New Mahyco Cotton Hybrids for Zimbabwe & Africa

QUTON
SEED COMPANY (PVT) LIMITED
A subsidiary of Mahyco
Everywhere cotton grows

Plant Breeding – Cotton Hybrids
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Cotton Hybrids – A new frontier for improved productivity

- **Hybrid** – F1 (1st generation) progeny between 2 pure line parents
- Exploits **"Heterosis"** or hybrid vigor: improved or increased capacity in any biological quality in a hybrid
- Results in **higher yields** than varieties
- **better and wider adaptability** to environmental changes
- Better in **tolerance to abiotic and biotic stresses**
- **increased earliness**
- The story of impact of maize hybrids is known the world over (Zimbabwe maize crop is mainly hybrids)
- Mahyco cotton hybrids registered for commercial production in Zimbabwe & Malawi (2017) and Zambia (2018).
- 7 other African countries currently in process of registration of hybrids.
- Hybrids have potential to transform cotton production in Zimbabwe through;
- **Improved farmer viability**
- **Increase in national area under cotton**
- **Increased national cotton output**

Terminology

- **TSC** : Total seed cotton yield (kg/ha) – farmers yield
- **LINT**: Lint yield (kg/ha) – lint produced per hectare (export product)
- **BWT** : Boll weight (g) – standardised by sampling 50 undamaged bolls.
- **SWT:** Seed weight (g) – important trait for commercial ginning esp. lint contamination.
- **Earliness Index (%)** – combined yield of boll sample & 1st pick expressed as a % of the total crop yield.
- **Fiber/Staple length (mm)** – Length of a fibre
- **Fiber strength (g/tex)** – Fibre tenacity
- **Elongation (El**) – the distance that the fibers extend before they break.
- **Uniformity Index (UI)** – an indication of fiber length distribution within the fibrogram.
- **Micronaire (MIC)** – Fibre fineness
- **Fibre Maturity (Mat)** – the degree of cell wall thickness within a cotton sample.
- **Reflectance (Rd)** – the whiteness of the light that is reflected by the cotton fiber.
- **Yellowness (+b)** – the cotton fiber's reflectance to yellowness.
- **PHT:** Plant Height – height of the cotton plant at physiological maturity

Mahyco Cotton Hybrids Testing Details

Eight cotton hybrids (*Gossypium hirsutum L.*) from MAHYCO, two seasons 2015/16 and 2016/17

Genotype	Status	Growth Habit	Maturity	Source
MAHYCO C 567	Hybrid	Semi-determinate	Medium	Mahyco, India
MAHYCO C 569	Hybrid	Semi-determinate	Medium	Mahyco, India
MAHYCO C 571	Hybrid	Determinate	Early	Mahyco, India
MAHYCO C 577	Hybrid	Determinate	Early	Mahyco, India
MAHYCO C 579	Hybrid	Indeterminate	Late	Mahyco, India
MAHYCO C 608	Hybrid	Semi-determinate	Medium	Mahyco, India
CHECK 1	OPV	Determinate	Medium	Zimbabwe
CHECK 2	OPV	Indeterminate	Late	Zimbabwe

HYBRID TRIALS_2015/16 and 2016/17 details:

Experimental design:

Randomized Complete Block Design with three replications.

Treatments: Ten

- Eight Mahyco hybrids : **C 567, C569, C 570, C 571, C 577, C 579, C 608, C 609**
- Two check varieties : 2 OPV CHECK VARIETIES
- Plot size: 4 rows x 4.2 m
- Spacing: 100 x 30 cm

Locations: Six

(Bindura, Kadoma, Patchway, Chinhoyi, Gokwe, Sanyati)

Seed Cotton Yield superiority of hybrids

Pooled data of 8 and 9 locations each for two years 2015/16 and 2016/17, respectively.

Variety	2015/16 Seed Cotton Yield (*kg per ha*)	Per cent increase	2016/17 Seed Cotton Yield (*kg per ha*)	Per cent increase	POOLED Seed Cotton Yield (*kg per ha*)	Average per cent increase
C 567	2522	39	2597	41	2562	40
C571	2329	29	2630	43	2488	36
C608			2576	40		
CHECK 2	1811		1843		1828	
Trial Pooled Mean	1883		2292		2088	

Lint Yield superiority of hybrids

Pooled data of 8 and 9 locations each for two years 2015/16 and 2016/17, respectively.

Variety	2015/16 Lint Yield (*kg per ha*)	Per cent increase	2016/17 Lint Yield (*kg per ha*)	Per cent increase	POOLED Lint Yield (*kg per ha*)	Average per cent increase
C 567	988	5	939	23	962	13
C571	997	6	925	21	954	12
C608			900	18		
CHECK 2	938		762		845	
Trial Pooled Mean	937		865		901	

Yield Potential of hybrids

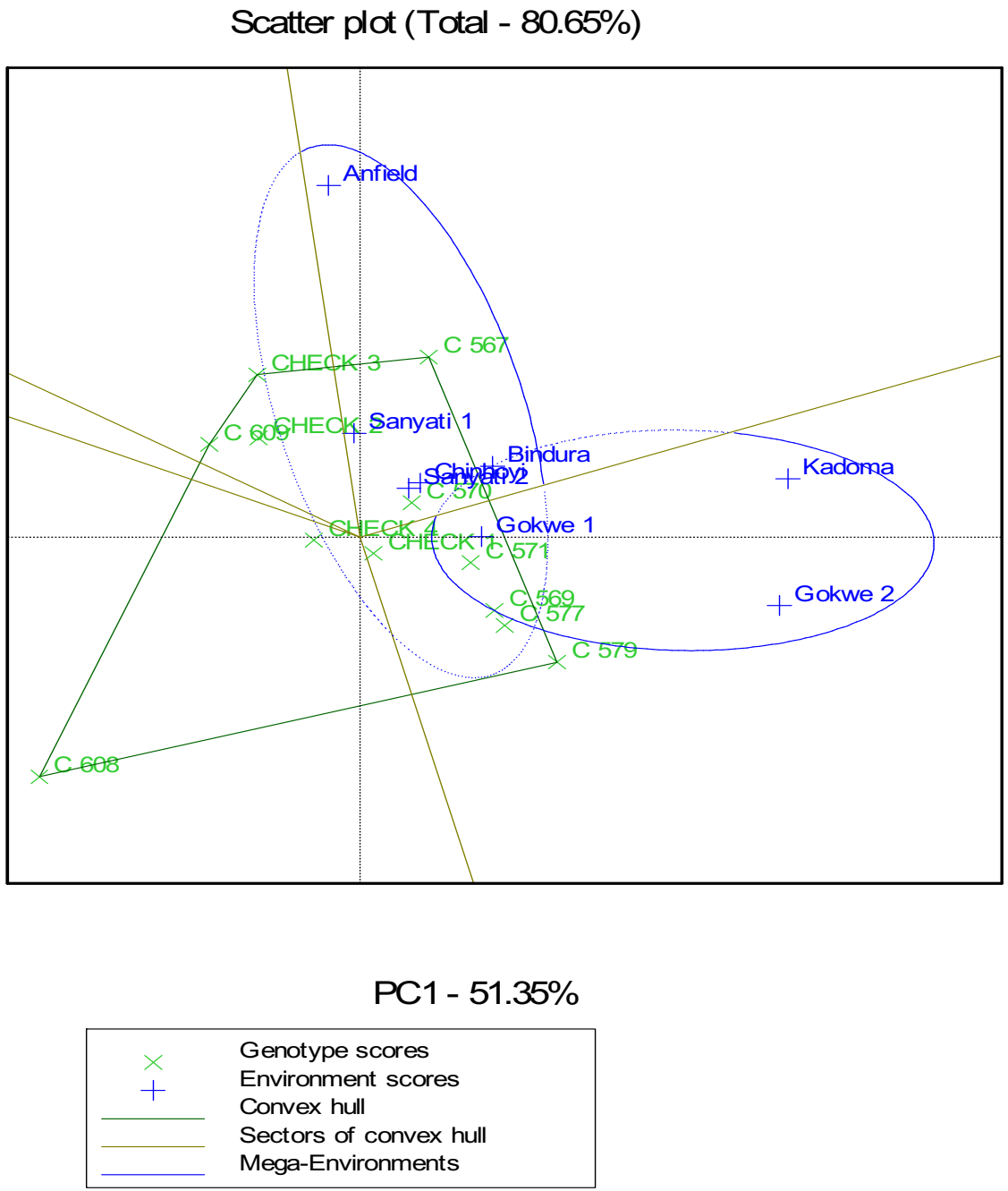
Table 2.1: Seed Cotton Yield (kg/ha) Results, Mahyco Hybrid Trial, Across site Summary (8 Sites), 2015-16

Entry	Anfield	Bindura	Chinhoyi	Gokwe 1	Gokwe 2	Sanyati 1	Sanyati 2	Seedco	MEANS
C 567	2768[a]	1436[a]	2496[a]	2430[a]	1369[a]	1832[a]	2309[a]	5536[a]	2522
C 571	1995[ab]	1237[b]	2011[ab]	2713[a]	1668[b]	1380[b]	2122[a]	5506[a]	2329
CHECK 2	1548[b]	1171[b]	1747[b]	1407[b]	1052[c]	1402[b]	1908[b]	4256[b]	1811
SITE MEANS	**1883**	**1294**	**2270**	**2251**	**1480**	**1439**	**1994**	**4717**	**2166**
SE OF MEANS	**494**	**52**	**214**	**232**	**137**	**152**	**108**	**230**	**-**
LSD (5%)	**883**	**101**	**394**	**407**	**263**	**293**	**208**	**444**	**-**
P values	**0.036**	**0.001**	**0.034**	**0.044**	**0.001**	**0.042**	**0.038**	**0.001**	**-**

Yield Potential of hybrids

Table 2.2: Seed Cotton Yield (kg/ha) Results, Mahyco Hybrid Trial, Across Sites Summary (9 Sites), 2016-17

ENTRY	Anfield	Bindura 1	Chinhoyi 1	Chinhoyi 2	Gokwe 1	Gokwe 2	Sanyathi 1	Sanyathi 2	Seedco	TRT Mean
C 567	1529^{ab}	2297	1675	1591	3046^{a}	3926^{a}	2959^{ab}	2582^{a}	3769^{a}	2597
C 571	1599^{ab}	2360	1884	1818	2816^{a}	3791^{a}	3544^{b}	2163^{ab}	3694^{a}	2630
C 608	2104^{b}	2621	2061	2154	3006^{a}	2600^{a}	3198^{b}	1649^{b}	3789^{a}	2576
CHECK 2	1114^{a}	1737	1702	1715	1521^{b}	2273^{b}	2454^{a}	1668^{b}	2407^{b}	1843
SITE MEANS	1444	2416	1824	1849	2282	3024	2836	1867	3089	2292
SE OF MEANS	196.4	210.2	182.6	261	199	493.2	245.1	192.6	314.6	.
LSD (5%)	577.6	616.5	535.4	765.5	583.5	1447	719	564.8	925.1	.
P values	0.008	0.152	0.659	0.387	0.000	0.000	0.035	0.073	0.015	-

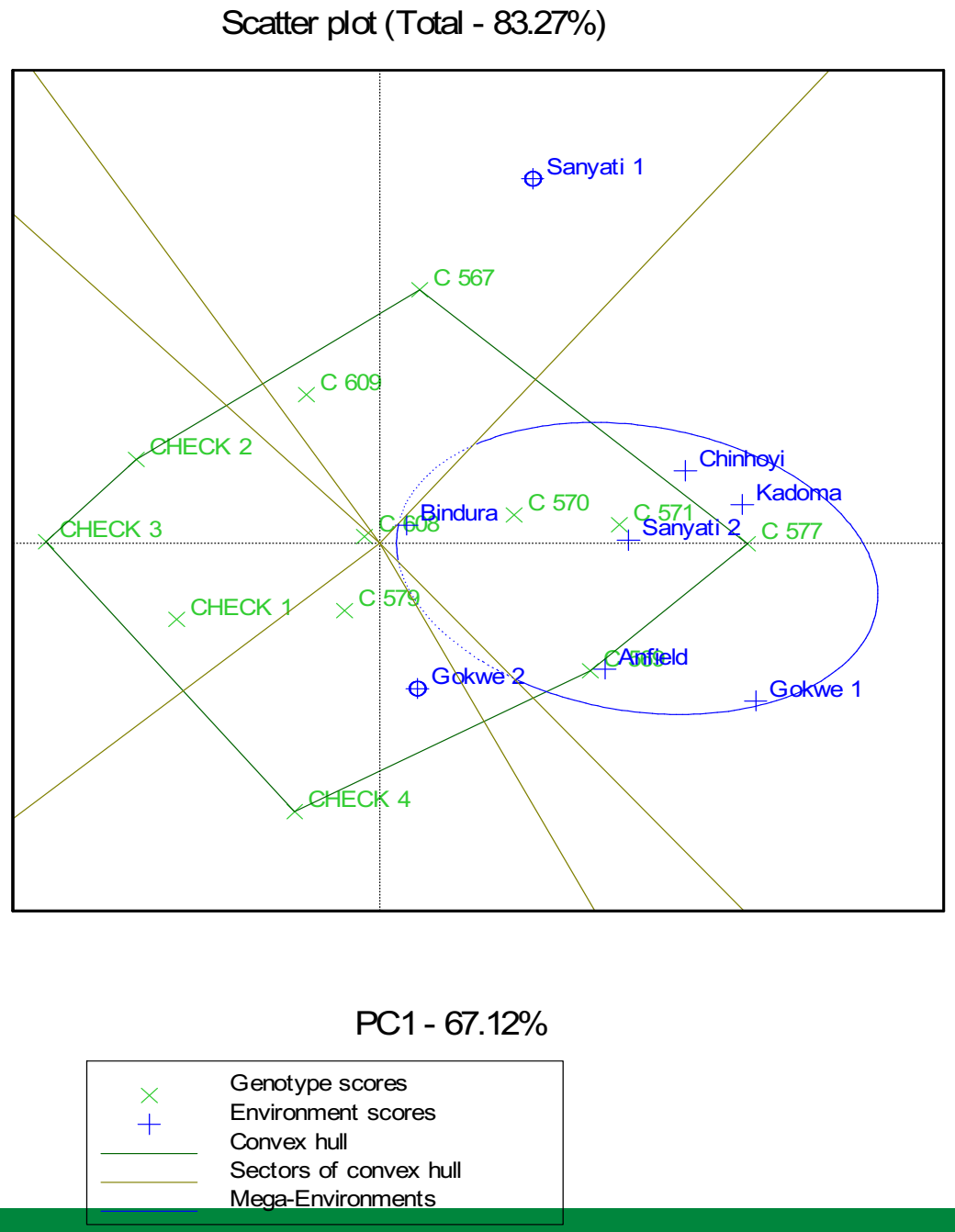


Stability Analysis: C567

1. **Medium Maturity**
2. **Apex genotype.**
3. **Moderate stability.**
4. **Performed well in the main mega-environment: Sanyati, Anfield, Gokwe 1, and Kadoma**

Field Performance of hybrids

YEAR	VARIETY	TSC (kg/ha)	LINT (kg/ha)	BWT (g)	SWT (g)	PHT (cm)	EARLINESS (%)
2015-16 8 SITES	C 567	2522	988	6.0	10.2	110	60
	C571	2329	987	6.2	11.3	98	66
	CHECK 2	1811	938	6.2	11.6	119	50
2016-17 9 SITES	C 567	2597	939	6.3	10.8	119	67
	C571	2630	925	6.3	11.8	113	70
	C608	2576	900	6.1	11.6	122	61
	CHECK 2	1843	762	6.2	11.6	129	53
MEANS ACROSS YEARS							
	C 567	2562	962	6.2	10.5	115	64
	C571	2488	954	6.3	11.6	106	68
	C608	2576	900	6.1	11.6	122	61



GGE Biplot for Earliness Index: C571 & C577

1. **Early Maturity**
2. **Apex genotype.**
3. **Very good stability.**
4. **Performed well in the main mega-environment**

Fiber Performance of hybrids

Table 3.1: Fibre Quality Analysis Results, Mahyco Hybrid Trial, Across Sites (5) Summary, 2015-16

ENTRY	LENGTH (mm)	STRENGTH (g/tex)	ELONGATION (%)	UNIFOMITY (%)	SHORT FIBRE (%)	MICRONAIRE	MATURITY	RD	B+
C 567	**32.7**	**27.6**	**6.4**	**87**	**3.5**	**4.6**	**0.87**	**82**	**10.4**
C571	32.3	28.0	6.6	86	3.9	4.7	0.87	81.2	10.5
C608	32.6	29.5	6.2	87	3.3	4.5	0.87	81.0	10.4
CHECK 2	31.8	29.5	6.6	86	4.6	4.7	0.87	81	10.2

Table 3.2: Fibre Quality Analysis Results, Mahyco Hybrid Trial, Across Sites (5) Summary, 2016-17

ENTRY	LENGTH (mm)	STRENGTH (g/tex)	MICRONAIRE	MATURITY	UNIFOMITY (%)	ELONGATION (%)	SHORT FIBRE (%)	RD	B+
C567	**31.2**	**29.7**	**4.4**	**0.86**	**86**	**7.0**	**4.8**	**84**	**8.1**
C571	31.4	32.2	4.4	0.86	86	7.0	5.5	84	8.1
C608	31.0	32.5	4.5	0.86	86	6.9	4.1	84	8.1
CHECK 2	30.2	32.1	4.3	0.86	86	7.0	4.7	84	8.1

Key features of Hybrid C 567

1. **Superior yield potential than check; wider adaptability**
   (5 500 kg/ha dryland production)
2. **Early in maturity** ***(Earliness index 64 % ; CHECK = 52 %)***
3. **Large bolls (6.2 g), high boll retention**
4. **Shorter internodes and interboll distance**
5. **Superior tolerance to Jassids** ***(hairy on dorsal side of leaf)***
6. **Smaller leaf size and open canopy**
7. **Very high oil content** ***(22.24% ; Checks 20%)***
8. **Very high protein content** ***(23% ; Check 21%)***
9. **Very good fibre quality parameters at par with checks**

Key features of Hybrid C 571

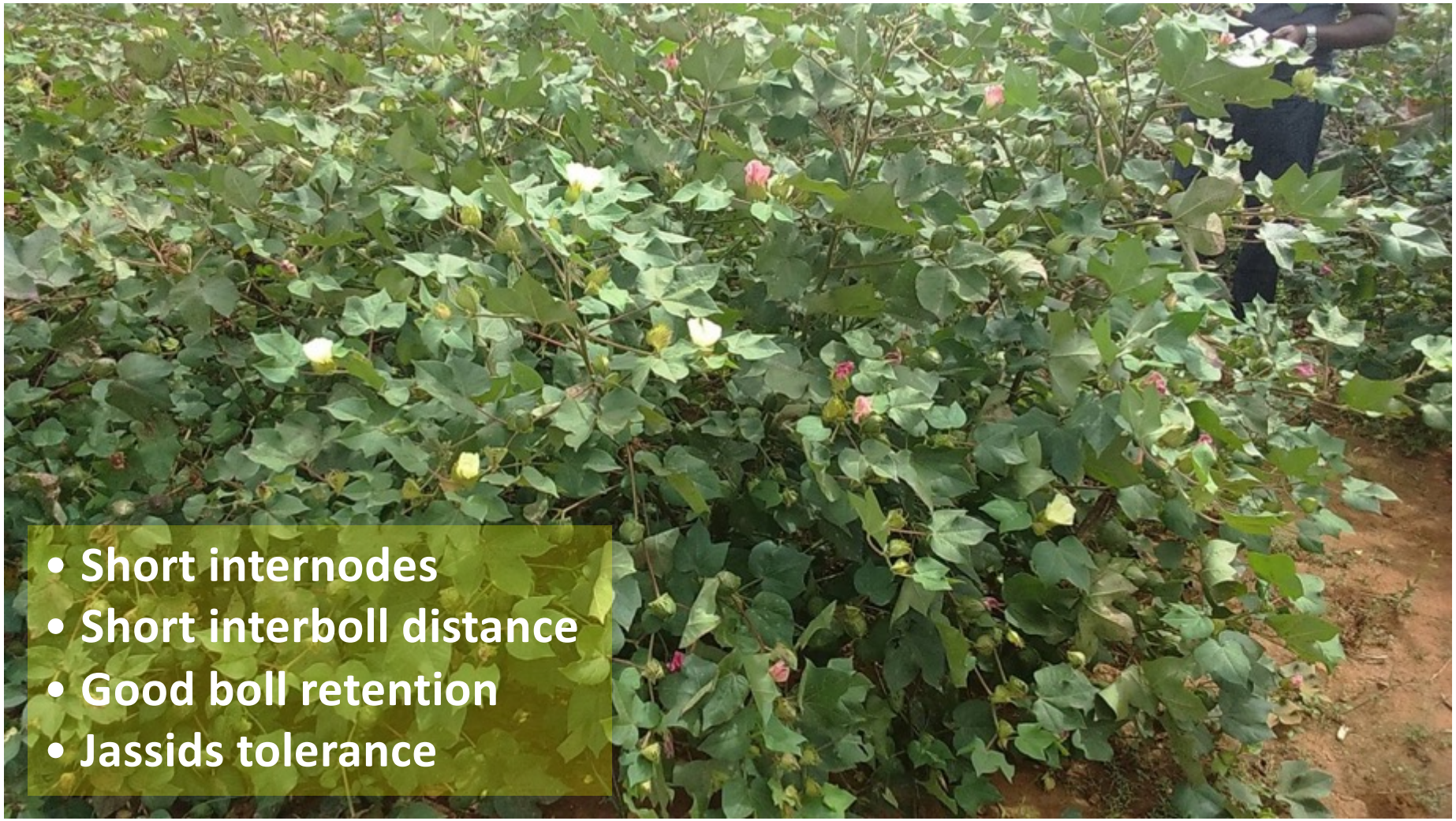
1. **Superior yield potential than check; wider adaptability**
   (5 500 kg/ha dryland production)
2. **Very early maturity** ***(Earliness index 68 % ; CHECK = 52 %)***
3. **Large bolls (6.3 g), high boll retention**
4. **Superior fibre quality parameters than checks**
5. **Short stature with open canopy**
6. **Good tolerance to Jassids**
7. **Very high oil content** ***(23% ; Checks 20%)***
8. **High protein content** ***(22% ; Check 21%)***

Key features of Hybrid C 608

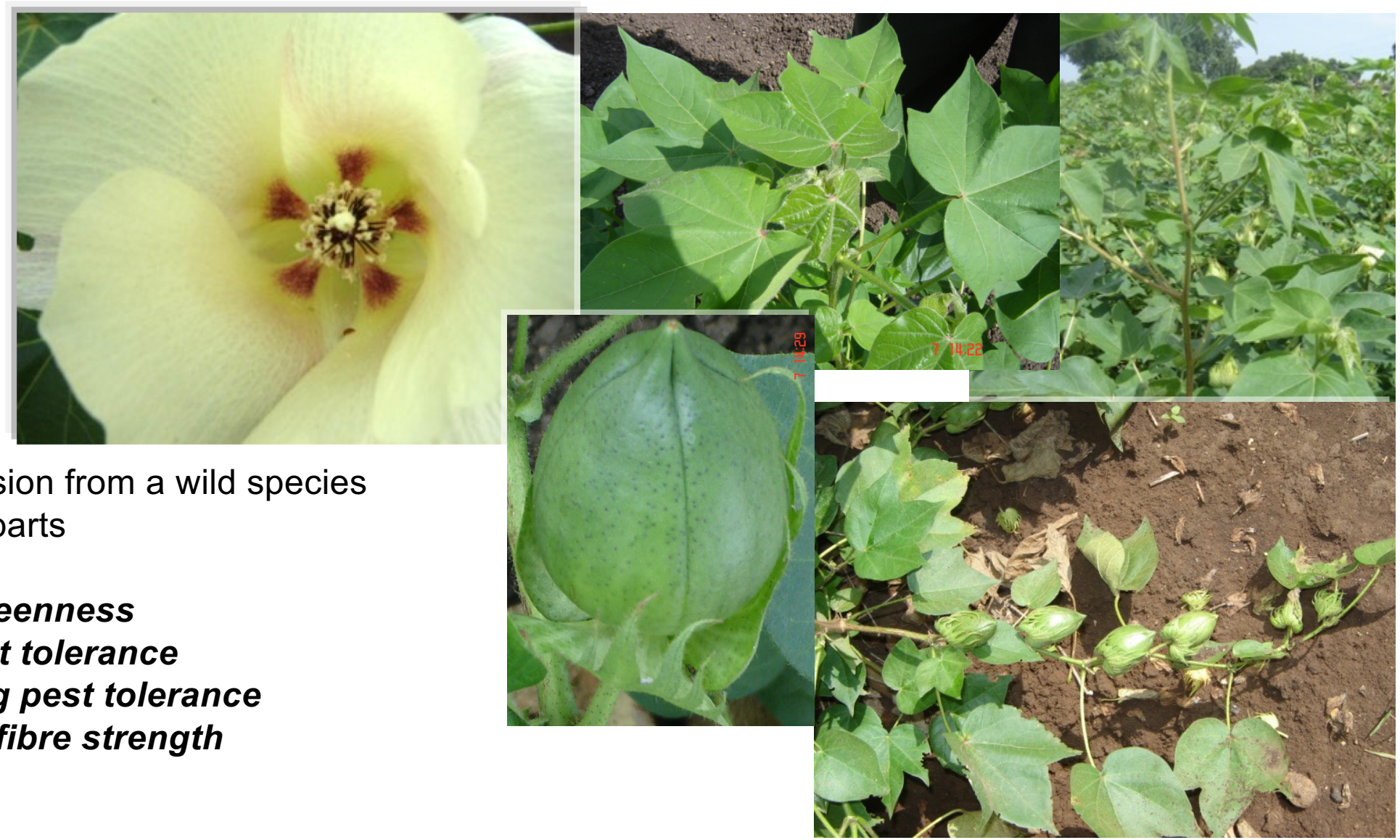
1. Superior yield potential than check ; wider adaptability
   (3 700 kg/ha dryland production)
2. Medium maturity *(Earliness index 62 % ; CHECK 2 = 52 %)*
3. Large bolls (6.0 g) , high boll retention, good boll visibility
4. It is a multiple stress tolerant hybrid (Jassids, Aphids and Drought)
5. Stay green trait – imparts tolerance to drought stress
6. Leathery leaves imparts tolerance to both Jassids and aphids
7. Superior fibre quality parameters than checks
8. Very high oil content *(22% ; Checks 20%)*
9. Very high protein content *(23% ; Check 21%)*

High Boll retention in C 567

Hybrid C 571


• Short internodes
• Short interboll distance
• Good boll retention
• Jassids tolerance

C 608: Morphological Uniqueness



Introgression from a wild species which imparts

- ***Stay greenness***
- ***Drought tolerance***
- ***Sucking pest tolerance***
- ***Higher fibre strength***

Summary of Mahyco Hybrid proposals

Hybrid	Maturity Group	% SC Yield adv over best check	Fibre length (mm)	Fibre strength (g/ tex)	Oil %	Crude Protein %	Special attributes
C 567	**Medium**	24	31.9	28.7	22 (Check 20)	23 (Check 21)	Wider adaptability, high boll retention, Superior SP tolerance, small size leaves, open canopy
C 608	**Medium**	22	31.8	31.1	22	23	Excellent SP tolerance, stay greener, Very Long fibre with high strength, , small size leaves, open canopy
C 569	**Early**	20	31.6	29.0	23	22	Large bolls, good boll retention, SP tolerance, , small size leaves, open canopy
C 577	**Very early**	15	28.3	31.2	22	23	Better SP tolerance – Jassids, GOT – 39% with medium staple length, , small size leaves, open canopy
C 571	**Very early**	20	31.8	30.2	23	22	Large bolls, SP tolerance, high boll retention, Very Long fibre with high strength , smaller size leaves, open canopy, boll visibility
C 579	**Medium to Late**	12	29.9	30.0	21	22	High GOT – 40 %, Better SP tolerance, Good rejuvenation (mid-season drought suit), large bolls

THANK YOU!!!