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Hybrid Cotton Adaption Performance under Irrigation Conditions of Ethiopia

Alehegn Workie Amanu*, Bedane Gudeta Arkebe, Egziabher Donis Gurmassa, Samuel Damitew and Merdassa Balcha

Werer Agricultural Research Center, P.O, Box, 2003, Addis Ababa, Ethiopia

Abstract

Cotton is the leading natural fiber crop in the world. Improvements in textile processing, particularly advances in spinning technology, have led to increased emphasis on breeding cotton for both improved yield and improved fiber properties in the world. Cotton production and weaving has a very long history in Ethiopia. It has also been contributing a lot for the development of textile industries and offering considerable employment opportunities in the textile mills and in the farms. The production and productivity of cotton has been constrained by lack of high yielding and widely adaptable varieties with higher fiber quality traits. The cotton varieties widely grown in Ethiopia are primarily Deltapine-90 and Acala-SJ2 (American varieties). However, these varieties have been used for more than 20 years, thus giving rise to the serious problem of variety ageing and degeneration. In order to meet the evolving demands of the producers and domestic textile mills and foreign market, high yielding and better fiber quality varieties must be introduced and adapted in a continuous basis. This experiment was conducted with the objective of evaluating the performance of introduced hybrid cotton under irrigated condition in Ethiopia. Six medium staple length hybrid cottons namely, VBCH 1533, VBCH 1537, Rambo VBCH 1521, VBCH 1517 and Hero VBCH 1511 were introduced from India by Vibha seed trading PLC, and compared with two commercialized checks Deltapine-90 and stam-59A at Werer Agricultural Reseach Center (WARC), Amibara (sheleko), Melkasedi, Gawane, Sille, and Woyto. The Experiment was laid out on a non-replicated plot area of 10 m × 10 m (100 m^2). Seed cotton yield result revealed that each of the candidate genotype had the best performed at Gewane as compared to other locations. At Gewane Hero VBCH 1511, VBCH 1537, VBCH 1533 surpassed for seed cotton yield of yielding 51.22, 50.05 and 49.97 q/ha, respectively. The lowest seed cotton yield was scored at Amibara for the check variety DP-90 (7.55 q/ha). Almost all test candidate genotypes surpassed over the check varieties for seed cotton yield at each location. The overall combined mean showed VBCH 1533 (32.31 q/ha) surpassed all the genotypes followed by VBCH 1537 (30.45 q/ha) and Hero VBCH 1511 (29.49 q/ha) for seed cotton yield. The yield advantage of the three highest candidate genotypes over the better check was 31.82%, 24.24% and 20.32%. Most of the genotypes best performed for upper half mean length at locations WARC and Woyto. Concerning to the fiber quality properties of the candidate genotypes viz. VBCH 1537, Rambo VBCH 1521, Hero VBCH 1511 and VBCH 1533 had best performed respectively as compared to other genotypes considered in this study. In general, VBCH 1533, VBCH 1537 and Hero VBCH 1511 were the best genotypes revealed superior performance in both seed cotton yield and related traits and fiber quality properties. Thus, these genotypes can be used in the breeding program for crossing and should be commercialized if these genotypes had surpassed the commercialized checks.

Keywords: Seed cotton yield • Quality • Irrigation conditions

Introduction

Cotton is the leading natural fibre crop and second most important oilseed crop in the world [1]. The green revolution was mainly attributed the development and adoption of high yielding varieties in grain crops. However, a similar revolution in cotton was ushered by the introduction of inter- and intra-specific hybrids. Improvements in textile processing, particularly advances in spinning technology, have led to increased emphasis on breeding cotton for both improved yield and improved fiber properties in the world [2]. Cotton production and weaving has a very long history in Ethiopia. It has played an important role as a means of livelihood for craftsmen involved in the weaving cottage industry. It has also been contributing a lot for the development of textile industries and offering considerable employment opportunities in the textile mills and in the farms [3]. Currently, the country's textile industry parks are booming in an alarming rate to use cotton fiber as a major source of raw material. The production and productivity of cotton has been constrained by lack of high yielding and widely adaptable varieties with higher fiber quality traits, insect pest and disease management techniques, crop management practices and biotic and abiotic stresses. The cotton varieties widely grown in Ethiopia are primarily Deltapine-90 and Acala-SJ2 (American varieties). However, these varieties have been used for more than 20 years, thus giving rise to the serious problem of variety ageing and degeneration. Generally, a variety is being limited to 3-5 year's use in the major cotton producing countries, because by renewal of species, yield can be increased by 10%-15%, in some cases, even by 30% [4]. As of 1928 in Ethiopia, research on cotton improvement has been mainly made to develop high yielding and high fiber quality cotton varieties for production. So far twenty-one varieties and seven hybrids have been released for irrigated areas and five varieties have also been released for rain fed areas in the merits of their both seed cotton yield and fiber quality traits [5]. In order to meet the evolving demands of the producers and domestic textile mills and foreign market, high yielding and better fiber quality varieties must be introduced and adapted in a continuous basis. This experiment was conducted with the objective of evaluating the performance of introduced hybrid cotton under irrigated condition in Ethiopia.

***Address for Correspondence:** Amanu AW, Werer Agricultural Research Center, P.O. Box, 2003, Addis Ababa, Ethiopia, Tel: +251910689681, E-mail: alehegnworkie@yahoo.com*

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Materials and Methods

This experiment was conducted at six representative testing sites viz., Werer Agricultural Research Center (WARC), Amibara (sheleko), Melkasedi,

Gawane in Afar Regional State and Sille, and Woyto in the Southern Nations, Nationalities and Peoples' Regional State during 2016 cropping season. Six medium staple length hybrid cottons namely, VBCH 1533, VBCH 1537, Rambo VBCH 1521, VBCH 1517 and Hero VBCH 1511 were introduced from India by Vibha seed trading PLC and compared with two commercialized checks Deltapine-90 and stam-59 A. The Experiment was laid out on a non-replicated plot area of 10 m × 10 m (100 m^2). Each plot consisted of eleven rows, each 10 m long and spaced 0.9 m apart and 0.90 m between plants and 90 cm between plants. The experiment was conducted according to the recommended production practices for this crop under irrigation. The experimental land has been prepared using appropriate farm implements. Two seeds per hole have been planted to ensure maximum germination. Thinning was conducted after two weeks of germination to ensure single plant per hill (Table 1).

Results and Discussion

Genotypes mean performance for yield and yield related traits at individual locations

Maximum plant height was recorded at Melkasedi testing site for genotype 'Hero VBCH 1511 (253.6 cm) followed by VBCH 1517 (249.8 cm). The minimum plant height was observed at WARC for Dltapine-90 (72.4 cm). Almost said to be all the genotypes at Melkasedi showed the maximum plant height compared to other locations. The highest number of bolls $plant^{-1}$ was observed at Gewane for genotype VBCH 1533 (74.9) followed by VBCH 1517 (74.4). The average boll holding capacity was surprisingly greater than other locations at Gewane. The minimum number of bolls $plant^{-1}$ was registered at Amibara location. This indicated that the potential of genotypes for boll number $plant^{-1}$ was expressed differently at different locations. Thus, genotypes were inconsistently performed across locations. Among the testing locations, the highest average boll weight was scored at Woyto for genotype Hero VBCH 1511 (11.13 g). This genotype also had the highest boll weight at Amibara (6.8 g). The minimum boll weight was scored at Sile for Rambo VBCH 1521 (4.19 g). The average performance of genotypes for average boll weight at Woyto was the highest compared to other locations. Seed cotton yield result indicated that each of the candidate genotype had the best performed at Gewane as compared to other locations. At this, location, Hero VBCH 1511, VBCH 1537, VBCH 1533 surpassed for seed cotton yield of yielding 51.22, 50.05 and 49.97 q/ha, respectively. The lowest seed cotton yield was scored at Amibara for the check variety DP-90 (7.55 q/ha). Almost all test candidate genotypes surpassed over the check varieties for seed cotton yield at each location. All candidate hybrids showed inconsistent performances across locations for seed cotton yield. Ginning out turn which is economically important parameter, the highest result was scored at Sile for the check variety Stam 59 A (43.56%). All the candidate genotypes were inferior to this check variety across locations. The highest lint yield was scored for Stam 59A (18.17 g) at Woyto and followed by Hero VBCH 1511 (17.99 g), and VBCH 1533 (17.49 g) at Gewane. The lowest lint yield was registered at Amibara for Deltapine-90 (2.88 g). Genotypes were not persistently performed across locations for lint yield. Although, the response of the genotypes at varied locations was different, there has been promising genotypes to be considered for further use. Most of the candidate genotypes were superior to checks at each location tested (Tables 2-5).

Genotypes mean for fibre quality traits at individual locations

The test result showed that micronaire performance of each candidate

Table 1. Growth and yield performance of genotypes at Werer Agricultural Research Center (WARC).

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	99.4	41.27	6.07	24.69	36.55	9.03
VBCH 1537	91.4	40.4	6.09	24.31	29.01	7.05
Rambo VBCH 1521	88.3	43.8	5.02	19.88	35.17	6.99
VBCH 1517	98	37.2	6.29	17.28	37.96	6.56
Hero VBCH 1511	109.1	46	5.81	25.91	36.45	9.44
Deltapine 90	72.4	28.07	5.1	13.85	38.98	5.4
Stam 59A	115.2	20.93	5.39	23.67	40.16	9.51

Where plh: Plant Height (cm), Bon: Boll Number $Plant^{-1}$, Bow: Boll Weight (G), SCY: Seed Cotton Yield (quintal/ha), GOT: Ginning Out Turn (%), LY: Lint Yield (Quintal/Ha), Note That 1 Quintal=100 kg

Table 2. Fiber quality traits of genotypes at WARC.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	4.55	30.15	31	86.2	9.9
VBCH 1537	4.45	29.91	34	85.5	10.8
Rambo VBCH 1521	4.09	30.89	30	84.8	10.2
VBCH 1517	4.48	28.48	28	84.3	9.7
Hero VBCH 1511	4.59	30	29	87.1	8.4
Deltapine 90	5.63	27.97	25	85.3	9.5
Stam 59A	4.46	30.67	32	85.2	9.9

Where: UHML=Upper Half Mean Length (mm), Str=Strength (g/tex), UI=Uniformity Index (%), SF=Short Fiber Index

Table 3. Growth and yield performance of genotypes at Melka Sedi.

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	239.5	34.7	5.88	26.43	37.15	9.82
VBCH 1537	197.8	34.8	5.47	25.27	33.64	8.5
Rambo VBCH 1521	247.6	34.8	6.68	26.15	33.75	8.83
VBCH 1517	249.8	27.3	6.33	21.31	37.04	7.89
Hero VBCH 1511	253.6	27.7	6.14	25.08	36.75	9.22
Deltapine 90	190.9	24.7	5.66	15.34	36.73	5.63
Stam 59A	263.6	24.6	6.17	21.93	42.12	9.24

Where plh: Plant Height (cm), Bon: Boll Number $Plant^{-1}$, Bow: Boll Weight (g), SCY: Seed Cotton Yield (quntal/ha), GOT: g inning out turn (%), LY: lint yield (quintal/ha)

Table 4. Fiber quality traits of genotypes at Melka Sedi.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	4.66	29.11	27.20	82.30	11.70
VBCH 1537	4.69	28.85	30.40	84.60	11.60
Rambo VBCH 1521	4.50	30.60	30.30	84.00	11.30
VBCH 1517	4.80	26.73	28.00	81.50	11.40
Hero VBCH 1511	4.40	28.40	30.60	84.20	13.10
Deltapine 90	5.52	26.31	26.20	81.60	14.60
Stam 59A	4.64	30.28	31.10	81.00	12.40

Where: UHML=upper half mean length (mm), Str =strength (g/tex), UI=uniformity index (%), SF=short fiber index (%)

Table 5. Growth and yield performance of genotypes at Amibara.

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	97.3	28.07	5.83	16.97	38.06	6.46
VBCH 1537	78.3	23.47	5.59	16.73	32.98	5.52
Rambo VBCH 1521	82.7	29.6	4.93	14.13	34.89	4.93
VBCH 1517	96.3	27.8	6.58	12.68	38.47	4.88
Hero VBCH 1511	114.3	33.6	6.8	16.29	36.23	5.9
Deltapine 90	75	18.73	4.65	7.55	38.09	2.88
Stam 59A	112	23.87	5.02	12.81	42.5	5.44

Where plh: Plant Height (cm), Bon: Boll Number Plant^{-1}, Bow: Boll Weight (g), SCY: Seed Cotton Yield (quintal/ha), GOT: Ginning Out Turn (%), LY: lint yield (quintal/ha)

genotype was relatively similar except at Sile in which the genotypes revealed less than 3.5 micronaire value. The micronaire vaue determines whether the fiber is mature or immature. According to Ethiopian grading standards the best quality is ranged from 3.5-4.2 and given 'A' grade and sold at premium price US $1.47/kg [6]. In each testing location, most of the candidate genotypes and that of the standard check varieties were not belong to this range. Either these genotypes had fallen below or above the range of premium price obtainable. Most of the genotypes best performed for upper half mean length at locations WARC and Woyto. Rambo VBCH 1521 had surpassed all the candidate genotypes and the checks considered for upper half mean length at Woyto (32.22 mm) and Gewane (31.57 mm) locations. Deltapine-90 was almost inferior in UHML in each location. The minimum and the maximum score for UHML ranged from 26.31 mm for Deltapine-90 at melkasedi to 32.22 mm at Woyto for Rambo VBCH 1521. World acceptable fiber length standard is greater than 27.4 mm as described by Pretorius [7] and all the genotypes, except Deltapine-90 at Melka sedi (26.31 mm), agrees with this standard. The minimum and the maximum fiber strength was registered at Amibara for Hero VBCH 1511 (23.7 g/tex) and at Werer for VBCH 1537 (34 g/tex). Rambo VBCH 1521 was very consistently performed across each location. The genotypes outperformed for fiber strength at WARC and Woyto compared to other locations considered in this study. One or two of the candidate genotypes in each location were superior to check varieties for fiber strength. Among the candidate genotypes at all locations, most have met the world acceptable fiber strength as described by Pretorius [7] which is greater than 28 gram/tex. The minimum and maximum uniformity index was recorded at Sile for Rambo VBCH 1521 (53.2%) and at WARC for Hero VBCH 1511 (87.1%). The higher the uniformity percentage the better is the genotype. One or more of the candidate genotypes surpassed the check varieties in each location. Most of the candidate genotypes in each location were not agreed with the Ethiopian micronaire standard set for Premium price which must be greater or equal to 85% uniformity index [8]. Short fiber index was inferior at Weyto and WARC compared to other locations. The less the value of short fiber index the better is the genotype. At Amibra the genotypes scored the highest short fiber index which is not important (Tables 2-5).

Combined mean of genotypes for growth and yield and yield related traits across locations

The table below revealed overall combined mean of genotypes performance across six testing locations. Based on this result, Stam 59 A was the first in plant height (154.36 cm) followed by Hero VBCH 1511 (140.24 cm). Plant height ranged from 104.5 cm (Deltapine 90) to 154.36 cm (Stam 59 A) which were both checks. All the candidate genotypes had fallen in this range. VBCH 1533 was superior to other genotypes for boll number plant^{1} (43.67) followed by Hero VBCH 1511 (43.64). The minimum and maximum boll number plant^{-1} ranged 33.71-43.67 respectively. The advantage of the highest candidate genotype over the better check for boll number plant^{-1} was 1.68%.

The highest average boll weight was weighed for Hero VBCH 1511 (6.58 g) followed by VBCH 1533 (6.20 g). The lowest average boll weight was scored for the check variety Deltapine-90. Average boll weight ranged from 5.07-6.58 g. Seed cotton yield which is the very critical parameter on which the pass or failure of the genotypes depends on. The overall combined mean showed that VBCH 1533 (32.31 q/ha) surpassed all the genotypes followed by VBCH 1537 (30.45 q/ha) and Hero VBCH 1511 (29.49 q/ha) considered in this study for seed cotton yield. The yield advantage of the three highest candidate genotypes over the better check was 31.82%, 24.24% and 20.32%. Thus, the three superior genotypes VBCH 1533, VBCH 1537 and Hero VBCH 1511 could be used as commercial and breeding materials. Ginning out turn which is a conversion factor from seed cotton yield into lint yield and economically important trait, showed the highest value for Stam 59 A (41.51%). Ginning out turn ranged from 32.42-41.51%. All the candidate genotypes were inferior to both check varieties. The highest lint yield was scored for VBCH 1533 (11.69 q/ha) followed by Hero VBCH 1511 (10.72 q/ha) and Stam 59 A (10.10 q/ha). Although, Stam 59 A had lower seed cotton yield compared to VBCH 1537, Stam 59 A came third and VBCH 1537 fourth for lint yield performance. This resulted in the difference in ginning out turn. Stam 59 had greater ginning out turn than VBCH 1537. Thus, this reflected that lint yield is highly dependent on seed cotton yield and the ginning out turn. Generally, based on seed cotton yield and yield related results obtained in each location and combined results suggest that the candidate genotypes had best performed. The three candidate genotypes viz. VBCH 1533, VBCH 1537 and Hero VBCH 1511 were the best materials. These genotypes excelled other genotypes in almost in all criteria (traits) considered (Tables 6-12).

Combined mean of genotypes for fiber quality traits across locations

As the table below showed genotype Rambo VBCH 1521 (30.91 mm) was superior to other genotypes for upper half mean length (UHML) followed by Stam 59 A (29.76 mm) and VBCH 1533 (29.67 mm). Except VBCH 1517 all the candidate genotypes had greater than 29 mm UHML. This indicated that these genotypes had acceptable upper half mean length in Ethiopia and in the global market. VBCH 1537 (31.20 g/tex) surpassed all the genotypes for fiber strength followed by Stam 59A (31.05 g/tex) and Rambo VBCH 1521 (30.37 g/tex). The three candidate genotypes viz. VBCH 1537, Rambo VBCH 1521 and Hero VBCH 1511 had above acceptable range of fiber strength in Ethiopia as well as in the global market for premium price. The maximum uniformity index

Table 6. Fiber quality traits of genotypes at Amibara.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	4.56	28.86	29	79.6	13.7
VBCH 1537	4.5	27.88	29.1	84.2	12.1
Rambo VBCH 1521	4.31	30.3	30.2	83.4	11.2
VBCH 1517	4.62	27.67	29.1	82	12.4
Hero VBCH 1511	4.66	29.23	31.2	85.4	11.4
Deltapine 90	4.94	27.66	23.7	83.2	13
Stam 59A	4.57	28.97	30.4	81.6	13.7

Where: UHML=Upper Half Mean Length (mm), Str=Strength (g/tex), UI=Uniformity Index (%), SF=Short Fiber Index (%)

Table 7. Growth and yield performance of genotypes at Gewane.

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	91.3	74.9	5.6	49.97	35	17.49
VBCH 1537	79	55.47	5.86	50.05	31	15.51
Rambo VBCH 1521	84	72.07	5.46	38.23	32.38	12.38
VBCH 1517	94.33	74.4	5.83	35.87	35.45	12.72
Hero VBCH 1511	116.33	69.27	5.25	51.22	35.13	17.99
Deltapine 90	75.67	44.67	5.15	19.65	36.35	7.14
Stam 59A	105	54.2	5.11	22.01	40.7	8.96

Where plh: Plant Height (cm), Bon: Boll Number Plant^{-1}, Bow: Boll Weight (g), SCY: Seed Cotton Yield (quntal/ha), GOT: Ginning Out Turn (%), LY: Lint Yield (quintal/ha)

Table 8. Fiber quality traits at Gewane.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	4.57	30.08	26.9	81.9	12.4
VBCH 1537	4.71	28.47	31.4	82	12.7
Rambo VBCH 1521	4.38	31.57	31.3	83.6	11.6
VBCH 1517	4.79	28.47	29.7	82.3	12
Hero VBCH 1511	4.4	30.39	32	81.5	11.8
Deltapine 90	5.23	27.72	25.4	82.5	13.5
Stam 59A	4.74	28.48	32.1	80.7	11.6

Where: UHML=Upper Half Mean Length (mm), Str =Strength (g/tex), UI=Uniformity Index (%), SF=Short Fiber Index (%)

Table 9. Growth and yield performance of genotypes at Sille.

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	124.67	39.07	5.1	27.11	37.45	10.15
VBCH 1537	120	35.63	5.52	31.68	34.8	11.02
Rambo VBCH 1521	121.33	30.5	4.19	18.32	36.17	6.62
VBCH 1517	114	30.93	5.52	21.78	37.5	8.17
Hero VBCH 1511	127.13	38.93	4.37	25.31	38.67	9.79
Deltapine 90	122.33	31.67	4.69	23.44	39.73	9.31
Stam 59A	170.67	28.6	5.04	21.28	43.56	9.27

Where plh: Plant Height (cm), Bon: Boll Number Plant^{-1}, Bow: Boll Weight (g), SCY: Seed Cotton Yield (quntal/ha), GOT: Ginning Out Turn (%), LY: Lint Yield (quintal/ha)

Table 10. Fiber quality traits of genotypes at Sille.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	3.21	28.9	26	79.3	10.8
VBCH 1537	3.3	29.99	30.2	86	8.3
Rambo VBCH 1521	2.76	29.89	29.3	53.2	9.5
VBCH 1517	3.42	27.82	28.2	82.5	9.7
Hero VBCH 1511	2.91	27.36	26.8	82	10.5
Deltapine 90	3.38	27.91	25.8	83.9	10.6
Stam 59A	3.69	29.06	28.5	82.9	10.2

Where: UHML=Upper Half Mean Length (mm), Str =Strength (g/tex), UI=Uniformity Index (%), SF=Short Fiber Index (%)

was scored for VBCH 1537 (84.38%) followed by Hero VBCH 1511 (83.60%). The uniformity index ranged from 78.50% for Rambo VBCH 1521 to 84.38% for VBCH 1537. Most of the candidate genotypes had high uniform index. The highest short fiber content was registered for Deltapine-90 (11.80%) followed by VBCH 1533 (11.47%). In short fiber content the lowest value is the better. Thus, the lowest value was recorded for Rambo VBCH 1521 (10.45%) followed by VBCH 1537 (10.75%). In general, based on the fiber quality properties of the candidate genotypes viz. VBCH 1537, Rambo VBCH 1521, Hero VBCH 1511 and VBCH 1533 had best performed, respectively over all the genotypes considered in this study (Tables 13 and 14).

Table 11. Growth and yield performance of genotypes at Woyo.

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	128	44	8.73	48.67	35.29	17.18
VBCH 1537	112	47.53	7.69	34.64	33.06	11.45
Rambo VBCH 1521	115	49.2	10.15	30.34	33.51	10.17
VBCH 1517	124	41.87	5.06	29.16	36.89	10.76
Hero VBCH 1511	121	46.33	11.13	33.11	36.25	12
Deltapine 90	90.67	54.43	5.18	35.89	39.64	14.22
Stam 59A	159.67	105.5	7.43	45.38	40.04	18.17

Where plh: Plant Height (cm), Bon: Boll Number Plant-1, Bow: Boll Weight (g), SCY: Seed Cotton Yield (quntal/ha), GOT: Ginning Out Turn (%), LY: Lint Yield (quintal/ha)

Table 12. Fiber quality traits of genotypes at Woyo.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	4.1	30.9	30	82	10.3
VBCH 1537	4.19	31.47	32	84	9
Rambo VBCH 1521	4.13	32.22	31	82	8.9
VBCH 1517	4.56	29.27	30	79.4	9.6
Hero VBCH 1511	3.77	30.57	31	81.4	10
Deltapine 90	5	28.21	26	82.2	9.6
Stam 59A	4.21	31.12	32	81.1	9.7

Where: UHML=Upper Half Mean Length (mm), Str =Strength (g/tex), UI=Uniformity Index (%), SF=Short Fiber Index (%)

Table 13. Over all combined result of the six locations result of growth performance.

Genotype	Plh	Bon	Bow	SCY	GOT	LY
VBCH 1533	130.03	43.67	6.20	32.31	36.58	11.69
VBCH 1537	113.08	39.55	6.04	30.45	32.42	9.84
Rambo VBCH 1521	123.16	43.33	6.07	24.51	34.31	8.32
VBCH 1517	129.41	39.92	5.94	23.01	37.22	8.50
Hero VBCH 1511	140.24	43.64	6.58	29.49	36.58	10.72
Deltapine 90	104.50	33.71	5.07	19.29	38.25	7.43
Stam 59A	154.36	42.95	5.69	24.51	41.51	10.10

Where plh: plant height (cm), Bon: boll number plant^{-1}, Bow: boll weight(g), SCY: seed cotton yield(quintal/ha), GOT: ginning out turn(%), LY: lint yield(quntal/ha)

Table 14. Over all combined result of the six locations result of yield performance.

Genotype	Micronaire	UHML	Str	UI	SF
VBCH 1533	4.28	29.67	28.43	81.88	11.47
VBCH 1537	4.31	29.43	31.2	84.38	10.75
Rambo VBCH 1521	4.03	30.91	30.37	78.5	10.45
VBCH 1517	4.45	28.07	28.83	82	10.8
Hero VBCH 1511	4.12	29.33	30.12	83.6	10.87
Deltapine 90	4.95	27.63	25.3	83.12	11.8
Stam 59A	4.39	29.76	31.05	82.08	11.25

Where: UHML=Upper Half Mean Length (mm), Str =Strength (g/tex), UI=Uniformity Index (%), SF=Short Fiber Index (%)

Conclusion

Based on the result obtained for growth, yield performance and fiber quality traits considered for the five candidate genotypes and the two checks showed mean differences at six experimental sites. Improving seed cotton yield while simultaneously maintaining fiber properties has been quite a challenge because of these negative associations. However, some studies have found a significant positive correlation between seed cotton yield and fiber strength, and seed cotton yield and fiber fineness. In most cases it is very difficult to get a genotype having increased seed cotton yield with equally increased fiber quality. But in this study, most of the candidate genotypes tendency had revealed simultaneously high seed cotton yield and high fiber quality. VBCH 1533, VBCH 1537 and Hero VBCH 1511 were the best genotypes that showed superior performance in both seed cotton yield and related traits and fiber quality properties. Although, Rambo VBCH 1521 had revealed the best quality traits, its yield and yield related performance was not excelled the check varieties. VBCH 1533, VBCH 1537 and Hero VBCH 1511 could be used in the breeding program for crossing and should be commercialized if these genotypes had surpassed the commercialized checks.

References

1. Fryxell PA. "A Revised Taxonomic Interpretation of *Gossypium* L (Malvaceae)." Rheedea 2(1992): 108-116.
2. Patil NB and Singh M. "Development of Medium staple High-Strength Cotton Suitable for Rotor Spinning Systems." *In: Challenging the future. Proceedings of the World Cotton Conference I, Brisbane, Australia* (1994): 14-17.
3. Alehegn Workie Amanu, Mohammed Hussien and Amsalu Berhanu. "Evaluation of Segregating Generations of Upland Cotton (*Gossypium hirustum* L.)." (2019).
4. Chavan RB. "Ethiopian Textile Industry Present Status and Future Growth Prospects." (2010).
5. WARC (Werer Agricultural Research Centre). National Cotton Research progress Report (Unpublished). Were, Ethiopia (2015).

6. ETIDI (Ethiopian Textile Industry Development Institute), Cotton quality specification, grading and local trading price (unpublished), Addis, Ababa, Ethiopia (2016).

7. Pretorius M, Allemann J and Smith MF. "Use of the AMMI Model to Analyse Cultivar-environment Interaction in Cotton Under Irrigation in South Africa." *Afr J Agric Res* 2(2015): 76-80.

8. Azhar FM, Naveed M and Ali A. "Correlation Analysis of Seed Cotton Yield with Fiber Characteristics in Gossypium Hirsutum L." *Int J Agric Biol* 4(2004): 656-658.

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