Identification of Best GMS Lines Having Maximum Cross Boll Setting in Desi Cotton (*G. arboreum* L.)

Presented by

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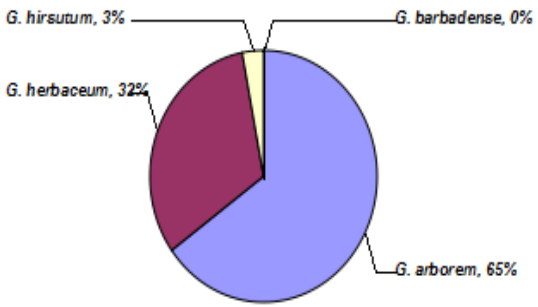
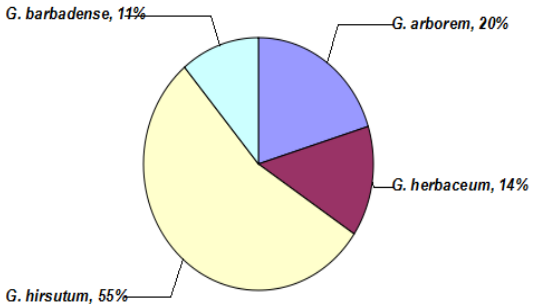
Changing trends of cotton cultivation in India



1947



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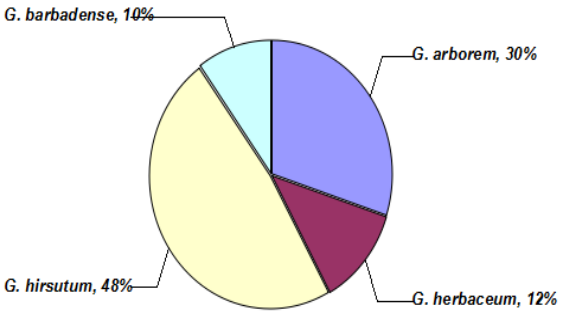
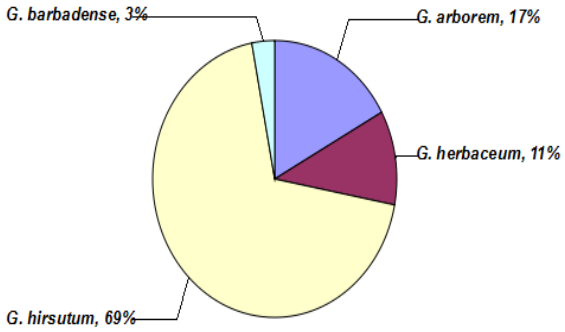
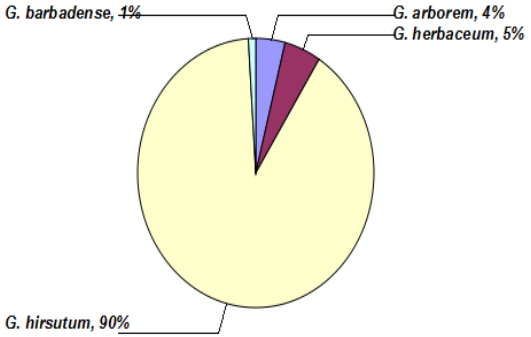


1990



2000



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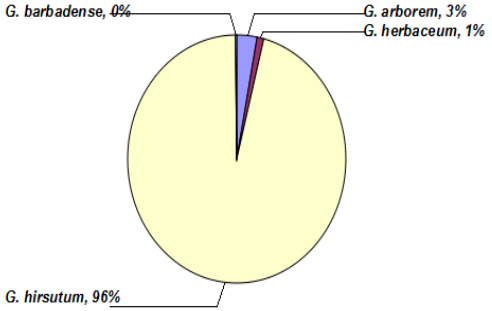
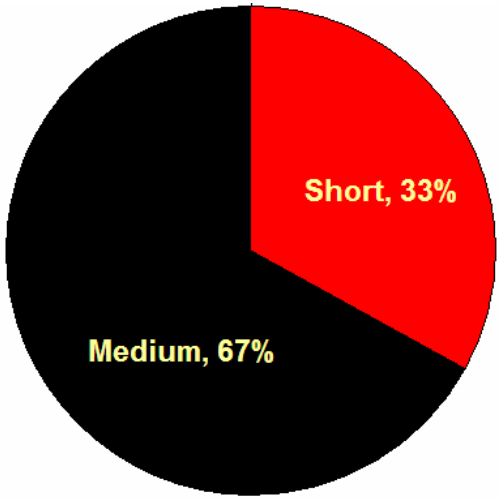
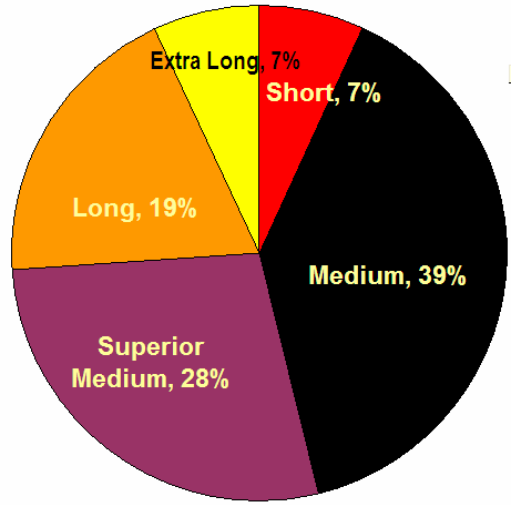


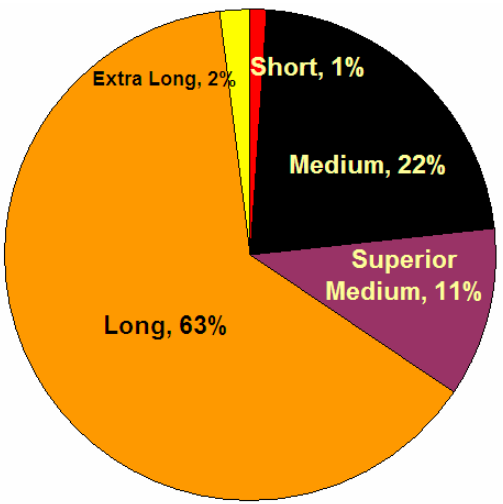
2012

Source:- ***Status paper of Indian Cotton, DCD, GOI, Nagpur, (2017)***

Imrovement in staple length of Indian Cotton







1947 **1990** **2012**

Source:- ***Status paper of Indian Cotton, DCD, GOI, Nagpur, (2017)***

Why Desi Cotton?

- Wider Adaptability
- Tolerant to drought (Rainfed area 60%)
- Resistant to diseases (immune to cotton leaf curl virus)
- Tolerant to Salinity and water-logging
- Tolerant to sucking pests (White Fly)
- Grow well in marginal soils
- Require least Inputs (Fertilizer & pesticide)
- Cultivated in Sustainable Approach (organic cotton)
- Produce short fibre cotton for absorbent, surgical cotton and Denim Industry
- Requirement of 20 Lakh bales short fibre cotton per annum(10% increase/annum).

Why Desi Cotton Hybrid?

- High Yield Potential

  (15-18 q/ha for rainfed and 30-32 q/ha for irrigated)
- Big boll size (upto 4.0 to 4.5 g)
- Excellent boll bursting
- Exellent locule (Kapas) retention
- Excellent reflushing ability
- Tolerant to sucking pests
- Tolerant to leaf reddening
- Suitable for both rainfed and irrgated conditions
- Short and coarse non- spinable fibre suitable for absorbent cotton

Constrains in *G. arboreum* Hybrid Seed Production

- ✓ **Hyrbid seed production in *G. arboreum* is only of GMS base system, so 50 % plants are rouged out from female parent.**

- ✓ **In *G. arboreum* cross boll retention is less (20 to 25 %) as compared to *G. hirsutum* (60 to 70%)**

- ✓ **Fluctuating rainfall and water stress with changes in cliamatic conditions are directly affecting on natural cross bolls droping, leads to less yield in commercial hybrid seed production programme.**

- ✓ **No any event or gene in *G. arboreum* cotton for controlling bollworm complex (Damage up to 25 %) as compared to *G. hirsutum* which reflects less yield in hybrid seed production.**

MATERIALS AND METHODS

Growing Season:- *Kharif 2015* (S/D:- 30/05/2015)
Kharif 2016 (S/D:- 28/06/2016)

Location **:-** R & D, Nirmal Seeds Pvt. Ltd, Bhadgaon, Jalgaon (MS)

Mating Design **:-** Line × Tester

Corssing programme:- Aug to Nov (K-2015)
Sep to Nov (K-2016)

- ✓ Rouged out fertile plants in GMS lines,
- ✓ The flower buds in GMS lines expected to open on next day morning were covered with the butter paper bag on previous day in between 3.0 to 5.0 pm.
- ✓ On the next day morning the butter paper bags were removed and flower buds were pollinated
- ✓ On each day, number of pollinated flowers buds in each GMS lines were counted and labelled with dates and count was also recorded.
- ✓ The crosses bolls count was recorded at boll bursting.
- ✓ The percent cross boll setting was calculated

Female (GMS) Lines
NCAGA-4
NCAGA-5
NCAGA-6
NCAGA-13
NCAGA-22
NCAGA-30
NCAGA-31
NCAGA-32
NCAGA-37
NCAGA-46

Male parents
NSA-29
NSA-236
NSA-256
NSA-306
NSA-312
NSA-318
NSA-319
NSA-322
NSA-502

Table 1: Genotypic effect of female parent (GMS line) on *per cent* cross boll setting in Desi cotton (*G. arboreum*)

Season	K-2015			K-2016		
Sowing Date	30/05/2015			28/06/2016		
Cross	Cross attempted	Crossed boll set	Av. Cross Boll Setting %	Cross attempted	Crossed boll set	Av. Cross Boll Setting %
NCAGA-4 x All Males	160	43	**26.6**	79	15	**19.0**
NCAGA-5 x All Males	143	44	**31.2**	91	22	**24.4**
NCAGA-6 x All Males	136	36	**26.4**	70	12	**17.9**
NCAGA-13 x All Males	114	56	**49.2**	98	34	**36.2**
NCAGA-22 x All Males	76	14	**17.5**	65	11	**17.0**
NCAGA-30 x All ,Males	67	19	**29.3**	60	11	**18.7**
NCAGA-31 x All Males	87	21	**23.2**	68	12	**18.3**
NCAGA-32 x All Males	108	24	**21.1**	76	15	**20.0**
NCAGA-37 x All Males	114	32	**28.2**	75	17	**22.3**
NCAGA-46 x All Males	75	24	**33.6**	55	13	**23.3**

***All Males= 9 Male parents**

Table 2: Genotypic effect of male parent on *per cent* cross boll setting in Desi cotton (*G. arboreum*)

Season	K-2015			K-2016		
Sowing Date	**30/05/2015**			**28/06/2016**		
Cross	**Cross attempted**	**Crossed boll set**	**Av. Cross Boll Setting %**	**Cross attempted**	**Crossed boll set**	**Av. Cross Boll Setting %**
All GMS x NSA-29	106	32	**29.7**	78	20	**25.0**
All GMS x NSA-236	117	39	**32.1**	67	17	**23.9**
All GMS x NSA-256	109	36	**32.9**	69	19	**27.0**
All GMS x NSA-306	117	42	**31.4**	65	17	**25.2**
All GMS x NSA-312	107	32	**32.0**	75	12	**15.3**
All GMS x NSA-318	105	33	**30.0**	81	22	**24.3**
All GMS x NSA-319	99	15	**13.5**	77	10	**11.8**
All GMS x NSA-322	112	19	**15.9**	79	10	**13.5**
All GMS x **NSA-502**	103	40	**37.0**	73	22	**29.5**

***All GMS = 10 female parents**

Tabel-3 Effect of enviromental factors on *per cent* cross boll setting of GMS lines in G. arboreum

Location:- Bhadgaon

Month	Metro. Standard Week	Kharif -2015						Kharif-2016					
		% Cross boll set	Temp (max)	Temp (min)	RH (max)	RH (min)	Rainfall (mm)	% Cross boll set	Temp (max)	Temp (min)	RH (max)	RH (min)	Rainfall (mm)
August	32	58	33	23	100	53	14	-	32	23	99	76	40
	33	52	34	23	100	54	15	-	34	22	97	45	0
	34	69	34	21	100	49	5	-	33	22	99	54	32
	35	64	34	21	99	50	6	-	33	23	100	58	130
September	36	48	35	23	100	44	36	47	32	21	99	53	3
	37	57	36	23	100	44	2	38	33	22	100	53	62
	38	36	33	22	100	53	117	34	31	23	100	68	87
	39	52	35	19	100	40	0	43	33	22	100	61	9
October	40	30	37	19	100	26	0	28	31	19	100	22	23
	41	32	38	19	95	19	0	20	33	18	100	29	0
	42	26	37	18	95	21	0	27	34	17	100	23	0
	43	28	37	20	94	29	0	23	33	17	96	27	0
November	44	14	36	16	97	27	0	16	31	11	100	12	0
	45	-	36	16	91	25		12	32	10	98	21	0
	46	-	34	14	91	27		-	31	10	100	27	0
	47	-	33	12	100	30		-	32	10	100	26	0

Source:- http://live.aeronsystems.com

Tabale-4 Fibre quality parameters of *G. arboruem* parental lines

Crosses	2.5% Staple lenght	Uniformity ratio (%)	Micronaire value	Tenacity 3.2 mm (g/tex)
GMS Lines				
NCAGA-4	**26.6**	49	5.1	22.5
NCAGA-5	**27.7**	51	**4.8**	**24.3**
NCAGA-6	**28.8**	46	**4.5**	21.1
NCAGA-13	21.9	54	6.5	18.7
NCAGA-22	22.9	53	6.8	16.8
NCAGA-30	25.1	48	6.6	21.0
NCAGA-31	**27.7**	50	5.4	19.9
NCAGA-32	21.7	54	6.8	16.4
NCAGA-37	25.3	53	6.2	22.3
NCAGA-46	23.5	51	5.7	18.7
Male parents				
NSA-29	**27.8**	53	**5.6**	23.3
NSA-236	**28.7**	50	**5.3**	23.3
NSA-256	**27.3**	50	**5.1**	23.0
NSA-306	**29.7**	49	**5.4**	20.8
NSA-312	20.9	53	7.1	21.1
NSA-318	20.4	54	7.5	15.2
NSA-319	23.9	51	6.5	16.6
NSA-322	19.8	52	6.7	15.0
NSA-502	19.2	58	7.8	15.6

CIRCOT, Mumbai

NCAGA-13

NCAGA-5

Conclusion

- Success of hybrid seed production in diploid cotton depends upon selecting compatible (GMS line) parents having maximum cross boll setting.

- Sowing should be adjusted between 25 May to 15 June to get maximum cross boll setting in hybrid seed production of desi cotton.

- Minimum temperature coupled with minimum relative humidity plays a crucial role in deciding amount of *per cent* crossed boll setting in GMS lines of diploid cotton.
- In present investigation, the GMS lines viz. NCAGA-13, NCAGA-46 and NCAGA- 5 were found to be promising for maximum cross boll setting. These lines may be exploited for commercial hybrid seed production in desi cotton after identification of best cross combination for yield and its contributing characters.

Nirmal's Desi Cotton Hybrids

Ambika (NACH-12)

Characteristics

Plant habit.....Tall, open, medium spreading
Duration.....Medium late
Boll size and shape.....Big, Round oblong
Avg. Boll Weight (gm)..3.5-4.0
Staple length (mm).....26-27
Fibre Strength (g/tex)...20-21
Micronaire (µg/inch).....5.5-6.0
Ginning (%).....38-40

Special features

- Big boll, long staple
- Very good boll bursting and reflush
- Suitable for irrigated and rainfed cultivation
- Recommended topping of main shoot and monopodia at 4 to 4.5 feet height
- Highly tolerant to sucking pest and diseases
- Suitable for Central and South zones of India
- Notified hybrid by Govt. of India

NACH - 18

Characteristics

Plant habit.....Tall, open, medium spreading
Duration.....Medium to late
Boll size and shape.....Big, Round oblong
Avg. Boll Weight (gm)....3.5-4.0
Staple length (mm).....25-26
Fibre Strength (g/tex).....22-23
Micronaire (µg/inch).....5.8-6.2
Ginning (%).....7-38

Special features

- Violet pigmented calyx & stem
- Big boll, good bursting and long staple
- Excellent reflush and high yielding
- Recommended topping of main shoot and monopodia at 4 to 4.5 feet height
- Suitable for irrigated and rainfed cultivation
- Highly tolerant to sucking pest and diseases
- Suitable for Central, South and North zones of India
- Notified hybrid by Govt. of India

NACH - 433

Characteristics

Plant habit .....Tall, open, medium spreading
Duration.....Medium
Boll size and shape.....Big, Round oblong
Avg. Boll Weight (gm).....3.5-4.0
Staple length (mm).....20-21
Fibre Strength (g/tex).....19-20
Micronaire (µg/inch).....Above 7.0
Ginning (%).....39-40

Special features

- Big boll size with excellent bursting
- Excellent locule retention
- Short coarse staple
- Resistant to sucking pest
- Suitable for irrigated and rainfed cultivation
- Recommended topping of main shoot and monopodia at 4 to 4.5 feet height
- Suitable for Central, South and North zones of India

NACH-556

Characteristics

Plant habit.....Tall, open, medium spreading
Duration.....Early to medium
Boll size and shape.....Big, Round oblong
Avg. Boll Weight (gm)....4.0-4.5
Staple length (mm).....20-22
Fibre Strength (g/tex).....19-20
Micronaire (µg/inch).....6.5-7.0
Ginning (%).....40-42

Special features

- Big boll size and excellent boll bursting
- Excellent locule retention ability
- Medium long coarse staple
- Suitable for irrigated and rainfed cultivation
- Recommended topping of main shoot and monopodia at 4 to 4.5 feet height
- Suitable for Central and South zones of India

Thank You...