiber Length (mm)	Mic. value	Mat. ratio	Fin. (m/tex)	Fiber Str. (g/tex)
1	11.33	5.97	27.17	4.23	0.96	177	20.40
2	11.03	5.87	26.77	4.00	0.93	173	20.43
3	10.97	6.00	26.93	4.27	0.95	179	20.67
4	11.17	5.93	27.90	4.03	0.93	170	21.13
5	10.30	6.00	27.43	4.10	0.94	175	20.87
6	11.03	5.97	28.17	4.33	0.98	173	20.50
7	10.37	5.50	27.77	4.03	0.93	169	20.30
8	10.47	5.70	26.87	4.07	0.93	173	20.07
9	11.40	6.40	27.30	4.03	0.94	171	19.37
10	10.83	5.83	27.60	3.97	0.93	170	20.67
11	10.77	6.13	27.43	3.67	0.86	177	20.80
12	10.60	5.87	28.13	4.03	0.92	176	20.87
13	10.63	5.70	26.60	4.13	0.98	162	19.50
14	9.70	5.67	27.77	3.73	0.92	161	19.60
15	10.70	5.93	27.37	3.80	0.95	156	20.43
Average	10.75	5.89	27.41	4.03	0.94	171	20.37
C.V%	7.72	9.11	2.90	6.01	5.48	6.56	6.53

C.V%: Coefficient of variation

Table (4). Cotton quality parameters, lower zone (C), 2015/2016 season, Variety Acala

Sample	Seed Index (g)	Lint Index(g)	Fiber Length (mm)	Mic. value	Mat. ratio	Fin. (m/tex)	Fiber Str. (g/tex)
1	10.80	5.57	27.90	4.07	0.96	169	19.57
2	9.90	5.27	27.67	4.03	0.94	164	19.90
3	11.77	6.17	28.33	4.20	0.97	171	21.53
4	10.93	5.77	28.17	4.13	0.94	180	21.93
5	11.63	6.13	28.10	4.23	0.98	165	20.43
6	11.00	5.87	28.70	4.03	0.95	167	20.63
7	10.03	5.20	27.03	4.00	0.92	170	19.60
8	10.73	5.67	26.83	4.20	0.97	176	21.33
9	11.37	5.87	27.97	4.23	0.96	176	19.53
10	11.13	5.47	26.30	3.63	0.95	162	20.67
11	10.67	5.17	27.23	3.83	0.95	157	19.83
12	10.60	5.73	27.73	3.97	0.93	170	20.20
13	10.14	4.90	26.93	3.93	0.95	161	20.43
14	9.83	4.97	28.80	3.67	0.89	169	20.40
15	11.60	5.87	28.80	3.30	0.88	153	19.63
Average	10.81	5.58	27.77	3.96	0.94	0.167	20.37
C.V%	9.54	10.97	2.53	8.07	6.18	5.80	6.91

C.V%: Coefficient of variation

Table (5). Average of cotton quality parameters for different zones, 2015/2016 season, variety Acala

Properties	Upper zone (A)	Middle zone (B)	Lower zone (C)
Seed index (g)	10.34	10.75	10.81
Lint index (g)	5.50	5.89	5.58
Fiber length(mm)	26.87	27.41	27.77
Micronaire value	3.79	4.03	3.96
Fiber strength (g/tex)	0.92	0.94	0.94
Seed index (g)	167.0	171.0	167.0
Lint index (g)	19.90	20.37	20.37

Table (6). Cotton quality parameters, upper zone (A), 2016/2017 season, Variety Acala

Sample	Seed index (g)	Lint Index (g)	Fiber Length (mm)	Mic. Value.	Fiber Str. (g/tex)
1	11.47	6.37	30.30	4.23	26.63
2	12.20	6.13	30.40	4.03	25.77
3	12.47	6.70	30.13	4.53	24.37
4	12.47	6.60	30.20	4.60	24.33
5	11.50	6.20	30.33	4.27	25.73
6	13.40	6.97	30.50	4.17	27.00
7	11.70	6.10	30.57	3.97	26.87
8	11.80	6.53	29.70	4.20	27.30
9	12.13	6.30	30.63	4.13	27.00
10	12.30	6.63	31.70	4.03	28.03
11	12.73	6.57	30.47	4.40	25.13
12	12.40	6.40	29.07	4.07	25.63
13	10.50	6.77	29.73	3.87	27.30
14	10.80	6.40	29.87	4.23	25.40
15	11.87	6.37	29.67	4.13	25.20
Average	11.98	6.40	30.22	4.19	26.11
C.V%	9.87	10.19	3.82	7.34	5.37

C.V%: Coefficient of variation

Table (7). Cotton quality parameters, middle zone (B), 2016/2017 season, Variety Acala

Sample	Seed index(g)	Lint index (g)	Fiber length (mm)	Mic.value.	Fiber str .(g/tex)
1	11.70	6.33	29.97	4.43	25.06
2	13.07	6.63	29.57	4.27	2.43
3	12.80	6.87	29.90	4.57	24.63
4	13.00	6.30	30.30	4.53	25.00
5	12.80	6.63	30.33	4.43	25.63
6	11.67	6.30	30.30	4.40	26.17
7	11.47	6.23	30.87	4.17	26.23
8	12.00	6.57	30.03	4.03	26.53
9	12.37	6.73	30.13	4.23	27.20
10	11.60	5.67	29.60	4.07	27.27
11	11.87	6.40	29.67	4.33	24.87
12	11.97	6.13	30.47	4.23	25.80
13	11.30	5.83	30.10	3.83	27.10
14	13.00	6.87	29.90	4.43	26.80
15	11.90	6.20	30.43	4.03	25.30
Average	12.17	6.38	30.10	4.27	25.91
C.V%	8.64	7.51	3.77	7.15	6.39

C.V%: Coefficient of variation

Table (8). Cotton quality parameters, lower zone (C), 2016/2017 season, Variety Acala

Sample	Seed index (g)	Lint index (g)	Fiber length (mm)	Mic. value.	Fiber str. (g/tex)
1	13.07	6.8	30.57	4.47	25.00
2	11.63	6.1	29.57	4.00	25.13
3	12.70	7.1	30.30	4.50	25.87
4	12.43	6.47	30.77	4.43	27.87
5	13.30	6.80	30.70	4.33	27.13
6	11.73	5.97	30.37	4.43	26.07
7	12.00	6.27	31.03	4.10	26.73
8	12.47	6.83	30.17	4.03	26.83
9	12.40	6.53	30.67	3.97	28.47
10	12.27	6.23	29.93	4.30	28.10
11	12.43	6.23	30.37	4.47	25.93
12	13.37	6.57	29.73	3.93	26.70
13	11.43	6.10	29.73	3.87	25.33
14	12.50	6.27	30.40	4.20	25.87
15	13.20	5.87	30.20	4.03	27.47
Average	12.46	6.41	30.30	4.20	26.57
C.V%	8.39	7.98	3.36	7.98	-

C.V%: Coefficient of variation

Table (9). Averages of cotton quality parameters for different zones, 2016/2017 season, Variety Acala

Parameters	Upper zone(A)	Middle zone (B)	Lower zone (C)
Seed index (g)	11.98	12.17	12.46
Lint index (g)	6.40	6.38	6.41
Fiber length(mm)	30.22	30.10	30.30
Micronaire value	4.19	4.27	4.20
Fiber strength (g/tex)	26.11	25.91	26.57

Table (10). Coefficient of variation (CV %) for cotton quality parameters for different plants zones

Parameters	Upper zone (A)		Middle zone (B)		Lower zone (C)	
	1 st	2 nd	1 st	2 nd	1 st	2 nd
Seed Index	9.51	9.87	7.72	8.64	9.54	8.39
Lint Index	10.41	10.19	9.11	7.51	10.97	7.98
Length	2.39	3.82	2.90	3.77	2.53	3.36
Micronaire Value	10.11	7.34	6.01	7.15	8.07	9.98
Maturity Ratio	6.25	-	5.48	-	6.18	-
Fineness	11.72	-	6.56	-	5.80	-
Strength	4.86	5.37	6.53	6.39	6.91	-

- Not tested

الملخص العربي

تأثر خواص جودة القطن ورتبته بموقع اللوزة

نعمة عثمان

هيئة البحوث الزراعية ، واد مدني- السودان

محصول القطن هو واحد من أهم المحاصيل النقدية في السودان. وتتراوح مساهمته في عائدات التصدير بين ٣٠-٤٠٪. ولذلك ، ينبغي إعطاء عناية كبيرة للعوامل التي تؤثر على المنتج النهائي لتعزيز التجانس ورتبة القطن وغيرها من معايير الجودة.

الهدف من هذه الدراسة هو التحقق من تأثير رتبة وجودة نيلة القطن بموقع اللوزة على النبات. أجريت الدراسة لموسمين متتاليين ٢٠١٥/٢٠١٦ و ٢٠١٦/٢٠١٧. الصنف قيد الدراسة هو أكالا (*Gossypium hirsutum*) وتم تقسيم نبات القطن إلى ثلاث مناطق: المنطقة العليا (A) والمنطقة الوسطى (B) والمنطقة السفلى (C) تم جنى كل منطقة على حدة وتقدير رتبته حسب نظام تصنيف السودان لرتب القطن، وأجريت اختبارات جودة النيلة في ظل ظروف قياسية من الحرارة والرطوبة.

أوضحت النتائج أن القطن الزهر المتحصل عليه من المنطقة العليا A لديه رتبة أفضل من المنطقة المتوسطة B والمنطقة السفلى C. شكلت الرتبة (١) ٤٠٪ و ٥٨٪ من المجموع للموسمين ، على التوالي . بالنسبة لـ C-zone ، فإن الرتبة (١) تساوي ٢٪ و ١٦٪ من الإجمالي للموسم الأول ٢٠١٥/٢٠١٦ والثاني ٢٠١٦/٢٠١٧ ، على التوالي. وكانت معايير الجودة الأخرى لمعامل البذرة ، ومعامل الشعر ، وطول النيلة ، وقيمة الميكرونير ، ونسبة النضج ، والنعمومة أفضل في المنطقة السفلى (C).