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Research Article

NDLH 2035-5: A high yielding cotton variety with high fibre quality and sucking pest tolerance suitable for both Central and South zones of India

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Abstract
The cotton variety NDLH 2035-5 is a *Gossypium hirsutum* variety identified for both central and south zone states of India in rainfed situations, released by Acharya N.G. Ranga Agricultural University, Andhra Pradesh during 2022. This variety was developed at the Regional Agricultural Research Station, Nandyal through the pedigree method by crossing the parents of NDLH – 1905 × MCU 5. This variety recorded a mean seed cotton yield of 1436 kg/ha and 1471 kg/ha as against 1294 kg/ha and 1291 kg/ha of the Zonal check variety NH-615 in Central and Sahana in the south zone, respectively under rainfed conditions. The percentage increase in seed cotton yield was 11.0 per cent and 14.0 per cent at the central and south zones, respectively. The variety has a yield potential of 2219 kg/ha in the Dharwad centre and of 2719 kg/ha in the Nagpur centre as has been recorded during 2018-19. The variety has recorded an Upper Half Mean Length (UHML) of 29.6 mm, micronaire of 4.0 µg/inch and bundle strength of 27.6 g/tex in HVI mode. The variety recorded a mean boll weight of 4.4 g/boll, and is superior to local check and zonal check. NDLH 2035-5 combines high yield potential, big boll size and basic tolerance to pests and diseases. The entry NDLH 2035-5 identified for release as Nandyal Cotton - 25 by Central Variety Identification Committee during 2022 and the farmers will be highly benefitted by cultivating this variety in non-bt segment.

Keywords: Cotton, fibre quality, new variety, NDLH 2035-5

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is a fibre, oil and protein yielding crop of global significance. It is cultivated in tropical and subtropical regions of more than 80 countries of the world. The major cotton producing countries are USA, China, India, Pakistan, Uzbekistan, Turkey, Brazil, Greece, Argentina and Egypt. These countries contribute about 85% to global cotton production. (Technical bulletin of CICR, 2011). India occupied 3rd position in production with 5.5 million bales after the USA with 16.25 million bales and Brazil with 10.70 million bales (USDA, 2020-21). Andhra Pradesh is one of the major cotton growing states in India with an area of 5.24 lakh hectare, production with 18.0 lakh bales and with a productivity of 584 kg/ha (CICR, Nagpur 2020-21: https://www.cicr.org.in/database). Among the 52 species of *Gossypium* only four are cultivated globally *viz., Gossypium herbaceum*, *Gossypium arboreum*, *Gossypium hirsutum* and *Gossypium barbadense*. Among the four species, *Gossypium hirsutum* is cultivated commercially worldwide due to its wider adaptability and seed cotton yield and fibre quality traits.

In Andhra Pradesh, Regional Agricultural Research Station (RARS), Nandyal, established in 1906, is one

of the oldest Research Station of the Acharya N. G. Ranga Agricultural University which mainly works on the development of new cotton varieties with good fibre quality traits. Since the foundation of research station, tremendous research was carried in cotton and developed many varieties in *G. hirsutum* and in *G. arboreum*. The development of varieties suitable to the demands of rainfed cotton farmers is a continuous process. Keeping in the importance of cotton varieties, the variety NDLH 2035-5 has been developed for both central and south zones of India to meet the demands of a rainfed cotton farming situation.

MATERIALS AND METHODS

The variety NDLH 2035-5 was developed from the cross NDLH 1905 × MCU-5 during 2008-09. The single plant selection and selfing programme was initiated during 2010-11 at the Regional Agricultural Research Station, Nandyal of Acharya N.G. Ranga Agricultural University, Andhra Pradesh. The culture NDLH 2035-5 was evaluated in the ICAR-All India Coordinated Research Project on Cotton trials during 2018-19 to 2021-22 across nine locations of both the central and South Zone States of India (ICAR-AICRP on Cotton - Proceedings of VIC 2022 on Conventional Cotton Variety / Hybrid). Based on the superiority in nine locations in the Central and south zones, the culture NDLH 2035-5 was proposed for release as Nandyal Cotton - 25.

RESULTS AND DISCUSSION

The overall performance of *Gossypium hirsutum* L. NDLH 2035-5 was summarized in **Table 1**. This culture has registered a mean seed cotton yield of 1436 kg/ha as against 1294 kg/ha of the Zonal check variety NH-615 in the Central zone and 1471 kg/ha as against 1291 kg/ha of the Zonal check variety Sahana in the South zone under rainfed condition in nine locations between 2018-19 and 2021-22. The variety has a yield potential of 2219 kg/ha in the Dharwad centre and of 2719 kg/ha in the Nagpur centre as has been recorded during 2018-19. Spacing experiments *viz.,* 60× 45 cm and 60× 30 cm and different doses of fertilizers *viz.,* 75% RDF, 100% RDF and 125% RDF were conducted during 2021-22. The entry, NDLH 2035-5 showed significant differences at 60 × 30 cm spacing with 125% RDF than any other combination of fertilizer and spacing. Numerically, a higher seed cotton yield of 2405 kg/ha was recorded at 60 × 30 cm spacing with 125% of RDF (**Table 2**).

Table 1. Mean seed cotton yield (kg/ha) in coordinated varietal trials

Particulars	Year of Testing	Number of locations	Proposed entry NDLH 2035-5	Local check (Sivanandi)	Zonal check**
Centra Zone	2018-19	5	1939	1906	1689
Centra Zone	2019-20	5	1462	1348	1368
Centra Zone	2020-21	4	906	763	824
South Zone	2018-19	4	1907	1895	1533
South Zone	2019-20	3	1643	1576	1497
South Zone	2020-21	3	862	859	843
Weighted Mean		24	1453	1391	1292

** Centra Zone: NH 615; South Zone: Sahana

Table 2. Adaptability to agronomic variables - Seed cotton yield (kg/ha) of NDLH-2035-5

Spacing	75% RDF	100% RDF	125% RDF	Mean	CD @ 5%
Akola (Central Zone)					
S1:60 × 30	2082	2382	2696	2387	NS
S2:60 × 45	1967	1947	2161	2025	NS
Mean	2025	2165	2429		
CD @ 5%	NS	NS	NS		
Nandyal (South Zone)					
S1: 90 × 60 cm	612	585	793	663	NS
S2: 90 × 45 cm	641	735	868	748	NS
S3: 60 × 30 cm	625	784	814	741	NS
Mean	626	701	825		
CD @ 5%	NS	NS	NS		

The entry, NDLH 2035-5 recorded Upper Half Mean Length (UHML) of 29.6 mm, micronaire of 4.0 µg/inch and bundle strength of 27.6 g/tex in HVI mode (**Table 3**). It registered a mean lint yield of 500 - 690 kg/ha with ginning outturn of 34.0 - 34.6 %. It recorded a mean number of bolls per plant of 21 and a boll weight of 3.5 - 4.4 g (**Table 4**). The culture was found to be moderately tolerant to Alternaria leaf blight, grey mildew and Myrothecium leafspot (**Table 5**) and moderately tolerant to leaf hoppers, thrips and aphids (**Table 6**).

Table 3. Fibre quality traits of the entry NDLH 2035-5

Particulars	Year of Testing	Number of locations	Proposed entry NDLH 2035-5	Local check (Sivanandi)	Zonal check**
Upper half mean length (mm)					
Centra Zone	2018-19	4	28.8	26.9	28.5
Centra Zone	2019-20	-	-	-	-
Centra Zone	2020-21	4	28.1	25.7	26.9
South Zone	2018-19	3	29.8	27.3	28.2
South Zone	2019-20	3	28.6	26.9	26.7
South Zone	2020-21	3	30.4	28.1	26.9
Mean			29.14	26.98	27.44
Micronaire (µg/length)					
Centra Zone	2018-19	4	4.1	4.2	4.0
Centra Zone	2019-20	-	-	-	-
Centra Zone	2020-21	4	3.5	3.9	3.6
South Zone	2018-19	3	3.7	4.6	4.4
South Zone	2019-20	3	4.5	4.9	4.7
South Zone	2020-21	3	3.9	4.7	4.3
Mean			3.94	4.46	4.2
Bundle Strength (g/tex)					
Centra Zone	2018-19	4	27.0	25.7	26.7
Centra Zone	2019-20	-	-	-	-
Centra Zone	2020-21	4	26.1	25.4	25.6
South Zone	2018-19	3	27.0	26.3	25.9
South Zone	2019-20	3	27.3	26.7	24.8
South Zone	2020-21	3	27.5	26.8	25.9
Mean			26.98	26.18	25.78

** Centra Zone: NH 615; South Zone: Sahana

Table 4. Performance of NDLH 2035-5 for other important traits

Particulars	Year of Testing	Number of locations	Proposed entry NDLH 2035-5	Local check (Sivanandi)	Zonal check **
Mean lint yield (kg/ha)					
Centra Zone	2018-19	5	669	662	617
Centra Zone	2019-20	5	495	472	500
Centra Zone	2020-21	4	906	763	824
South Zone	2018-19	4	658	676	529
South Zone	2019-20	3	551	510	502
South Zone	2020-21	3	291	294	300
Mean			595	563	545

Table 4. Continued.

Particulars	Year of Testing	Number of locations	Proposed entry NDLH 2035-5	Local check (Sivanandi)	Zonal check **
Mean Ginning Out Turn (%)					
Centra Zone	2018-19	5	34.3	34.5	36.5
Centra Zone	2019-20	5	33.6	35.0	36.5
Centra Zone	2020-21	4	33.6	34.6	35.4
South Zone	2018-19	4	34.4	34.9	34.4
South Zone	2019-20	3	33.7	32.2	33.2
South Zone	2020-21	3	34.6	34.7	36.2
Mean			**34.0**	**34.3**	**35.4**
Mean Number of bolls per plant					
Centra Zone	2018-19	5	21.7	23.5	19.8
Centra Zone	2019-20	5	19.6	19.6	18.4
Centra Zone	2020-21	4	20.2	19.8	23.0
South Zone	2018-19	4	19.0	20.3	18.9
South Zone	2019-20	3	17.8	15.3	15.5
South Zone	2020-21	3	15.1	12.5	11.7
Mean			**18.9**	**18.5**	**17.9**
Mean boll weight (g)					
Centra Zone	2018-19	5	3.9	3.5	3.6
Centra Zone	2019-20	5	3.6	3.3	3.6
Centra Zone	2020-21	4	3.1	2.7	2.7
South Zone	2018-19	4	4.5	4.0	4.3
South Zone	2019-20	3	4.4	4.1	4.5
South Zone	2020-21	3	4.3	4.3	3.9
Mean			**4.0**	**3.7**	**3.8**

** Centra Zone: NH 615; South Zone: Sahana

Table 5. Reaction to major diseases

Particulars	Year of Testing	Location	Proposed entry NDLH 2035-5	Local check (Sivanandi)	Zonal check **
Alternaria leaf Spot					
Centra Zone	2019-20	NAN	2	3	1
Centra Zone	2019-20	BHR	1	0	1
Centra Zone	2020-21	NAN	0	0	0
Centra Zone	2020-21	BHR	5	5.1	4.5
South Zone	2018-19	DW	4	4	4
South Zone	2019-20	DW	4	4	4
South Zone	2020-21	DW	21.5	25.3	23.6
Grey mildew					
Centra Zone	2019-20	AKA	2	1	2
Centra Zone	2019-20	NAN	2	1	2
Centra Zone	2020-21	AKA	8.3	6.7	3.3
Centra Zone	2020-21	NAN	14.8	26.1	14.5
South Zone	2018-19	DW	1	1	1
South Zone	2019-20	DW	3	4	3
South Zone	2020-21	DW	0	0	0
Myrothecium leaf spot					
Centra Zone	2019-20	AKA	2	3	1
Centra Zone	2020-21	AKA	15	11.7	15

** Centra Zone: NH 615; South Zone: Sahana

Table 6. Reaction to major insect pests

Particulars	Year of Testing	Location	Proposed entry NDLH 2035-5	Local check (Sivanandi)	Zonal Check **
Jassids/3 leaves					
Centra Zone	2018-19	BA	8	12	9
		BH	-	-	-
		AK	-	-	-
		NA	-	-	-
	2019-20	BA	8	9	10
		BH	4.2	3.3	2.8
		AK	2.9	4.6	2.5
		NA	2.85	3.4	3
	2020-21	BA	4.33	5.33	6
		BH	3.3	3.7	3.5
		AK	1.27	1.87	1.07
		NA	3.15	2.5	2
South Zone	2018-19	ND	3.5	4.3	4.2
		DW	6.1	9.2	6.6
		CN	7.7	6.7	1.1
	2019-20	ND	3.47	6.27	4.93
		DW	5.6	6.3	7.2
		CN	3.05	2.85	3
	2020-21	ND	3.6	3.13	5.07
		DW	2.5	8.8	7.5
		CN	1.57	1.49	3.03
Thrips/3 leaves					
Central Zone	2019-20	BH	2.9	5.4	2.6
		NA	6.5	8.5	7.7
	2020-21	BH	1.3	0.6	1.4
		NA	4.8	4.8	3.8
South Zone	2018-19	ND	0.6	0	0
		CN	3.9	4.1	1.3
	2019-20	ND	0.13	0.53	0.2
		CN	1.45	2	1.65
	2020-21	ND	0.27	0.87	0.4
		CN	1.05	0.88	2.28
Open boll damage (%)					
Central Zone	2019-20	BH	6.72	5.88	5.83
		AK	28.45	29.17	46.67
		NA	23.15	18.9	20.75
	2020-21	BH	3.47	3.32	2.89
		NA	22.75	25.84	28.47
Locule damage (%)					
	2019-20	BH	2.78	2.5	1.64
		NA	9.1	7.9	7.95
	2020-21	BH	1.5	1.0	1
		NA	26.5	30.3	38.7

** Centra Zone: NH 615; South Zone: Sahana

Table 7. Detailed description of NDLH 2035-5

S.No.	Characteristics	NDLH 2035-5
1	Leaf: Colour	Green
2	Leaf: Hairiness	Medium
3	Leaf: Nectaries	Present
4	Leaf: Shape	Normal
5	Plant: Stem hairiness	Medium
6	Plant: Growth habit	Spreading
7	Bract: Type	Normal
8	Flower: Petal colour	Yellow
9	Flower: Petal spot	Absent
10	Flower: Stigma	Exerted
11	Flower: Pollen colour	Cream
12	Boll: Colour	Green
13	Boll:Shape (longitudinal section)	Ovate
14	Boll: Surface	Smooth
15	Boll: Prominence of tip	Pointed
16	Boll: Weight of seed cotton/boll (g)	Medium
17	Seed: Fuzz	Medium
18	Seed: Fuzz colour	White
19	Seed: Index (100 seed wt. in gram)	Medium
20	Ginning %	Medium
21	Fibre: Colour	White
22	Fibre: Length (UHML) (mm)	Long
23	Fibre: Strength (g/tex)	Strong
24	Fibre: Fineness (Micronaire value)	Medium
25	Fibre: Uniformity	Good
26	Fibre: Maturity (%)	Good

The complete description of NDLH 2035-5 as per the DUS characters is presented in **Table 7**. Based on the superiority over check NH-615 evaluated in nine locations of the Central and South Zones, the culture NDLH 2035-5 was identified for release as Nandyal Cotton - 25 by the Central Variety Identification Committee during 2022.

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