Plant Germplasm Registration Notice*

The Plant Germplasm Registration Committee of ICAR in its XXIII meeting held on July 18, 2011 at the National Bureau of Plant Genetic Resources, New Delhi approved the registration of following 36 germplasm lines out of 105 proposals considered. The information on registered germplasm is published with the purpose to disseminate the information to respective breeders for utilization of these genetic stocks in their crop improvement programmes. Upon request, the developer(s)/author(s) is/are obliged to distribute the material for crop improvement programme of National Agricultural Research System.

1. T3-2, T3-3, T3-4 and T3-5 (IC0587407-IC0587410 and INGR11001-INGR11004), a Paddy (*Oryza sativa* L.) Germplasm, with High Yielding Pyramid Lines of Type 3 Basmati, Two Bacterial Leaf Blight Resistance Genes and a Semi-dwarfing Gene

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A traditional Type 3 Basmati rice cultivar grown in Uttarakhand possesses long, slender, translucent grains with strong and pleasant aroma and excellent cooking quality. It is, however tall and lodges even under low nitrogen fertilizer dose. In addition to lodging, it is highly susceptible to several diseases and pests including bacterial blight (BB). Efforts to evolve semi-dwarf basmati cultivars with aroma and cooking quality comparable to those of traditional basmati cultivars through conventional breeding methods have not met with much success. With the availability of series of molecular markers, construction of high density molecular maps and tagging of genes of economic importance it has been possible to improve rice cultivars through marker assisted backcross breeding (Joseph *et al.*, 2004; Sundaram *et al.*, 2008).

Type 3 Basmati also known as Dehraduni Basmati was taken as the recurrent parent in crosses with a non-basmati rice donor line PR106-P2 with semidwarf *sd-1* gene and three bacterial leaf blight resistance genes *xa5, xa13* and *Xa21* pyramided through marker assisted selection (Singh *et al.*, 2001).

A number of BC_2F_6 semidwarf and bacterial leaf blight resistant pyramid lines of Type 3 Basmati with *sd-1, xa13* and *Xa21* genes were developed through marker assisted foreground selection for markers linked to the genes (Fig.1) and background selection using SSR and ISSR markers. About 17 selected lines with more than 85% Type 3 Basmati background recovery, reduced plant height, BB resistance against a mixture of *Xanthomonas oryzae* pv. *oryzae* isolates of northern

Table1. Morphological, yield and quality characteristics of BC2 F6:7 pyramid lines of Type 3 Basmati grown at IIT Roorkee in 2010

Pyramid lines/Parents	Pedigree	Plant height (cm)	Days to 50% flowering	No. of tillers per plant	L/W ratio of milled rice	L/W ratio of cooked rice	% Amylose	Aroma	Paddy Yield kg/ha
T3-2	31-4-2-6-1⊗	117.0^{b}	116^{b}	13.4^{a}	3.61^{c}	5.20^{c}	22.02^{b}	Strong	5170^{a}
T3-3	36-3-8-5-4⊗	121.5^{c}	116^{b}	15.6^{c}	3.88^{f}	5.00^{b}	21.74^{b}	Mild	5877^{b}
T3-4	36-5-4-2-13⊗	130.8^{d}	123^{d}	18.5^{d}	3.82^{e}	5.76^{c}	20.13^{b}	Strong	5993^{b}
T3-5	38-5-2-5⊗	139.0^{e}	121^{c}	13.1^{a}	3.82^{e}	5.95^{c}	20.05^{b}	Strong	5263^{a}
Type 3	-	172.3^{f}	115^{b}	12.0^{a}	3.82^{e}	4.80^{b}	21.50^{b}	Strong	4611^{a}
PR106-P2	-	91.0^{a}	110^{a}	12.7^{a}	3.20^{a}	3.44^{a}	26.07^{d}	None	6537^{b}

Critical difference for paddy yield at 5% level of significance= 1125kg/ha
Different superscript letters on mean values of various traits denote significant differences among pyramid lines and control as based on t-test.

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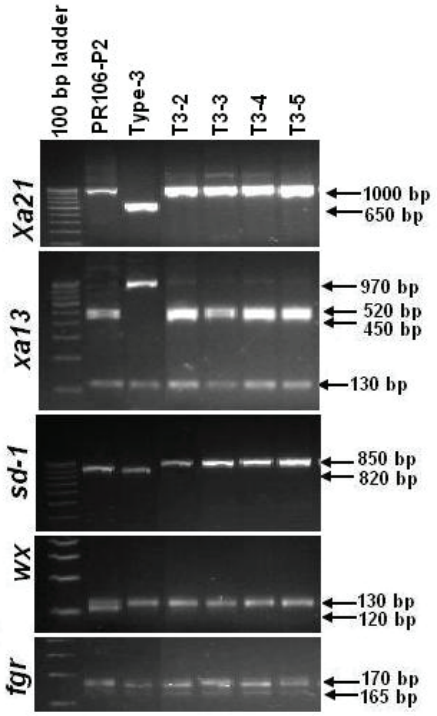

Fig.1: PCR analysis of the parental lines and foreground selection of BC2F6 pyramid lines of Type 3 Basmati using pTA248 primers linked to *Xa21*, RG136 linked to *xa13* (digested with HinfI) and 'h', RM190 and RM42 linked to semidwarfing (*sd-1*), intermediate amylose content(*wx*), and fragrance(*fgr*) genes, respectively

India, desirable kernel length/width ratio and cooking quality (Rajpurohit *et al.*, 2011) were tested in a replicated trial at the Indian Institute of Technology, Roorkee in 2010 using the recommended package of practices for basmati cultivation. Detailed data of four high yielding pyramid lines T3-2, T3-3, T3-4 and T3-5 with significantly higher yield than the recurrent parent Type 3 Basmati, reduced plant height, higher tillering, BB resistance, similar or better uncooked and cooked kernel length/width ratio and strong aroma is given in Table 1.

Registration of the pyramid lines of Type 3 Basmati will help the rice breeders to use the pyramid lines as such or as donors in their ongoing breeding programmes for development of semi-dwarf, high yielding, disease resistance and photosensitive basmati varieties with strong aroma and excellent cooking quality for export and indigenous markets.

References

Singh S, JS Sindhu, N Huang, Y Vikal, Z Li, DS Brar, HS Dhaliwal and GS Khush (2001) Pyramiding three bacterial blight resistance genes (*xa-5, xa-13* and *Xa-21*) using marker-assisted selection into indica rice cultivar PR106. *Theor. Appl. Genet.* **102:** 1011–1015.

Sundaram RM, MR Vishnupriya, SK Biradar, GS Laha, GA Reddy, NS Rani, NP Sharma and RV Sonti (2008) Marker assisted introgression of bacterial blight resistance in Samba Mahsuri, an elite indica rice variety. *Euphytica* **160:** 411-422

Joseph M, S Gopalakrishnan, RK Sharma, VP Singh, AK Singh, NK Singh and T Mohapatra (2004) Combining bacterial blight resistance and basmati quality characteristics by phenotypic and molecular marker-assisted selection in rice. *Mol. Breed.* **13:** 377-387.

Rajpurohit D, R Kumar, M Kumar, P Paul, A Awasthi, PO Basha, A Puri, T Jhang, K Singh and HS Dhaliwal (2011) Pyramiding of two bacterial blight resistance and a semidwarfing gene in Type 3 Basmati using marker-assisted selection. *Euphytica* **178:** 11-126.

2. KML-29, KDTML-3, KDTML-19 and KDTML-66 (IC0589129- IC0589132 and INGR11005–INGR11008), a Maize (*Zea mays*) Germplasm, with Drought and Water Logging Tolerance and Higher Number of Rows Per Cob and High Test Weight

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Drought is a major source of grain yield instability in maize (*Zea mays* L.) grown in Peninsular India and use of cultivars with improved drought tolerance may be the only affordable option for many small scale farmers. Among various abiotic stresses, inadequate water availability at critical stages of crop growth and

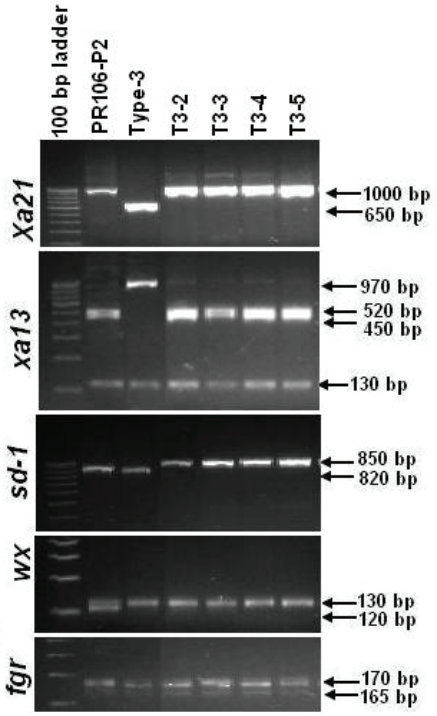

Fig.1: PCR analysis of the parental lines and foreground selection of BC2F6 pyramid lines of Type 3 Basmati using pTA248 primers linked to *Xa21*, RG136 linked to *xa13* (digested with HinfI) and 'h', RM190 and RM42 linked to semidwarfing (*sd-1*), intermediate amylose content(*wx*), and fragrance(*fgr*) genes, respectively

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References

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2. KML-29, KDTML-3, KDTML-19 and KDTML-66 (IC0589129- IC0589132 and INGR11005–INGR11008), a Maize (*Zea mays*) Germplasm, with Drought and Water Logging Tolerance and Higher Number of Rows Per Cob and High Test Weight

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Drought is a major source of grain yield instability in maize (*Zea mays* L.) grown in Peninsular India and use of cultivars with improved drought tolerance may be the only affordable option for many small scale farmers. Among various abiotic stresses, inadequate water availability at critical stages of crop growth and

development is the major limiting factor for maize production and productivity. Global warming is likely to increase the incidence of drought in many established maize growing areas. Rosenzweig *et al.* (1995) revealed that decline in yield will result largely from temperature induced acceleration of crop growth and development, hastened crop maturity and reduced soil moisture. Maize is very sensitive to stress at tasseling and silking stage. Schussler and Westgate (1995) established that stress due to limited moisture can play significant role in reducing yield of Maize. Understanding the nature of the higher grain potential and enhanced yield stability especially in stress prone environments will provide opportunities to improve the breeding process for selection of stress tolerant genotypes. Hence, a systematic study was conducted at Agricultural Research Station, ANGRAU, Karimnagar, to identify the genotypes tolerant to mid-season drought conditions based on desirable traits and subsequently their seed was increased.

KDTML-3: KDTML-3 is genetically uniform inbred line derived from Tuxpeno sequia population (Temperate material). Six cycles of full-sib recurrent selection (2004-2007) were carried out in the population, Tuxpeno sequia during the rain free winter season at Agricultural Research Station, Karimnagar under controlled moisture stress to coincide either in flowering or grain filling. Among the total germplasm present, promising inbred lines were identified for secondary traits such as Short Anthesis-Silking Interval (ASI), functional stay greenness at grain filling, delayed leaf senescence and less number of barren plants. Further, the line was maintained by inbreeding.

Studies on different morphological traits revealed that KDTML-3 is a late maturing line. The angle between leaf blade and stem is wide with drooping blade attitude. The line takes 72 days for anthesis and 75 days for silk emergence during *rabi*. Purple colouration of brace roots. The study of tassel traits highlighted that there is no pigmentation at the base of the glume, glume excluding base as well as anthers. The spikelets are dense, the angle between main axis and lateral branches is wide and the attitude of lateral branches is curved. The leaves are medium in size, there is purple pigmentation on the silk and no pigmentation on the glumes of the cob. It has short plant height (120 cm) with medium ear placement. The cobs are bold, conico-cylindrical and having many number (14) of rows of grains with irregular grain row aarangement. Grains are orange in colour with yellow cap and flint grain type. It has small 1000 kernel weight. Grains are round in shape. Recorded Anthesis-silking interval of 4-5 days under drought situations with barren ness of about 20%.

KDTML-19: KDTML-19 is genetically uniform inbred line derived from Tuxpeno sequia population (Temperate material). Six cycles of full-sib recurrent selection (2004-2007) were carried out in the population, Tuxpeno sequia during the rain free winter season at Agricultural Research Station, Karimnagar under controlled moisture stress to coincide either in flowering or grain filling. Among the total germplasm present, promising inbred lines were identified for secondary traits such as Short Anthesis-Silking Interval (ASI), functional stay greenness at grain filling, delayed leaf senescence and less number of barren plants. Further, the line was maintained by inbreeding.

Studies on different morphological traits revealed that KDTML-19 is a late maturing line. It has erect plant type with medium sized leaves. The angle between leaf blade and stem is small with straight blade attitude. The line takes 69 days for anthesis and 71 days for silk emergence during *rabi.* The study of tassel traits displayed that there is no pigmentation at the base of the glume and as well as anthers but, purple pigmentation of glumes excluding base. The spikelets are sparse, the angle between main axis and lateral branches is wide and the attitude of lateral branches is curved. There is no pigmentation on the silk as well as glumes of the cob. It has medium plant height (142 cm) with medium ear placement. The cobs are long and conico-cylindrical in shape and having medium number (12-14) of rows of grains with irregular grain row arrangement. It has light Orange flint grain colour and medium 1000 kernel weight. Grains are round in shape. Recorded Anthesis-silking interval of 4-5 days under drought situations with zero percent barren ness. Plant is highly stay green in nature till late grain filling stage.

KDTML-66: KDTML-66 is genetically uniform inbred line derived from Tuxpeno sequia population (Temperate material). Six cycles of full-sib recurrent selection (2004-2007) were carried out in the population, Tuxpeno sequia during the rain free winter season at Agricultural Research Station, Karimnagar under controlled moisture stress to coincide either in flowering or grain filling. Among the total germplasm present, promising inbred lines were identified for secondary traits such as Short Anthesis-Silking Interval (ASI), functional stay greenness

at grain filling, delayed leaf senescence and less number of barren plants. Further, the line was maintained by inbreeding.

Studies on different morphological traits revealed that KDTML-66 is a late maturing line. It has erect plant type. The angle between leaf blade and stem is small with straight blade attitude. The line takes 71 days for anthesis and 72 days for silk emergence during *rabi.* The study of tassel traits revealed that there is no pigmentation at the base of the glume, glume excluding base and as well as anthers. The spikelets are sparse, the angle between main axis and lateral branches is wide and the attitude of lateral branches is curved. There is no pigmentation on the silk as well as glumes of the cob. It has medium plant height (150 cm) with medium ear placement. The cobs are long and conico-cylindrical in shape and large sized having medium number (12-14) of rows of grains. The kernel row arrangement is straight and grains are light orange and flint. It has medium 1000 kernel weight and grains are round in shape. Recorded Anthesis-Silking interval (ASI) of 3-4 days under drought situations with 25% barrenness.

KML-29: KML-29 is genetically uniform inbred line derived from CIMMYT material (Temperate material). Tropicalized plant from CIMMYT material was subjected to inbreeding followed by ear-to-row selection. The inbreeding was done at Agricultural Research Station, Karimnagar. The productive ears with desirable traits were selected in each generation and after seven generations of selfing, this line became uniform. Selection for traits such as texture, ear shape, row number and configuration, kernel shape and colour and husk appearance was effectively practiced during inbreeding.

Studies on different morphological traits revealed that KML-29 is a late maturing line. It has erect plant type with narrow leaves. The angle between leaf blade and stem is small with straight blade attitude. The line takes 69 days for anthesis and 71 days for silk emergence during rabi. The study of tassel traits revealed that there is no pigmentation at the base of the glume, glume excluding base and as well as anthers. It has compact tassel with dense spikelets and longevity of pollen shedding for 7-8 days. A very good pollen shedder. The angle between main axis and lateral branches is narrow and the attitude of lateral branches is straight. The leaves are dark green in colour and there is pigmentation on the silk and no pigmentation on the glumes of the cob. It has short plant height (115 cm) with medium ear placement. The cobs are medium in size and conical in shape having medium number (12) of rows of grains. The kernel row arrangement is straight and grains are orange and flint. It has small 1000 kernel weight and grains are round in shape.

These lines may be involved in on- going single cross hybrid breeding program for development of drought tolerant maize hybrids.

References

Rosenweig C, LH Allen, LA Harper, SE Hollinger and JW Jones (eds) (1995) *Climate Change and Agriculture: Analysis of Potential International Impact.* Madison, Wisconsin: America Society of Agronomy, Inc.

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3. DDW 12 (IC0589133; INGR11009), a Wheat (*Triticum durum*) Germplasm, with Highest Iron (45.9 ppm), Zinc (47.4 ppm), Manganese (941.6 ppm) Contents; Resistance to Rusts and Karnal Bunt

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The durum wheat genotype DDW 12 has the higher Iron, Zinc, Manganese contents in comparison to the best available variety PDW 233. This stock was developed from the progeny of cross RASCON 3 / RAJ 1555 following pedigree selection method at Directorate of Wheat Research, Karnal. The first parent (Rascon3) is a high yielding genotype, while the other parent Raj 1555 is known for wider adaptation and quality attributes. This genotype was evaluated for three years under All India Wheat Coordinated trials during 2007/08 to 2009/10

at grain filling, delayed leaf senescence and less number of barren plants. Further, the line was maintained by inbreeding.

Studies on different morphological traits revealed that KDTML-66 is a late maturing line. It has erect plant type. The angle between leaf blade and stem is small with straight blade attitude. The line takes 71 days for anthesis and 72 days for silk emergence during *rabi.* The study of tassel traits revealed that there is no pigmentation at the base of the glume, glume excluding base and as well as anthers. The spikelets are sparse, the angle between main axis and lateral branches is wide and the attitude of lateral branches is curved. There is no pigmentation on the silk as well as glumes of the cob. It has medium plant height (150 cm) with medium ear placement. The cobs are long and conico-cylindrical in shape and large sized having medium number (12-14) of rows of grains. The kernel row arrangement is straight and grains are light orange and flint. It has medium 1000 kernel weight and grains are round in shape. Recorded Anthesis-Silking interval (ASI) of 3-4 days under drought situations with 25% barrenness.

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Studies on different morphological traits revealed that KML-29 is a late maturing line. It has erect plant type with narrow leaves. The angle between leaf blade and stem is small with straight blade attitude. The line takes 69 days for anthesis and 71 days for silk emergence during rabi. The study of tassel traits revealed that there is no pigmentation at the base of the glume, glume excluding base and as well as anthers. It has compact tassel with dense spikelets and longevity of pollen shedding for 7-8 days. A very good pollen shedder. The angle between main axis and lateral branches is narrow and the attitude of lateral branches is straight. The leaves are dark green in colour and there is pigmentation on the silk and no pigmentation on the glumes of the cob. It has short plant height (115 cm) with medium ear placement. The cobs are medium in size and conical in shape having medium number (12) of rows of grains. The kernel row arrangement is straight and grains are orange and flint. It has small 1000 kernel weight and grains are round in shape.

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3. DDW 12 (IC0589133; INGR11009), a Wheat (*Triticum durum*) Germplasm, with Highest Iron (45.9 ppm), Zinc (47.4 ppm), Manganese (941.6 ppm) Contents; Resistance to Rusts and Karnal Bunt

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The durum wheat genotype DDW 12 has the higher Iron, Zinc, Manganese contents in comparison to the best available variety PDW 233. This stock was developed from the progeny of cross RASCON 3 / RAJ 1555 following pedigree selection method at Directorate of Wheat Research, Karnal. The first parent (Rascon3) is a high yielding genotype, while the other parent Raj 1555 is known for wider adaptation and quality attributes. This genotype was evaluated for three years under All India Wheat Coordinated trials during 2007/08 to 2009/10

for yield, quality and resistance. Initially it was tested in NIVT-4 for one year (2007-08) and then in Advance Varietal Trial (AVT) for irrigated, timely sown durum trial for two crop seasons (2008-09 and 2009-10). DDW 12 performed as a high yielding genotype along with resistance to rusts and Karnal bunt and also found very good for quality traits as indicated by highest Iron (45.9 ppm), Zinc (47.4 ppm), Manganese (941.6 ppm) contents.

Therefore, it can be used as the genetic stock for these unique characteristics in future breeding programs to improve the nutrition quality in wheat. In addition, this genotype pertains many other characteristics like least mottled grain percent, good hectoliter weight, and resistance to all the three rusts and also for Karnal Bunt. The quality parameters for some of the traits of the coordinated trial entries including DDW 12 were tested at IARI, New Delhi and salient data for quality attributes in comparison to the best check (PDW 233), disease reactions and other agro-morphological traits are presented below.

Quality attributes of DDW 12 under coordinated trials

Parameter	DDW 12	PDW 233 (Available best quality check)
Iron content	45.90	43.80
Zinc	47.40	43.40
Manganese	41.60	34.30
Copper	6.06	4.05
Protein Content (%)	12.51	11.70
Hectolitre weight (Kg/hl)	81.20	79.30
Yellow berry incidence (%)	0.80	3.10

Disease and other agronomic characteristics of DDW 12

Characteristics	Observation
Brown rust	Resistant to all pathotypes
Yellow rust	Resistant to predominant pathotypes
Black rust resistance	Resistant to predominant pathotypes
Karnal Bunt	Resistant
Average plant height	100 cm
Days to maturity	130 days
1000 grain weight	50.0g

4. DBW 51 (IC0589135; INGR11011), a Wheat (*Triticum aestivum*) Germplasm, with Very High Iron Content (50.4 ppm), *Chapatti* Quality Score (8.06), Protein Content (12.84%) and High Biscuit Spread Factor (7.87cm); High Yield and Resistance to Diseases Particularly Rusts and Leaf Blight

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Bread wheat (*Triticum aestivum* L.) genotype DBW 51 was developed out of cross SITE/MILAN following the modified pedigree-bulk method of breeding. Under All India Coordinated Trials, it showed yield potential up to 52.1q/ha during 2008-09, thereby indicating that under better management conditions it can give very high yields even under late sown conditions. Besides, this genotype has wider adaptability and stable yields under late as well as very late sown conditions at various locations of north-eastern India in the coordinated trials as compared to the checks.

For quality parameters, DBW 51 has highest protein content (13.51%), good grain appearance (5.1), high Glu-1 score (10), and has a rare combination of suitability for three major end products (*chapati*, bread and biscuit) of wheat. DBW 51 has the best *chapati* score (8.06) at par with best available variety (C 306), bread quality score (7.49), highest bread loaf volume (583) and highest biscuit quality spread factor (7.87) thus making it suitable for *chapati*, bread and also biscuit quality. Regarding nutritional qualities, DBW 51 has shown highest iron (50.4 ppm), high yellow pigment (4.07), zinc (35.6 ppm), copper (5.50 ppm) and also high content of manganese (45.0 ppm) as compared to the best check variety. This indicates that the variety DBW 51 has potential to accumulate more micro-nutrients even under the most commonly followed and exhaustive crop rotation of rice-wheat.

for yield, quality and resistance. Initially it was tested in NIVT-4 for one year (2007-08) and then in Advance Varietal Trial (AVT) for irrigated, timely sown durum trial for two crop seasons (2008-09 and 2009-10). DDW 12 performed as a high yielding genotype along with resistance to rusts and Karnal bunt and also found very good for quality traits as indicated by highest Iron (45.9 ppm), Zinc (47.4 ppm), Manganese (941.6 ppm) contents.

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Quality attributes of DDW 12 under coordinated trials

Parameter	DDW 12	PDW 233 (Available best quality check)
Iron content	45.90	43.80
Zinc	47.40	43.40
Manganese	41.60	34.30
Copper	6.06	4.05
Protein Content (%)	12.51	11.70
Hectolitre weight (Kg/hl)	81.20	79.30
Yellow berry incidence (%)	0.80	3.10

Disease and other agronomic characteristics of DDW 12

Characteristics	Observation
Brown rust	Resistant to all pathotypes
Yellow rust	Resistant to predominant pathotypes
Black rust resistance	Resistant to predominant pathotypes
Karnal Bunt	Resistant
Average plant height	100 cm
Days to maturity	130 days
1000 grain weight	50.0g

4. DBW 51 (IC0589135; INGR11011), a Wheat (*Triticum aestivum*) Germplasm, with Very High Iron Content (50.4 ppm), *Chapatti* Quality Score (8.06), Protein Content (12.84%) and High Biscuit Spread Factor (7.87cm); High Yield and Resistance to Diseases Particularly Rusts and Leaf Blight

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Bread wheat (*Triticum aestivum* L.) genotype DBW 51 was developed out of cross SITE/MILAN following the modified pedigree-bulk method of breeding. Under All India Coordinated Trials, it showed yield potential up to 52.1q/ha during 2008-09, thereby indicating that under better management conditions it can give very high yields even under late sown conditions. Besides, this genotype has wider adaptability and stable yields under late as well as very late sown conditions at various locations of north-eastern India in the coordinated trials as compared to the checks.

For quality parameters, DBW 51 has highest protein content (13.51%), good grain appearance (5.1), high Glu-1 score (10), and has a rare combination of suitability for three major end products (*chapati*, bread and biscuit) of wheat. DBW 51 has the best *chapati* score (8.06) at par with best available variety (C 306), bread quality score (7.49), highest bread loaf volume (583) and highest biscuit quality spread factor (7.87) thus making it suitable for *chapati*, bread and also biscuit quality. Regarding nutritional qualities, DBW 51 has shown highest iron (50.4 ppm), high yellow pigment (4.07), zinc (35.6 ppm), copper (5.50 ppm) and also high content of manganese (45.0 ppm) as compared to the best check variety. This indicates that the variety DBW 51 has potential to accumulate more micro-nutrients even under the most commonly followed and exhaustive crop rotation of rice-wheat.

Salient quality attributes of DBW 51 as compared to best checks

Quality trait	DBW 51	Promising check varieties		
		NW 2036	HD 2985	DBW 14
Iron content	50.4	44.4	39.1	44.2
Chapati quality score	8.06	7.63	7.83	7.67
Biscuit spread factor	7.87	7.87	7.82	7.84
Protein Content (%)	14.4	12.2	12.1	13.4

The *per se* performance of DBW 51 could be attributed to its wider adaptability desirable plant height, heading and maturity duration and overall superiority for quality, resistance along with high yield potential.

Salient grain, quality and other morphological features of DBW 51

Parameter	Value
Days to heading	72 days
Days to maturity	107 days
Plant height	89 cm
1000- grain weight	39 g
Yield potential	52.1 q/ha

This genotype has shown resistance to both brown and yellow rusts under natural as well as artificial conditions. DBW 51 was found resistant against all the presently virulent pathotypes of yellow (46S 119 & 78S 84) and brown (77-5 & 104-2) rusts as supported by its adult plant response (APR) at Ludhiana and Delhi, locations, thereby indicating the presence of wide spectrum of genes to protect this genotypes for a longer time. The genotype has the highest tolerance level against leaf blight (23 score). In addition, DBW 51 has shown lowest incidence of loose smut (2.8) and acceptable level of Karnal Bunt (KB) and foliar head blight.

The registration of DBW 51 as a genetic stock especially for quality attributes will help as potential donor for improving nutritional qualities in future wheat genotypes and might reduce the problem of malnutrition.

5. DBW 46 (IC0589134; INGR11010), a Wheat (*Triticum aestivum*) Germplasm, with a High Level of Resistance to Most Prevalent Races of Yellow Rust (46S119, 78S84), Brown Rust (77-5, 104-2) and Leaf Blight (*Bipolaris sorokiniana*)

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Directorate of Wheat Research, Karnal-132001, Haryana (E-mail: gysingh@gmail.com)

Bread wheat (*Triticum aestivum* L.) Genotype DBW 46 was developed out of cross PBW 343/INQ 21 following modified pedigree-bulk method of breeding. Under all india coordinated trials, it showed yield superiority during 2008-09 & 2009-10 over ruling check varieties. The yield potential of DBW 46 under multilocational test was recorded up to 64.5 q/ha thereby meaning that under better management conditions it can give even very high yields. In coordinated trials, DBW 46 has shown highest 1000-grain weight under timely sown condition and minimum reduction in the grain weight under late sown situation thereby indicating that it has some degree of heat tolerance. This genotype has shown resistance to brown and yellow rusts under natural as well as artificial conditions in general and specific resistance against the presently virulent pathotypes of yellow (46s 119 & 78s 84) and brown (77-5 & 104-2) rusts. It also showed highest tolerance level against Karnal bunt as compared to checks. Besides, DBW 46 showed high degree of resistance to leaf blight (24 score) and foliar head blight.

Magnitude of disease resistance in DBW 46 against yellow and brown rusts and leaf blight disease

Location	Characters	Pathotypes	2009	2010
Ludhiana & Delhi	Yellow rust	46S119	0	0
		78S84	0	0
Controlled artificial conditions at Shimla	Brown rust	77-5	TS	0
		104-2	TS	0
Coordinated locations	Leaf Blight (Average score)	-	24	24

In addition, DBW 46 has good combination of quality attributes for *chapati,* bread and biscuit making. DBW 46 showed highest bread loaf volume (573), bread quality score (7.22), and very high biscuit spread factor (7.85). It has desirable protein content, good grain appearance, desirable hectoliter weight and sedimentation value. For nutritional attributes, DBW 46 showed very high gluten index (71) and moderate nutritional quality attributes *viz;* zinc (35.6 ppm), iron (44.2 ppm), copper (5.14 ppm) and manganese (40.1 ppm).

Salient quality attributes of DBW 51 as compared to best checks

Quality trait	DBW 51	Promising check varieties		
		NW 2036	HD 2985	DBW 14
Iron content	50.4	44.4	39.1	44.2
Chapati quality score	8.06	7.63	7.83	7.67
Biscuit spread factor	7.87	7.87	7.82	7.84
Protein Content (%)	14.4	12.2	12.1	13.4

The *per se* performance of DBW 51 could be attributed to its wider adaptability desirable plant height, heading and maturity duration and overall superiority for quality, resistance along with high yield potential.

Salient grain, quality and other morphological features of DBW 51

Parameter	Value
Days to heading	72 days
Days to maturity	107 days
Plant height	89 cm
1000- grain weight	39 g
Yield potential	52.1 q/ha

This genotype has shown resistance to both brown and yellow rusts under natural as well as artificial conditions. DBW 51 was found resistant against all the presently virulent pathotypes of yellow (46S 119 & 78S 84) and brown (77-5 & 104-2) rusts as supported by its adult plant response (APR) at Ludhiana and Delhi, locations, thereby indicating the presence of wide spectrum of genes to protect this genotypes for a longer time. The genotype has the highest tolerance level against leaf blight (23 score). In addition, DBW 51 has shown lowest incidence of loose smut (2.8) and acceptable level of Karnal Bunt (KB) and foliar head blight.

The registration of DBW 51 as a genetic stock especially for quality attributes will help as potential donor for improving nutritional qualities in future wheat genotypes and might reduce the problem of malnutrition.

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Salient grain, quality and other morphological features of DBW 46

Parameters	Value
Grain protein	11.80
Chapati quality (max score 10)	7.71
Bread loaf volume (ml)	573.00
Bread quality (max score 10)	7.22
Biscuit quality spread factor	7.85
Sedimentation value (ml)	50.00
Gluten index	71.00
Grain hardness index	74.00
Average plant height (cm)	98.00
Days to maturity (days)	122.00
1000 grain weight (g)	40.00

In view of the above merits, DBW 46 was found a suitable genotype for utilizing as a donor parent for improving yield, disease resistance, quality and variety of products.

6. HTW 6 (IC029007A; INGR11012), a Wheat (*Triticum aestivum* L) Germplasm, with Terminal Heat Tolerance; Suffers Only 7% Reduction in Thousand Grain Weight Under Heat Stress; 1000-Grain Weight (39 g) and HTW 11 (IC035117; INGR11013), a Wheat (*Triticum aestivum* L) Germplasm, with Terminal Heat Tolerance with Only 9% Reduction in 1000-Grain Weight Under Late Planting (heat stress); 1000-Grain Weight is 38 g (37-40 g) Under Heat Stress; The Heat Susceptibility Index is 0.83 and Heat Tolerance Index is 0.94

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HTW6: Terminal heat is one of the stress factors for wheat production. A significant wheat growing area in South Asia is affected by heat stress and majority of this area lies in Eastern Gangetic Plains, central and peninsular parts of India (Joshi *et al*., 2007a, b). Both the proximity to the equator and the popular rice-wheat cropping systems, which involve late sowing of wheat, are the major causes of exposure of wheat in India and other neighboring countries to high temperatures during grain filling (Rane *et al*., 2000). The threat of terminal heat stress is increasing due to global warming also. In order to meet the challenging temperature ahead of global warming, there is need to incorporate heat tolerance into wheat germplasm and develop genotypes which are suitable to such stressed environments. The indigenous wheat germplasm accessions which bear heat tolerance as well as reasonable thousand grain weight can be used directly in breeding programme targeting for stressed environments.

Seventy-seven germplasm accessions were evaluated for terminal heat tolerance under late planting during 2008-09. Fifteen heat tolerant and eight susceptible accessions were identified on the basis of heat sensitivity index and reduction in thousand grain weight under late planting. These accessions along with two checks WH 730 (Heat tolerant) and HUW 510 (Heat susceptible) were evaluated again during 2009-10 under late planting in field as well as temperature controlled polyhouse. The morpho-agronomic trats of the genotype are given in Table 1. It suffered less than 20% reduction in grain yield, 2.1% in thousand grain weight. The heat sensitivity and tolerance index of the accession was 0.13 and 1.03 respectively (Table 2).

The genotype was evaluated at four locations during 2010-11 under late planting. The data pooled over locations revealed that the genotype suffers 7% reduction in thousand grain weight (Table 3). Thousand grain weight under late sown conditions is 39g. The heat sensitivity and tolerance index under multilocation testing is 0.64 and 0.95 respectively (Table 4).

Salient grain, quality and other morphological features of DBW 46

Parameters	Value
Grain protein	11.80
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Bread loaf volume (ml)	573.00
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Table 1. Morpho-agronomic characteristics of IC029007A and IC035117

Trait	IC 29007 A	IC035117
Coleoptile colour	Green	Green
Growth habit	Semi Erect	Semi Erect
Auricle colour	Absent	Absent
Auricle pubescence	Medium	Absent
Waxiness Leaf sheath	Weak	Strong
Waxiness Leaf blade	Absent	Weak
Waxiness Ear	Absent	Absent
Waxiness Peduncle	Weak	Strong
Foliage Colour	Pale green	Green
Days to heading	95	97
Days to maturity	132	137
Plant height	105	121
Flag leaf attitude	Erect	Drooping
Thousand grain weight	45	43
Ear colour	White	White
Ear shape	Tapering	Parallel
Ear density	Dense	Dense

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Table 2. Average Increase/ decrease (%) in grain traits, grain growth duration over control under high temperature conditions and heat sensitivity index and heat tolerance index

GENOTYPE	Grain yield	Grain no./spike	Grain weight/spike	1000- grain weight	Grain growth duration	HSI	HTI
IC 28585	21.3	15.1	22.3	5.3	6.8	2.88	1.19
IC 28620 B	32.9	10.4	16.4	7.1	16.0	2.58	0.82
IC 28913	37.7	2.3	3.1	1.1	12.6	0.88	0.80
IC 28940 A	23.2	4.4	12.2	7.7	10.9	1.79	0.95
IC 28951 A	34.5	18.2	21.7	3.2	13.1	2.80	0.85
IC 29007 A	**19.1**	**-0.5**	**4.8**	**2.1**	**9.3**	**0.13**	**1.03**
IC 29017 A	24.2	4.6	11.3	-5.6	23.3	2.11	0.87
IC 29040	19.9	2.2	10.3	10.5	6.2	1.23	1.25
IC 32508 A	42.4	15.7	17.8	1.7	7.4	2.59	1.33
IC 35037	32.5	1.9	-13.9	-17.4	19.0	-2.18	0.57
IC 35117	**31.6**	**0.6**	**-1.4**	**-0.6**	**9.5**	**0.53**	**0.96**
IC 36725	47.6	5.7	6.5	10.1	11.3	0.36	0.70
IC 45437	5.0	3.1	1.2	-0.5	13.7	0.37	1.01
IC 47073 B	39.8	5.5	12.9	6.2	10.5	2.32	0.99
IC 47585 A	14.0	3.4	-1.8	-3.5	10.3	-0.72	0.90
IC 47793 A	17.8	4.9	8.8	6.3	9.9	1.26	0.99
IC 55665	22.4	-7.1	-1.8	6.1	4.0	-1.23	0.71
IC 55707 A	23.2	4.1	3.1	2.2	9.2	-0.57	0.84
IC55707 B	22.7	-16.7	-11.9	-0.9	9.4	-1.86	0.64
IC 57985	25.9	2.6	10.4	9.3	17.2	1.25	0.89
IC 59534	29.5	-11.0	4.7	11.5	16.0	0.25	0.79
IC 73598	40.8	-10.2	-5.6	5.4	11.0	-0.81	0.71
IC 78094 B	43.0	0.6	2.6	3.9	11.0	-0.08	1.10
HUW 510	37.5	17.6	23.9	11.4	4.4	3.15	0.89
WH 730	38.6	0.6	6.4	1.5	-5.4	0.96	0.99
Mean	29.1	4.3	6.6	3.4	11.0	1.07	0.90

Table 3. Data on average reduction in various traits under heat stress during 2010-11(Pooled over 4 locations)

Genotype	% Reduction in Germination							
	Germination	Grain filling duration	Plant height	Productive tillers	Grain yield	1000- grain weight	Grain number/ spike	Grain weight/ spike
IC 28913	20.7	19.2	13.3	17.4	42.2	19.8	20.4	34.6
IC 29007 A	6.1	15.0	6.3	36.6	28.4	**7.1**	**-2.9**	**7.5**
IC 29017 A	19.3	16.5	6.6	21.5	18.4	18.8	3.0	26.0
IC 35117	**5.6**	20.3	22.7	27.9	40.5	**9.3**	**10.3**	24.2
IC 45437	14.0	9.3	-10.6	20.5	19.6	3.7	11.9	26.6
IC 47585 A	5.7	13.4	14.1	29.6	37.4	21.4	29.7	45.5
IC 47793 A	31.1	23.4	18.3	33.7	25.3	8.1	23.5	38.3
IC 55665	7.4	19.2	7.6	34.7	30.4	12.2	8.0	25.5
IC 55707 A	10.6	9.0	16.4	22.3	22.5	11.8	12.4	28.8
IC55707 B	7.3	7.7	8.8	26.4	33.6	13.4	13.0	30.0
IC 59534	10.5	12.9	7.8	24.9	13.4	-3.8	19.8	15.8
IC 73598	6.2	24.0	13.5	29.2	21.4	7.6	23.5	23.4
WH 730	20.9	27.7	32.0	42.2	10.8	13.6	**8.8**	12.2
HUW 510	13.7	18.9	45.7	45.0	40.1	33.6	51.9	31.6

Table 4. Data on grain yield & 1000 grain weight under timely and late sown conditions and their heat susceptibility and heat tolerance index during 2010-11 (Pooled over locations)

Genotype	Timely sown		Late sown		Heat susceptibility index		Heat tolerance index	
	Grain yield	1000-grain wt.	Grain yield	1000- grain wt.	Grain yield	1000- grain wt.	Grain yield	1000- grain wt.
IC 28913	46.6	42.7	26.9	34.2	1.49	1.77	0.88	0.86
IC 29007 A	36.5	41.5	26.1	38.6	1.00	**0.64**	0.67	**0.95**
IC 29017 A	34.9	44.0	28.5	35.7	0.65	1.68	0.69	0.93
IC 35117	38.5	41.9	22.9	38.0	1.43	**0.83**	0.62	**0.94**
IC 45437	33.5	38.4	27.0	37.0	0.69	0.33	0.63	0.84
IC 47585 A	42.7	46.6	26.7	36.7	1.32	1.91	0.80	1.01
IC 47793 A	35.2	39.1	26.3	35.9	0.89	0.73	0.65	0.83
IC 55665	35.6	43.6	24.8	38.3	1.07	1.09	0.62	0.99
IC 55707 A	35.3	41.5	27.4	36.6	0.79	1.05	0.68	0.90
IC55707 B	37.7	41.0	25.0	35.5	1.19	1.20	0.66	0.86
IC 59534	36.0	32.7	31.2	33.9	0.47	-0.34	0.78	0.66
IC 73598	40.6	40.4	31.9	37.4	0.76	0.68	0.91	0.89
WH 730	32.0	42.2	28.5	36.5	**0.30**	**0.89**	0.65	0.87
HUW 510	45.7	45.0	27.0	30.0	1.75	2.30	0.70	0.78
SE	1.6	0.9	1.8	1.5				
5%LSD	4.7	2.5	5.0	4.2				

The genotype was evaluated at four locations during 2010-11 under late planting. The data pooled over locations revealed that the genotype suffers 9.3% reduction in thousand grain weight (Table 3). Thousand grain weight under late sown conditions is 38g (37–40g). The heat sensitivity and tolerance index under multilocation testing is 0.83 and 0.94 respectively (Table 4).

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Salient grain, quality and other morphological features of DBW 46

Parameters	Value
Grain protein	11.80
Chapati quality (max score 10)	7.71
Bread loaf volume (ml)	573.00
Bread quality (max score 10)	7.22
Biscuit quality spread factor	7.85
Sedimentation value (ml)	50.00
Gluten index	71.00
Grain hardness index	74.00
Average plant height (cm)	98.00
Days to maturity (days)	122.00
1000 grain weight (g)	40.00

In view of the above merits, DBW 46 was found a suitable genotype for utilizing as a donor parent for improving yield, disease resistance, quality and variety of products.

6. HTW 6 (IC029007A; INGR11012), a Wheat (*Triticum aestivum* L) Germplasm, with Terminal Heat Tolerance; Suffers Only 7% Reduction in Thousand Grain Weight Under Heat Stress; 1000-Grain Weight (39 g) and HTW 11 (IC035117; INGR11013), a Wheat (*Triticum aestivum* L) Germplasm, with Terminal Heat Tolerance with Only 9% Reduction in 1000-Grain Weight Under Late Planting (heat stress); 1000-Grain Weight is 38 g (37-40 g) Under Heat Stress; The Heat Susceptibility Index is 0.83 and Heat Tolerance Index is 0.94

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Trait	IC 29007 A	IC035117
Coleoptile colour	Green	Green
Growth habit	Semi Erect	Semi Erect
Auricle colour	Absent	Absent
Auricle pubescence	Medium	Absent
Waxiness Leaf sheath	Weak	Strong
Waxiness Leaf blade	Absent	Weak
Waxiness Ear	Absent	Absent
Waxiness Peduncle	Weak	Strong
Foliage Colour	Pale green	Green
Days to heading	95	97
Days to maturity	132	137
Plant height	105	121
Flag leaf attitude	Erect	Drooping
Thousand grain weight	45	43
Ear colour	White	White
Ear shape	Tapering	Parallel
Ear density	Dense	Dense

HTW 11: Terminal heat is one of the stress factors for wheat production. A significant wheat growing area in South Asia is affected by heat stress and majority of this area lies in Eastern Gangetic Plains, central and peninsular parts of India (Joshi *et al*., 2007a, b). Both the proximity to the equator and the popular rice-wheat cropping systems, which involve late sowing of wheat, are the major causes of exposure of wheat in India and other neighboring countries to high temperatures during grain filling (Rane *et al*., 2000). The threat of terminal heat stress is increasing due to global warming also. In order to meet the challenging temperature ahead of global warming, there is need to incorporate heat tolerance into wheat germplasm and develop genotypes which are suitable to such stressed environments. The indigenous wheat germplasm accessions which bear heat tolerance as well as reasonable thousand grain weight can be used directly in breeding programme targeting for stressed environments.

Seventy-seven germplasm accessions were evaluated for terminal heat tolerance under late planting during 2008-09. Fifteen heat tolerant and eight susceptible accessions were identified on the basis of heat sensitivity index and reduction in thousand grain weight under late planting. These accessions along with two checks WH 730 (Heat tolerant) and HUW 510 (Heat susceptible) were evaluated again during 2009-10 under late planting in field as well as temperature controlled polyhouse. The morpho-agronomic trats of the genotype are given in Table 1. It suffered less than 31.6% reduction in grain yield, -0.6% in thousand grain weight. The heat sensitivity and tolerance index of the accession was 0.53 and 0.96 respectively (Table 2).

Table 2. Average Increase/ decrease (%) in grain traits, grain growth duration over control under high temperature conditions and heat sensitivity index and heat tolerance index

GENOTYPE	Grain yield	Grain no./spike	Grain weight/spike	1000- grain weight	Grain growth duration	HSI	HTI
IC 28585	21.3	15.1	22.3	5.3	6.8	2.88	1.19
IC 28620 B	32.9	10.4	16.4	7.1	16.0	2.58	0.82
IC 28913	37.7	2.3	3.1	1.1	12.6	0.88	0.80
IC 28940 A	23.2	4.4	12.2	7.7	10.9	1.79	0.95
IC 28951 A	34.5	18.2	21.7	3.2	13.1	2.80	0.85
IC 29007 A	**19.1**	**-0.5**	**4.8**	**2.1**	**9.3**	**0.13**	**1.03**
IC 29017 A	24.2	4.6	11.3	-5.6	23.3	2.11	0.87
IC 29040	19.9	2.2	10.3	10.5	6.2	1.23	1.25
IC 32508 A	42.4	15.7	17.8	1.7	7.4	2.59	1.33
IC 35037	32.5	1.9	-13.9	-17.4	19.0	-2.18	0.57
IC 35117	**31.6**	**0.6**	**-1.4**	**-0.6**	**9.5**	**0.53**	**0.96**
IC 36725	47.6	5.7	6.5	10.1	11.3	0.36	0.70
IC 45437	5.0	3.1	1.2	-0.5	13.7	0.37	1.01
IC 47073 B	39.8	5.5	12.9	6.2	10.5	2.32	0.99
IC 47585 A	14.0	3.4	-1.8	-3.5	10.3	-0.72	0.90
IC 47793 A	17.8	4.9	8.8	6.3	9.9	1.26	0.99
IC 55665	22.4	-7.1	-1.8	6.1	4.0	-1.23	0.71
IC 55707 A	23.2	4.1	3.1	2.2	9.2	-0.57	0.84
IC55707 B	22.7	-16.7	-11.9	-0.9	9.4	-1.86	0.64
IC 57985	25.9	2.6	10.4	9.3	17.2	1.25	0.89
IC 59534	29.5	-11.0	4.7	11.5	16.0	0.25	0.79
IC 73598	40.8	-10.2	-5.6	5.4	11.0	-0.81	0.71
IC 78094 B	43.0	0.6	2.6	3.9	11.0	-0.08	1.10
HUW 510	37.5	17.6	23.9	11.4	4.4	3.15	0.89
WH 730	38.6	0.6	6.4	1.5	-5.4	0.96	0.99
Mean	29.1	4.3	6.6	3.4	11.0	1.07	0.90

Table 3. Data on average reduction in various traits under heat stress during 2010-11(Pooled over 4 locations)

Genotype	% Reduction in Germination							
	Germination	Grain filling duration	Plant height	Productive tillers	Grain yield	1000- grain weight	Grain number/ spike	Grain weight/ spike
IC 28913	20.7	19.2	13.3	17.4	42.2	19.8	20.4	34.6
IC 29007 A	6.1	15.0	6.3	36.6	28.4	**7.1**	**-2.9**	**7.5**
IC 29017 A	19.3	16.5	6.6	21.5	18.4	18.8	3.0	26.0
IC 35117	**5.6**	20.3	22.7	27.9	40.5	**9.3**	**10.3**	24.2
IC 45437	14.0	9.3	-10.6	20.5	19.6	3.7	11.9	26.6
IC 47585 A	5.7	13.4	14.1	29.6	37.4	21.4	29.7	45.5
IC 47793 A	31.1	23.4	18.3	33.7	25.3	8.1	23.5	38.3
IC 55665	7.4	19.2	7.6	34.7	30.4	12.2	8.0	25.5
IC 55707 A	10.6	9.0	16.4	22.3	22.5	11.8	12.4	28.8
IC55707 B	7.3	7.7	8.8	26.4	33.6	13.4	13.0	30.0
IC 59534	10.5	12.9	7.8	24.9	13.4	-3.8	19.8	15.8
IC 73598	6.2	24.0	13.5	29.2	21.4	7.6	23.5	23.4
WH 730	20.9	27.7	32.0	42.2	10.8	13.6	**8.8**	12.2
HUW 510	13.7	18.9	45.7	45.0	40.1	33.6	51.9	31.6

Table 4. Data on grain yield & 1000 grain weight under timely and late sown conditions and their heat susceptibility and heat tolerance index during 2010-11 (Pooled over locations)

Genotype	Timely sown		Late sown		Heat susceptibility index		Heat tolerance index	
	Grain yield	1000-grain wt.	Grain yield	1000- grain wt.	Grain yield	1000- grain wt.	Grain yield	1000- grain wt.
IC 28913	46.6	42.7	26.9	34.2	1.49	1.77	0.88	0.86
IC 29007 A	36.5	41.5	26.1	38.6	1.00	**0.64**	0.67	**0.95**
IC 29017 A	34.9	44.0	28.5	35.7	0.65	1.68	0.69	0.93
IC 35117	38.5	41.9	22.9	38.0	1.43	**0.83**	0.62	**0.94**
IC 45437	33.5	38.4	27.0	37.0	0.69	0.33	0.63	0.84
IC 47585 A	42.7	46.6	26.7	36.7	1.32	1.91	0.80	1.01
IC 47793 A	35.2	39.1	26.3	35.9	0.89	0.73	0.65	0.83
IC 55665	35.6	43.6	24.8	38.3	1.07	1.09	0.62	0.99
IC 55707 A	35.3	41.5	27.4	36.6	0.79	1.05	0.68	0.90
IC55707 B	37.7	41.0	25.0	35.5	1.19	1.20	0.66	0.86
IC 59534	36.0	32.7	31.2	33.9	0.47	-0.34	0.78	0.66
IC 73598	40.6	40.4	31.9	37.4	0.76	0.68	0.91	0.89
WH 730	32.0	42.2	28.5	36.5	**0.30**	**0.89**	0.65	0.87
HUW 510	45.7	45.0	27.0	30.0	1.75	2.30	0.70	0.78
SE	1.6	0.9	1.8	1.5				
5%LSD	4.7	2.5	5.0	4.2				

The genotype was evaluated at four locations during 2010-11 under late planting. The data pooled over locations revealed that the genotype suffers 9.3% reduction in thousand grain weight (Table 3). Thousand grain weight under late sown conditions is 38g (37–40g). The heat sensitivity and tolerance index under multilocation testing is 0.83 and 0.94 respectively (Table 4).

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7. KBRL76-3 (IC0589136; INGR11014), a Wheat (*Triticum aestivum* L.) Germplasm, with a Karnal Bunt Resistant Near Isogenic Line of Bread Wheat Variety PBW343

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The wheat line KBRL 76-3 is a Near Isogenic Line (NIL) of wheat variety PBW 343, which is resistant to Karnal Bunt disease of wheat. This disease is of great importance due to its implications on international wheat grain market. The wheat genotypes infested with this disease cannot be exported outside the country. Wheat variety PBW 343, a major variety in Indian context has shown susceptibility to Karnal Bunt. Thus incorporation of resistance to this disease became a primary objective, if wheat is to be exported. Resistance breeding has emerged as the only viable option for controlling the KB problem. A KB resistant stock KBRL 22 has already been identified and is best suited source for incorporation in to PBW 343. Thus a backcross approach and simultaneous screening for the disease resistant lines was adopted, with PBW 343 as recurrent parent. Using this method a large number of Near Isogenic Lines were developed in the background of PBW 343. KBRL 76-3 is one such line which is as high yielding as PBW 343 and also resistant to KB.

The parental variety PBW 343 was tested under All India Coordinated Wheat and Barley Improvement Programme (AICW&BIP) from 2005 to 2007 for Karnal Bunt resistance which showed that this genotype is affected by this disease. Also the NIL KBRL 76-3 when tested for resistance to this disease was found to be highly resistant. Also this line carries good agronomic characteristics and yield of PBW 343.

Therefore the line KBRL 76-3 can be used as the genetic stock for Karnal Bunt resistance along with its good agronomic characteristics, in future breeding programs. The multilocation evaluation of Near Isogenic Lines of PBW 343 during 2010-11 is given below:

Multilocation evaluation of Near Isogenic Lines of PBW 343

Entry	% KB incidence				
	Hisar	Ludhiana	Karnal	Dhaulakuan	Average
Near Isogenic Line 76	0	0	0	7.20	1.80
Near Isogenic Line 76-1	2.41	0	0	1.50	0.97
Near Isogenic Line 76-2	2.21	0	0	1.20	0.85
Near Isogenic Line 76-3	1.67	0	0	1.00	0.67
Near Isogenic Line 76-4	1.78	0	0	7.80	2.39

8. PT-0012 (IC0587711; INGR11015), a Pigeonpea (*Cajanus cajan*) Germplasm, with Early Maturity (133 days)

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Early maturing (133 days) genotype derived by crossing ICP-332 x BSMR-736.

Morpho-agronomic characteristics

Entries	Zone/ Maturity group	AVT-2 (2010-2011)			AVT-1 (2009-10)			IVT (2008-09)			Weighted mean			Yield % increase over the check		
		Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ ha)	Matu- rity days	100 seed (wt.)	UPAS 120	CORG 9701	GC 11-39
PT0012*	CZ/ (E)	1321	162	11.4	1727	153	10.9	1612	155	9.9	1547	157	10.7	21.7	48.5	31.7
UPAS 120		1065	149	8.9	1444	136	8.2	1332	144	8.5	1274	143	8.6	–	–	–
ICPL 87		1019	150	10.5	1072	136	9.8	1041	143	9.8	1042	143	10.0	–	–	–
GGT 101		907	155	12.0	1416	144	11.3	1232	152	10.9	1175	151	11.6	–	–	–

*Percent increase of grain yield over best check (UPAS 120) across CZ and SZ = 22.6

Entries	Zone/ Maturity group	AVT-2 (2010-2011)			AVT-1(2009-10)			IVT(2008-09)			Weighted mean			Yield % increase over the check		
		Yield (kg/ha)	Matu- rity days	100 seed (wt.)	Yield (kg/ha)	Matu- rity days	100 seed (wt.)	Yield (kg/ha)	Matu- rity days	100 seed (wt.)	Yield (kg/ha)	Matu rity days	100 seed (wt.)	UPAS 120	CORG 9701	GC 11-39
PT0012*	SZ/ (E)	1126	140	10.3	1268	133	11.3	1355	148	9.7	1258	141	10.4	24.6	40.6	55.3
PT 04-31		1099	147	9.7	1254	130	11.4	1239	151	10.00	1200	143	10.3	18.8	34.1	48.1
UPAS 120		932	129	8.7	950	129	9.9	1121	136	8.3	1010	132	8.9	–	–	–
CORG 9701		859	124	9.3	857	129	10.3	953	129	8.8	895	127	9.4	–	–	–
GC 11-39		859	133	9.5	732	134	12.4	832	130	10.0	810	132	10.6	–	–	–

*Percent increase of grain yield over best check (UPAS 120) across CZ and SZ = 22.6

Source: Annual. Prog. Rep. (2010-2011). All India Research Project on pigeonpea (ICAR). Annual group meet: 31st May to 2nd June, 2011 held at ANGRAU, Hyderabad (A.P.). 67p

Morphological characterization of pigeonpea variety Phule T 0012 on the basis of DUS test

Character	Salient features	Character	Salient features
Early plant vigour	Good	No. of pods per plant	230 to 415
Growth habit	Semi- spreading	Pod colour	Mixed, green & purple
Plant height(cm) at maturity	230-240cm	Pod form	Flat
Number of branches a) Primary :	5-7	Pod bearing length of branch	80-90cm
b) Secondary :	15-25	Pod hairiness	Pubescent
Stem colour	Green	Pod waxyness	Present
Stem thickness	Intermediate	No. of seeds/pod	3 to 4
Leaflet shape	Broad-elliptic	Seed colour	Reddish brown
Leaf hairiness	Pubescent	Seed shape	Globular
Days to 50 % flowering	90 to 105	100 seed weight(g)	10.6g to 11.4 g
Days to maturity	142 to 156 days	Biotic stress	Moderately resistant to wilt and sterility mosaic disease
Base flower colour	Yellow		
No. of flowers & pods per peduncle	1	Nematode resistance	Moderately resistant to root knot nematode (*M. incognita* and *M. javanica*) and cyst nematode (*H. cajani*).
Pattern of streaks on dorsal side of standard petal	Medium amount of streaks		
Flowering pattern	Indeterminate		

Associated Characters and cultivated practices

Early maturity (133 days), Average yield is 15.47q/ha. across the Central Zone and 12.58 q/ha. across the South Zone .Over all PT- 0012 recorded 22.60 % higher yield than the check UPAS-120 under Central and South Zone 43.00 q/ha. Bold seed size (11.0 g/100 seeds) with attractive red seed colour. Moderately resistant to *Fusarium* wilt, sterility mosaic and tolerant to pod borer, pod fly, root knot & cyst nematode.

References

Annual Progress Report on pigeonpea (2010-2011) All India Research Project on pigeonpea (ICAR), Annual group meet: 31st May to 2nd June, 2011 held at ANGRAU, Hyderabad (A.P.).

9. PT-04-31 (IC0587712; INGR11016), a Pigeonpea (*Cajanus cajan*) Germplasm, with Early Maturity (130 days)

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Early maturing (130 days), selection from ICP No. 13171.

Morpho-agronomic haracteristics

Entries	Zone/ Maturity group	AVT-2 (2010-2011)			AVT-1(2009-10)			IVT(2008-09)			Weighted mean			Yield % increase over the check		
		Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	UPAS 120	CORG 9701	GC 11-39
PT0012*	SZ/ (E)	1126	140	10.3	1268	133	11.3	1355	148	9.7	1258	141	10.4	24.6	40.6	55.3
PT 04-31		**1099**	**147**	**9.7**	**1254**	**130**	**11.4**	**1239**	**151**	**10.00**	**1200**	**143**	**10.3**	**18.8**	**34.1**	**48.1**
UPAS 120		932	129	8.7	950	129	9.9	1121	136	8.3	1010	132	8.9	–	–	–
CORG 9701		859	124	9.3	857	129	10.3	953	129	8.8	895	127	9.4	–	–	–
GC 11-39		859	133	9.5	732	134	12.4	832	130	10.0	810	132	10.6	–	–	–

*Percent increase of grain yield over best check (UPAS 120) across CZ and SZ = 22.6

Source: *Annual. Prog. Rep.* on pigeonpea (2010-2011). All India Research Project on pigeonpea (ICAR). Annual group meet: 31st May to 2nd June, 2011 held at ANGRAU, Hyderabad (A.P.).

Morphological characterization of pigeonpea variety Phule T 04-31 on the basis of DUS test

Character	Salient features	Character	Salient features
Early plant vigour	Good	Pod form	Flat
Growth habit	Semi- spreading	Pod bearing length of branch	75-80cm
Plant height(cm) at maturity	220-230 cm	Pod hairiness	Pubescent
Number of branches a) Primary :	6-7	Pod waxyness	Present
b) Secondary :	14-22	No. of seeds/pod	3 to 4
Stem colour	Green	Seed colour	Reddish brown
Stem thickness	Intermediate	Seed shape	Globular
Leaflet shape	Broad-elliptic	100 seed weight(g)	10.30 g
Leaf hairiness	Pubescent	Biotic stress	Moderately resistant to wilt and sterility mosaic disease
Days to 50% flowering	73 to 104		
Days to maturity	130 to151 days		
Base flower colour	Yellow	Nematode resistance	Moderately resistant to r oot knot nematode (*M. incognita, M. javanica*) and cyst nematode *(H. cajani*) and reniformis nematode (*R. reniformis*)
No. of flowers & pods per peduncle	1		
Pattern of streaks on dorsal side of standard petal	Medium amount of streaks		
Flowering pattern	Indeterminate		
No. of pods per plant	148 to 268 cm		
Pod colour	Mixed, green & purple		

Associated Characters and cultivated practices

Early maturity (133 days), Average yield is 15.47q/ha. across the Central Zone and 12.58 q/ha. across the South Zone .Over all PT- 0012 recorded 22.60 % higher yield than the check UPAS-120 under Central and South Zone 43.00 q/ha. Bold seed size (11.0 g/100 seeds) with attractive red seed colour. Moderately resistant to *Fusarium* wilt, sterility mosaic and tolerant to pod borer, pod fly, root knot & cyst nematode.

References

Annual Progress Report on pigeonpea (2010-2011) All India Research Project on pigeonpea (ICAR), Annual group meet: 31st May to 2nd June, 2011 held at ANGRAU, Hyderabad (A.P.).

9. PT-04-31 (IC0587712; INGR11016), a Pigeonpea (*Cajanus cajan*) Germplasm, with Early Maturity (130 days)

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Early maturing (130 days), selection from ICP No. 13171.

Morpho-agronomic haracteristics

Entries	Zone/ Maturity group	AVT-2 (2010-2011)			AVT-1(2009-10)			IVT(2008-09)			Weighted mean			Yield % increase over the check		
		Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	Yield (kg/ha)	Maturity days	100 seed (wt.)	UPAS 120	CORG 9701	GC 11-39
PT0012*	SZ/ (E)	1126	140	10.3	1268	133	11.3	1355	148	9.7	1258	141	10.4	24.6	40.6	55.3
PT 04-31		**1099**	**147**	**9.7**	**1254**	**130**	**11.4**	**1239**	**151**	**10.00**	**1200**	**143**	**10.3**	**18.8**	**34.1**	**48.1**
UPAS 120		932	129	8.7	950	129	9.9	1121	136	8.3	1010	132	8.9	–	–	–
CORG 9701		859	124	9.3	857	129	10.3	953	129	8.8	895	127	9.4	–	–	–
GC 11-39		859	133	9.5	732	134	12.4	832	130	10.0	810	132	10.6	–	–	–

*Percent increase of grain yield over best check (UPAS 120) across CZ and SZ = 22.6

Source: *Annual. Prog. Rep.* on pigeonpea (2010-2011). All India Research Project on pigeonpea (ICAR). Annual group meet: 31st May to 2nd June, 2011 held at ANGRAU, Hyderabad (A.P.).

Morphological characterization of pigeonpea variety Phule T 04-31 on the basis of DUS test

Character	Salient features	Character	Salient features
Early plant vigour	Good	Pod form	Flat
Growth habit	Semi- spreading	Pod bearing length of branch	75-80cm
Plant height(cm) at maturity	220-230 cm	Pod hairiness	Pubescent
Number of branches a) Primary :	6-7	Pod waxyness	Present
b) Secondary :	14-22	No. of seeds/pod	3 to 4
Stem colour	Green	Seed colour	Reddish brown
Stem thickness	Intermediate	Seed shape	Globular
Leaflet shape	Broad-elliptic	100 seed weight(g)	10.30 g
Leaf hairiness	Pubescent	Biotic stress	Moderately resistant to wilt and sterility mosaic disease
Days to 50% flowering	73 to 104		
Days to maturity	130 to151 days		
Base flower colour	Yellow	Nematode resistance	Moderately resistant to r oot knot nematode (*M. incognita, M. javanica*) and cyst nematode *(H. cajani*) and reniformis nematode (*R. reniformis*)
No. of flowers & pods per peduncle	1		
Pattern of streaks on dorsal side of standard petal	Medium amount of streaks		
Flowering pattern	Indeterminate		
No. of pods per plant	148 to 268 cm		
Pod colour	Mixed, green & purple		

Associated Characters and cultivated practices

Early maturity (130 days), high averages yield of 12.0 q/ha. High yield potential (43.00 q/ha), bold seed size (10.3 g/100 seeds). Attractive red seed colour and moderately resistant to *Fusarium* wilt, sterility mosaic and tolerant to pod borer, podfly, root knot and cyst nematode.

References

Annual. Progress Report on pigeonpea (2010-2011) All India Research Project on pigeonpea (ICAR), Annual group meet: 31st May to 2nd June, 2011 held at ANGRAU, Hyderabad (A.P.).

10. CRHG-6 (IC0587786; INGR11017), a Horsegram (*Macrotyloma uniflorum*) Germplasm, with Tolerant to Anthracnose

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Colletotrichum lindemuthianum is a major disease of horsegram and can infect other pulse crops like cow pea, blackgram, beans etc .The fungus may attack all plant parts if not controlled, at any stage of plant growth .Spots with dark centre and bight red with orange margines may occur more often on under surface of the leaf than on the upper surface and also occur on petioles and stems and may in severe case spread to pods results in yield losses. (Purushothaman *et al,* 2006. The disease incidence in the field can be managed with carbendazim 0.1% spray (Thakur and Khare 1990).

A mutant line, CRHG-6 developed by γ-ray's irradiation of K-42 seed showed tolerance to Anthracnose as evidenced by three years of testing by the National Network Research Project on Arid legumes along with National Checks viz; 2006-07, 2007-08 and 2008-09.

During 2006-07, CRHG-6 showed a disease of 1.4 rating which was better to that of all three checks *viz;* AK-21, PHG-9 and BJPL-1 with a rating of 1.7, 2.2 and 2.3 respectively. (Annual Progress Report, 2006-07, National Network Research Project on Arid Legumes, CAZRI, Jodhpur).

During 2007-08, CRHG-6 showed a rating of 4.6 while the checks AK-21, PHG-9 and BJPL-1 showed 4.2, 6.8 and 4.8 respectively. (PP 226 of Annual Progress Report, 2007-08, National Network Research Project on Arid Legumes, CAZRI, Jodhpur).

During 2008-09, CRHG-6 revealed a superior rating of 1.2 over the checks AK-21, PHG-9 and AK-42 with 3.2, 2.2 and 2.8 respectively. (PP 288 of Annual Progress Report, 2008-09, National Network Research Project on Arid Legumes, CAZRI, Jodhpur).

The three year testing revealed CRHG-6 to be better than the checks for tolerance to Anthracnose and hence can be a source of tolerance in future crop improvement programmes of the country.

Morpho-agronomic characters	Observations
Plant type	Semi Compact
Plant height (cm)	40
Branching Pattern	Semi erect
No of Branches/plant	4
Pods/plant (no)	32.6
Seeds/pod (no)	6
100 seed weight (g)	3
Seed colour	Brown
Associated Characters	
Days to 50% flowering	53
Days to to Maturity	96

References

Anonymous (2007) *Annual Prog. Rep.* (2006-07) National Network Research Project on Arid Legumes. CAZRI, Jodhpur, 247p.

Anonymous (2008) *Annual Prog. Rep.* (2007-08) National Network Research Project on Arid Legumes. CAZRI, Jodhpur, 226p.

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Purushothaman S, M Manichellappan, E Sreenivasan and K Karthikeyan (2006) Plant protection. *In:* D.Kumar (ed) *Horsegram in India.* pp 71-86.

Thakur MP and MN Khare (1990) Efficacy of different fungicides on the severity of mungbean anthracnose. *Indian J. Pulses Res.* **3:** 94-96.

Associated Characters and cultivated practices

Early maturity (130 days), high averages yield of 12.0 q/ha. High yield potential (43.00 q/ha), bold seed size (10.3 g/100 seeds). Attractive red seed colour and moderately resistant to *Fusarium* wilt, sterility mosaic and tolerant to pod borer, podfly, root knot and cyst nematode.

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10. CRHG-6 (IC0587786; INGR11017), a Horsegram (*Macrotyloma uniflorum*) Germplasm, with Tolerant to Anthracnose

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Colletotrichum lindemuthianum is a major disease of horsegram and can infect other pulse crops like cow pea, blackgram, beans etc .The fungus may attack all plant parts if not controlled, at any stage of plant growth .Spots with dark centre and bight red with orange margines may occur more often on under surface of the leaf than on the upper surface and also occur on petioles and stems and may in severe case spread to pods results in yield losses. (Purushothaman *et al,* 2006. The disease incidence in the field can be managed with carbendazim 0.1% spray (Thakur and Khare 1990).

A mutant line, CRHG-6 developed by γ-ray's irradiation of K-42 seed showed tolerance to Anthracnose as evidenced by three years of testing by the National Network Research Project on Arid legumes along with National Checks viz; 2006-07, 2007-08 and 2008-09.

During 2006-07, CRHG-6 showed a disease of 1.4 rating which was better to that of all three checks *viz;* AK-21, PHG-9 and BJPL-1 with a rating of 1.7, 2.2 and 2.3 respectively. (Annual Progress Report, 2006-07, National Network Research Project on Arid Legumes, CAZRI, Jodhpur).

During 2007-08, CRHG-6 showed a rating of 4.6 while the checks AK-21, PHG-9 and BJPL-1 showed 4.2, 6.8 and 4.8 respectively. (PP 226 of Annual Progress Report, 2007-08, National Network Research Project on Arid Legumes, CAZRI, Jodhpur).

During 2008-09, CRHG-6 revealed a superior rating of 1.2 over the checks AK-21, PHG-9 and AK-42 with 3.2, 2.2 and 2.8 respectively. (PP 288 of Annual Progress Report, 2008-09, National Network Research Project on Arid Legumes, CAZRI, Jodhpur).

The three year testing revealed CRHG-6 to be better than the checks for tolerance to Anthracnose and hence can be a source of tolerance in future crop improvement programmes of the country.

Morpho-agronomic characters	Observations
Plant type	Semi Compact
Plant height (cm)	40
Branching Pattern	Semi erect
No of Branches/plant	4
Pods/plant (no)	32.6
Seeds/pod (no)	6
100 seed weight (g)	3
Seed colour	Brown
Associated Characters	
Days to 50% flowering	53
Days to to Maturity	96

References

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Purushothaman S, M Manichellappan, E Sreenivasan and K Karthikeyan (2006) Plant protection. *In:* D.Kumar (ed) *Horsegram in India.* pp 71-86.

Thakur MP and MN Khare (1990) Efficacy of different fungicides on the severity of mungbean anthracnose. *Indian J. Pulses Res.* **3:** 94-96.

11. CRHG-8 (IC0587788; INGR11018), a Horsegram (*Macrotyloma uniflorum*) Germplasm, with High Fodder Yield

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Horsegram [(*Macrotyloma uniflorum* (Lam.)Verdc.)] is an important drought resistant dual purpose crop cultivated mainly in the tropics (Asha, *et al*, 2006). The biomass of Horsegram is highly nutrition and is used as fodder for cattle and buffalows. Horsegram hey commonly known bhusa usually fed to cattle is also highly palatahle along with nutrition. A mutant line CRHG-8 was developed by γ-ray irradiation of K-42 resulting in high fodder yield. In breeding programmes, the crop needs to be improved not only as a pulse, but also as a forage plant (Hanet, 2001). This variety was tested during the years 2005-06 and 2006-07 by the National Network Research Project on Arid legumes along with National Checks. During 2005-06, CRHG-8 showed highest fodder yield of 1332.0 kg/ha when tested over four southern locations of India, while the checks AK-21, AK-42 and PHG-9 yielded 929.8, 568.3 and 531.0 kg/ha respectively showing significantly superior fodder yield. (PP 117 of Annual Progress Report of National Network Research Project on Arid Legumes, 2005-06). During 2006-07, CRHG-8 revealed a fodder yield of 590 kg/ha, while the checks AK-42 and PHG-9 showed 518 and 586 kg/ha respectively. (PP 115 of Annual Progress Report of National Network Research Project on Arid legumes 2006-07).

The results have shown that CRHG-8 can be a source of high fodder yield in future crop improvement programmes.

Morpho-agronomic characteristics

Morpho-agronomic Characters recorded	Observations
Plant type	Compact
Plant height (cm)	40
Branching Pattern	erect
No of Branches/plant	5
Pods/plant (no)	24
Seeds/pod (no)	4.5
100 seed weight (g)	3.3
Seed colour	Brown
Associated Characters	
Days to 50% flowering	53
Days to to Maturity	99

References

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Hanet P (2001) *Mansfelds Encyclopedia of Agricultural and Horticultural Crops* (Except Ornamentals), Spinger, Berlin.

12. PT-03-142 (IC0588674; INGR11019), a Pigeonpea (*Cajanus cajan*) Germplasm, with Resistance to Wilt and Sterility Mosaic

GP Deshmukh

Pulses Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri-413722, Maharashtra (E-mail: gpdpulses@gmail.com)

The two diseases *viz*., *fusarium* wilt and sterility mosaic are important in Pathology. To overcome this, one of resistant genotype in breeding programme is essential. The genotype PT-03-142 is such a genotype having resistant to both of these diseases. It is medium late maturing genotype (195 days) with resistance to wilt and sterility mosaic

Morpho-agronomic characteristics of PT-03-142

Entries	Year	Yield (kg/ha)	Maturity days	Plant height	Plant spread	No. of branches/ plant	Pods/plant	100- seed wt.
PT-03-142	2004-05	2292	207	236.60	45.60	14	159	11.10
	2006-07	1975	183	242.30	80.50	11	246	10.80
	2007-08	2928	195	276.30	44.30	13	388	11.70
	Mean	2398.33	195	251.73	56.80	12.66	264.33	11.20

Per cent incidence of *Fusarium* wilt and sterility mosaic on Phule Tur -03-142 in wilt sick plot and sterility mosaic disease nursery during the following years.

Entries	Year	Wilt (%)	SM (%)
PT-03-142	2004-05	0.00	0.00
	2006-07	6.11	3.77
	2007-08	9.77	8.66
	2008-09	8.18	9.52
	2009-10	0.00	7.90
	Mean	4.81	5.97
ICP-2376 (Wilt Susceptible check)		100	--
ICP-8863 (SM Susceptible check)		--	100

Morphological characterization of Pigeonpea variety: Phule T 03-142.

Sr. No.	Character	Salient features
1	Early plant vigour	Good
2	Growth habit	spreading
3	Plant height (cm) at maturity	220-230 cm
4	Number of branches a) Primary : b) Secondary :	6-7 14-22
5	Stem colour	Green
6	Leaflet shape	Broad-elliptic
7	Leaf hairiness	Pubescent
8	Days to maturity	195 days
9	Base flower colour	Yellow
10	No. of flowers & pods/peduncle	1
11	Pattern of streaks on dorsal side of standard petal	Medium amount of streaks
12	Flowering pattern	Indeterminate
13	No. of pods/plant	159 to 388 cm
14	Pod colour	Mixed, green & purple
15	Pod form	Flat
16	Pod bearing length of branch	75-80cm
17	Pod hairiness	Pubescent
18	Pod waxyness	Present
19	No. of seeds/pod	3 to 4
20	Seed colour	Reddish brown
21	Seed shape	Globular
22	100- seed weight(g)	11.20 g
23	Biotic stress	Resistant to wilt and sterility mosaic disease

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13. PRR 2007-1 (IC0589127; INGR11020), a Ricebean (*Vigna umbellata*) Germplasm, with Narrow Leaf; Early Maturity; Determinate Growth Habit

M Dutta
Germplasm Evaluation Division, National Bureau of Plant Genetic Resources, New Delhi-110012 (E-mail: manoranjandutta@rediffmail.com)

The plant is having narrow leaf, early maturing, determinate growth habit and moderate yield.

14. PPR 2007-2 (IC0589128; INGR11021), a Ricebean (*Vigna umbellata*) Germplasm, with Narrow Leaf; Early Maturity

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The plant having narrow leaf and early maturing habit.

15. AKG 18-1 (IC0587384; INGR11022), a Groundnut (*Arachis hypogaea*) Germplasm, with Multi-foliate Leaves, 5-8 Leaflets in 30% of Leaves, Reticulated Two Seeded Pods

SN Deshmukh, MY Ladole and NS Shrikhandkar
Dr Panjbrao Deshmukh Krishi Vidyapeeth, Akola-444104, Maharashtra (E-mail: srsoilseeds@pdkv.ac.in)

A Spanish groundnut mutant with multifoliate leaves. Derived from the cross Jyoti x EC76446 (292), this mutant exhibits multifoliate leaves on the upper portion of the main stem and primary branches. The mutant bred true in the next season, 30% of leaves having 5-8 leaflets/petiole.

16. Cardozo Mankurad (IC587716; INGR11023), a Mango (*Mangifera indica*) Germplasm, with Regular Bearing Nature, Attractive Fruit Colour and Bigger Fruit Size, Higher Contents of Fibers, Pulp, Higher Fruit Yield and Better Shelf Life

AB Cardozo, PA Mathew, DG Dhandar, AR Desai, NP Singh, Fausto Cardozo, Ivo Coardozo and Maria Do Ceu Cardozo
ICAR Research Complex for Goa, ELA, Old Goa-403402 (E-mail: desaiavars@gmail.com)

Among several mango varieties of Goa, "Mankurad" is the most popular variety in the state (Desai and Dhandar, 2000). Due to continuous stone-propagation of Mankurad variety for several decades, there exists tremendous variability having desired traits within the population of this variety. Cardozo Mankurad is one such chance seedling selected for several superior characters over the parental variety (Dhandar *et al.*, 1997). This important germplasm was located in a homestead garden of Cardoso family in Mapusa city of Bardez Taluka in North Goa and selected for its regular bearing tendency, attractively coloured fruits with higher contents of fibreless pulp and better storage quality (Mathew and Dhandar, 1997). Clonal progeny was developed from the mother tree

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and evaluated at ICAR Research Complex for Goa, for validating the desired traits. Progeny orchard of this new selection is being developed at ICAR Research Complex for Goa, Old Goa. Morpho-agronomic Characteristics of the new selection are presented here in the table.

S. No.	Trait	Mankurad (parent)	Cardozo Mankurad (Selection)
1.	Bearing	Alternate to irregular	Regular
2.	Yield	Medium	Heavy
3.	Fruit size	Small to medium (278.0 g)	Medium to large (320.0 g)
4.	Fruit skin colour	Yellowish orange with pink blush, seen mostly on ventral shoulder	Yellowish orange with deep pink seen on both shoulders or throughout.
5.	Fruit pulp		
a	Texture	Melting	Firm, melting
b	Aroma	Strong aromatic	Aromatic (Rose)
c	Colour	Yellowish orange	Deep Orange
d	Fibre	Scanty	None
e	Flesh (%)	75.98	78.29
f	TSS	21.0 ° Brix	22.0 – 25.0 ° Brix
6	Quality	Excellent	Excellent
7	Shelf life	Poor (3days)	Better (about one week)
8	Stone weight (g)	28.5	22.67

The soft wood grafting is a suitable propagation method for multiplication of grafts of this promising selection. One to one and half-year old grafts can be used for planting in the main field. The pits of one cubic metre size spaced at 10 m x 10 m distance are to be filled with top soil mixed with 15 kg FYM, 1.0 kg mussorie phosphate and 1.0 kg neem cake well before planting and kept ready for planting with onset of monsoon.

After one year, first year fertilizer dose of 150:50:50g of N, P_2O_5 and K_2O along with 10 kg/graft of FYM has to be applied to each young graft. Doubled quantity of nutrients should be applied for two year old grafts and from third year onwards, the first year dose be added to the previous year's dose till 9th year. For ten year old trees, nutrients comprising of 1500 g N, 500 g P_2O_5 and 500 g of K_2O along with 50 kg/tree of FYM need to be applied for better performance. Full dose of recommended nutrients has to be given in circular rings, 0.5-2.0 m away from the trunk, in the month of August for rainfed gardens and incorporated into soil. The trees of Cardozo Mankurad commence flowering during November-December and fruits become ready for harvesting during March-April. About 1500-2000 fruits may be harvested from each tree at tenth year and onwards. The grafts of this new selection are in great demand in the state, especially for taking up new commercial plantations.

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17. CISH J – 42 (IC0587714; INGR11024), a Jamun (*Syzygium cuminii*) Germplasm, with Seedlessness and Pulp Content (97-98%) and High TSS (14-15º Brix)

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Seedless accession of jamun was selected by Central Institute for Subtropical Horticulture, Lucknow during 2008 in a survey conducted for selecting best Jamun genotypes from the country. The seedless jamun accession CISH J-42 was identified in wild road side avenues at Navgarh road (Near Vindhya Hills), Chakia, Chandauli, U.P. Its uniqueness lies in seedlessness (rudimentary seed). It was multiplied by softwood grafting and established in the field gene bank.

The superiority of the accession is due to rudimentary seed leading to seedlessness in fruit, with high pulp content (97-98 %) and fairly high TSS (14-16º Brix). The seedlessnes imparts great processing potential and product diversification opportunity for Jamun. Enhanced shelf-life 5-7 days of fruits at ambient temperature as compared to 3-4 days of local types make the accession commercially important.

and evaluated at ICAR Research Complex for Goa, for validating the desired traits. Progeny orchard of this new selection is being developed at ICAR Research Complex for Goa, Old Goa. Morpho-agronomic Characteristics of the new selection are presented here in the table.

S. No.	Trait	Mankurad (parent)	Cardozo Mankurad (Selection)
1.	Bearing	Alternate to irregular	Regular
2.	Yield	Medium	Heavy
3.	Fruit size	Small to medium (278.0 g)	Medium to large (320.0 g)
4.	Fruit skin colour	Yellowish orange with pink blush, seen mostly on ventral shoulder	Yellowish orange with deep pink seen on both shoulders or throughout.
5.	Fruit pulp		
a	Texture	Melting	Firm, melting
b	Aroma	Strong aromatic	Aromatic (Rose)
c	Colour	Yellowish orange	Deep Orange
d	Fibre	Scanty	None
e	Flesh (%)	75.98	78.29
f	TSS	21.0 ° Brix	22.0 – 25.0 ° Brix
6	Quality	Excellent	Excellent
7	Shelf life	Poor (3days)	Better (about one week)
8	Stone weight (g)	28.5	22.67

The soft wood grafting is a suitable propagation method for multiplication of grafts of this promising selection. One to one and half-year old grafts can be used for planting in the main field. The pits of one cubic metre size spaced at 10 m x 10 m distance are to be filled with top soil mixed with 15 kg FYM, 1.0 kg mussorie phosphate and 1.0 kg neem cake well before planting and kept ready for planting with onset of monsoon.

After one year, first year fertilizer dose of 150:50:50g of N, P_2O_5 and K_2O along with 10 kg/graft of FYM has to be applied to each young graft. Doubled quantity of nutrients should be applied for two year old grafts and from third year onwards, the first year dose be added to the previous year's dose till 9th year. For ten year old trees, nutrients comprising of 1500 g N, 500 g P_2O_5 and 500 g of K_2O along with 50 kg/tree of FYM need to be applied for better performance. Full dose of recommended nutrients has to be given in circular rings, 0.5-2.0 m away from the trunk, in the month of August for rainfed gardens and incorporated into soil. The trees of Cardozo Mankurad commence flowering during November-December and fruits become ready for harvesting during March-April. About 1500-2000 fruits may be harvested from each tree at tenth year and onwards. The grafts of this new selection are in great demand in the state, especially for taking up new commercial plantations.

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17. CISH J – 42 (IC0587714; INGR11024), a Jamun (*Syzygium cuminii*) Germplasm, with Seedlessness and Pulp Content (97-98%) and High TSS (14-15º Brix)

AK Singh, A Bajpai and H Ravishankar

Central Institute for Subtropical Horticulture, Rehmankhera, P.O. Kakori, Lucknow-227107, Uttar Pradesh (E-mail: singhakcish@gmail.com)

Seedless accession of jamun was selected by Central Institute for Subtropical Horticulture, Lucknow during 2008 in a survey conducted for selecting best Jamun genotypes from the country. The seedless jamun accession CISH J-42 was identified in wild road side avenues at Navgarh road (Near Vindhya Hills), Chakia, Chandauli, U.P. Its uniqueness lies in seedlessness (rudimentary seed). It was multiplied by softwood grafting and established in the field gene bank.

The superiority of the accession is due to rudimentary seed leading to seedlessness in fruit, with high pulp content (97-98 %) and fairly high TSS (14-16º Brix). The seedlessnes imparts great processing potential and product diversification opportunity for Jamun. Enhanced shelf-life 5-7 days of fruits at ambient temperature as compared to 3-4 days of local types make the accession commercially important.

Morpho-agronomic characteristics

The identified accession is 10-11.5 m tall, trunk girth being 1.50 m, with canopy spread E-W 10.20 m and N-S 11.70 m in the indigenous state, yield is 180-250 kg/ tree (age being 65 years old) and mid season maturity falling during the second week of June. The fruit is round shaped and has average weight 6.87 g, length 2.57 cm, pulp 97.9 per cent, TSS 14.7º Brix, ascorbic acid 34.14 mg/100g and total antioxidant value 15.54 mg AEAC/g of fresh weight and shelf life of 5-7 days at ambient temperature (Singh *et al.*, 2009).

Associated characters and cultivated practices

The jamun tree occurs in the tropical and sub-tropical climates under a wide range of environmental conditions. Due to wider adaptability jamun is valuable for reforestation programmes. It is hardy and can tolerate both short periods of drought as well as heavy rainfall and can also withstand floods (Chovatia and Singh, 2000). It can be grown successfully in semi-arid subtropical regions with an annual rainfall varying from 350 to 500 mm. However, in early periods of growth, protection from frost is needed. Its cultivation can be introduced in arid and semiarid, resource-poor and wasteland areas where other crops are difficult to grow. It requires dry weather at the time of flowering and fruit setting. In sub-tropical areas, early rain is beneficial for proper development of fruit size, colour, maturity and taste. Vigorous growth and high yield, however, could be obtained only when grown on deep loam and well drained soils that have the capacity to retain good soil moisture.

Reference

Chovatia RS and SP Singh (2000) Effect of time on budding and grafting success in jamun (*Syzygium cuminii* Skeels). *Indian J. Hort.* **57:** 255-258.

Singh AK, A Bajpai and H Ravishankar (2009) National Network Project on Underutilized Fruits. *Annual. Prog. Rep.,* Central Institute for Subtropical Horticulture, Lucknow.

18. CISH J-37 (IC0587715; INGR11025), a Jamun (*Syzygium cuminii*) Germplasm, with Bold Fruit and High Pulp Quality (Pulp Content 90-92% and TSS 16-17º Brix)

AK Singh, A Bajpai and H Ravishankar

Central Institute for Subtropical Horticulture, Rehmankhera, P.O. Kakori, Lucknow-227107, Uttar Pradesh (E-mail: singhakcish@gmail.com)

An elite and superior bold type jamun was identified by Central Institute for Subtropical Horticulture, Lucknow during exploration carried out in 2006. The jamun accession CISH J–37 (Syzygium cuminii Skeels) selected from Gaderiankhera, Lucknow, U.P. on road side avenue. This accession has superiority due to its bold large sized bunches with attractive deep purple colour. High pulp: seed ratio (90–92 %) and TSS (16–17º Brix) are other key features of this accession.

Morpho-agronomic characteristics

The identified tree was 12–15 m tall with trunk girth 1.95 m, canopy spread E–W and N–S being 14.10 m and 12.70 m respectively. The accession is high yielder (200–300 kg plant^{-1}) of about 45 years old and mid season maturity during the second week of June. The fruit is bold, oblong and has average weight of 24.05 g, length 3.90 cm, diameter 3.03 cm, pulp (92.26 %), TSS (16.4 ºBrix). High nutraceutical benefits accrue from this accession due to relatively high ascorbic acid (49.88 mg/100g) and total antioxidant value (38.30 mg AEAC/g) (Singh *et al.*, 2009).

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19. DWS-327 (IC0588697; INGR11026), an Ashwagandha (*Withania somnifera*) Germplasm, with Dwarf Plant Type

P Manivel, V Kumar, NA Gajbhiye and S Maiti
Directorate of Medicinal & Aromatic Plant Research, Boriavi, Anand-387310, Gujarat
(E-mail: manivelp@yahoo.com)

Ashwagandha (*Withania somnifera*) is an important medicinal herb also known as Indian ginseng, belong to the family Solanaceae. The medicinal properties of this plants is attributed due to the presence of several classes of withanolides, steroidal lactones, which are widely used; as an antioxidant, adaptogen, aphrodisiac, anti-inflammatory agent and recently proved to combat against ulcer, arthritis, venom toxine and cancer like diseases. It is being cultivated in India as post rainy season crop (August sowing and harvesting in March). So for only two varieties (JA 20 and JA 13405) have been released for commercial cultivation through AICRMAP. Both these varieties are longer duration (6-7 months). The demand for this crop is increasing both in national and international market. Hence, the demand has to be mainly met out through developing high yielding, dwarf and early maturing varieties with high active ingredients. At DMAPR, Anand a dwarf pure line DWS 327 with plant hight of less than 30 cm which mature by 120-130 days and having high withanolide-A content (>1.75 mg g^{-1} dry weight) as compared to its parent JA 134 (0.477 mg g^{-1} dry weight) has been identified. The genetic diversity studies of the selected pure lines (along with its parent JA 134) using molecular markers (RAPD) indicated the line DWS 327 is genetically divergent from all other pure lines including its parent. Hence, this could be used as variety after assessing its performance in multilocation trails and also as parent in the hybridization programme to develop high yielding and early maturing varieties with high 'Withonolide-A' content.

20. DMRHO 57 (IC0589137; INGR11027), a Maize (*Zea mays*) Germplasm, with High Oil Line (6.34%)

R Sai Kumar, JC Shekhar, J Kaul, S Dass, D Pal, P Shanti and SK Vasal
Directorate of Maize Research, Pusa Campus, New Delhi-110012
(E-mail: kauljyoti1@yahoo.co.in)

With the urbanization, specialty corn has gained a great acceptability among the masses. With rapid changes in life style, popcorn is gaining its market in India. High oil corn with added advantages in feed ration has significant importance as cooking oil due to high level of unsaturated fatty acid in it. Over the years, the demand for specialty corn in Indian market is increasing. The composites of popcorn that have been released so far have low productivity and hence not accepted by the farmers. Till now in India no high oil variety/hybrid is available. Hence, the thrust is on the development of high yielding Single Cross Hybrids of specialty corn meeting international standards in quality parameters. Keeping all this in mind, DMR is involved in developing desirable maize germplasm for specialized purposes which would augment the breeding program of the entire country.

It is derived from Tempx Trop (HO) QPM-B-B-B-57-B-B (exotic germplasm) after 7-8 years of inbreeding

grown on deep loam and well drained soils but have the capacity to retain good soil moisture.

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It is derived from Tempx Trop (HO) QPM-B-B-B-57-B-B (exotic germplasm) after 7-8 years of inbreeding

following by ear-to-row selection at Directorate of Maize Research, Indian Agricultural Research Institute, Pusa campus, New Delhi.

DMRHO-57 is late maturing, medium stature plant type with medium long cob. This line flowers in 57-60 days under Delhi conditions. This line is rich in oil content (6.34%). Based on the two year data the oil content of DMRHO 57 was higher by 5.67% and 5.31% over the two previously registered high oil inbred lines HKI-(T) and HKI-6, respectively. It has dense tassel branches and is a good pollen shedder. The anthocyanin colouration of both anthers and silk are present. The grain row arrangement is irregular and the anthocyanin colour of glume is white. It has very attractive yellow flint grains.

21. DMRE-9 (IC0589141; INGR11028), a Maize (*Zea mays*) Germplasm, as an Inbred Line as Source of Resistance to Pink Borer, *Sesamia inferans*

JC Shekhar, P Kumar, R Sai Kumar, J Kaul, S Rakshit, S Dass and SK Vasal
Directorate of Maize Research, Pusa Campus, New Delhi-110012
(E-mail: kauljyoti1@yahoo.co.in)

A late maturing line derived from WNZPBTL 3 after 7-8 years of inbreeding following by ear-to-row selection at Directorate of Maize Research, Indian Agricultural Research Institute, Pusa campus, New Delhi.

DMRE-9 is medium stature plant type with medium size cob. The line is late maturing and flowers in 57-62 days under Delhi conditions. The four year data with respect to pink borer reaction revealed that line has shown consistently very high level of resistance against the susceptible check CM 300. The mean leaf injury for Pink borer in DMRE-9 ranged from 2.5 to 3.2 with a mean of 2.72. Thus can be utilized as a source of stable resistance against the above mentioned insect for development of insect free hybrids. It has sparse tassel branches and is a good pollen shedder. The grain row arrangement is straight and the anthocyanin colour of glume is purple. The anthocyanin colouration of both anthers and silk are present.

22. DMRE-57 (IC0589142; INGR11029), a Maize (*Zea mays*) Germplasm, as an Extra-early Line as Source of Resistance to Pink Borer, *Sesamia inferans*

JC Shekhar, P Kumar, R Sai Kumar, J Kaul, S Rakshit, S Dass and SK Vasal
Directorate of Maize Research, Pusa Campus, New Delhi-110012
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An early maturing line derived from WNZPBTL-6 after 7-8 years of inbreeding following by ear-to-row selection at Directorate of Maize Research, Indian Agricultural Research Institute, Pusa campus, New Delhi.

DMRE-57 is medium stature plant type with medium size cob. This is an extra-early line (flowers in 43-45 days) with dense tassel branches and is a good pollen shedder. The four year data with respect to pink borer reaction revealed that line has shown consistently very high level of resistance against the susceptible check CM 300. The mean leaf injury for Pink borer in DMRE-57 ranged from 3.0 to 3.5 with a mean of 3.17. Thus, can be utilized as a source of stable resistance against the above mentioned insect for development of insect free hybrids. The grain row arrangement is straight and the anthocyanin colour of glume is white. The anthocyanin colouration of both anthers and silk are absent.

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21. DMRE-9 (IC0589141; INGR11028), a Maize (*Zea mays*) Germplasm, as an Inbred Line as Source of Resistance to Pink Borer, *Sesamia inferans*

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22. DMRE-57 (IC0589142; INGR11029), a Maize (*Zea mays*) Germplasm, as an Extra-early Line as Source of Resistance to Pink Borer, *Sesamia inferans*

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23. DPcl-10 (IC0589143; INGR11030), a Maize (*Zea mays*) Germplasm, a Popcorn Line with High Poppiness

JC Shekhar, R Sai Kumar, S Venkatesh, J Kaul and S Dass
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A late maturing line derived from WINPOP-8 after 7-8 years of inbreeding following by ear-to-row selection at Directorate of Maize Research, Indian Agricultural Research Institute, Pusa campus, New Delhi.

DPcl-10 is short stature plant type with long cob. It has sparse tassel branches and a good pollen shedder which is a merit of good pollinator. This line is late maturing and flowers in 56-58 days under Delhi conditions. The anthocyanin colouration of both anthers and silk are present. The grain row arrangement is straight and the anthocyanin colour of glume is white. It has attractive yellow round grains with 1000 kernel weight (gm) in the range of 100-150 and the mean as 139.6. DPcl-10 is a popcorn line and shows 100% poppiness.

Pink borer is a pest that infests maize during *rabi* season. With the development of late maturing Single Cross Hybrids, winter maize is gaining significant importance in India; the area under the winter maize is on the increase. Hence, pink borer tolerant germplasm is urgently sought.

24. BSBS-151 (IC0383192; INGR11031), a Dolichos bean (*Lablab purpureus*) Germplasm, with resistance to aphids (*Aphis craccivora*) and Anthracnose (*Colletotrichum lindemuthianum*)

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Dolichos bean/ hyacinth bean/ lablab bean extensively cultivated in the tribal areas as well as in the plains of india is a popular vegetable which is a source of dietary protein. The main biotic constraints to increased production and productivity of dolichos bean are anthracnose (Rajesha, 2009) and aphids (Rekha and Mallapur, 2007), the incidence of which result in severe losses to both yield and quality of the pods and are major constraints in dolichos bean production.

Dolichos bean germplasm and field screening

Considering the importance of these two serious biotic constraints and the significance of identification of sources of resistance, 100 accessions of dolichos bean germplasm originated from South East Coastal India were screened in an augmented block design with RND-1 as a check variety in the Kharif season of 2003-04 and 2004-05 at NBPGR Reg. Station, Rajendranagar, Hyderabad. The weekly data on incidence of aphids and anthracnose manifestation was recorded on the germplasm.

Screening against aphids

The reaction of the genotypes based on the severity of aphid incidence was assessed by a visual rating on 0 - 9 scale with 15 genotypes recording nil incidence and the check variety RND-1 found to be highly susceptible with 7 and 9 ratings respectively during 2003-04 and 2004-05. Accession IC383192 was one among the 15 promising accessions with no aphid incidence considering the screening results for both the years.

Screening against anthracnose

The reaction of the genotypes based on the severity of anthracnose incidence was assessed by visual rating on 0-5 scale with 6 and 4 genotypes recording nil incidence and the check variety RND-1 found to be highly susceptible with 4 and 2 ratings respectively during 2003-04 and 2004-05. Accession IC383192 was one among the nine accessions promising with either 0 or 1 rating considering the screening results for both the years.

23. DPcl-10 (IC0589143; INGR11030), a Maize (*Zea mays*) Germplasm, a Popcorn Line with High Poppiness

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Directorate of Maize Research, Pusa Campus, New Delhi-110012
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A late maturing line derived from WINPOP-8 after 7-8 years of inbreeding following by ear-to-row selection at Directorate of Maize Research, Indian Agricultural Research Institute, Pusa campus, New Delhi.

DPcl-10 is short stature plant type with long cob. It has sparse tassel branches and a good pollen shedder which is a merit of good pollinator. This line is late maturing and flowers in 56-58 days under Delhi conditions. The anthocyanin colouration of both anthers and silk are present. The grain row arrangement is straight and the anthocyanin colour of glume is white. It has attractive yellow round grains with 1000 kernel weight (gm) in the range of 100-150 and the mean as 139.6. DPcl-10 is a popcorn line and shows 100% poppiness.

Pink borer is a pest that infests maize during *rabi* season. With the development of late maturing Single Cross Hybrids, winter maize is gaining significant importance in India; the area under the winter maize is on the increase. Hence, pink borer tolerant germplasm is urgently sought.

24. BSBS-151 (IC0383192; INGR11031), a Dolichos bean (*Lablab purpureus*) Germplasm, with resistance to aphids (*Aphis craccivora*) and Anthracnose (*Colletotrichum lindemuthianum*)

SR Pandravada, B Sarath Babu, K Anitha, SK Chakrabarty, N Sivaraj, V Kamala, N Sunil and KS Varaprasad
National Bureau of Plant Genetic Resources, Regional Station, Rajendranagar, Hyderabad-500030, Andhra Pradesh
(E-mail: pandravadasr@yahoo.com)

Dolichos bean/ hyacinth bean/ lablab bean extensively cultivated in the tribal areas as well as in the plains of india is a popular vegetable which is a source of dietary protein. The main biotic constraints to increased production and productivity of dolichos bean are anthracnose (Rajesha, 2009) and aphids (Rekha and Mallapur, 2007), the incidence of which result in severe losses to both yield and quality of the pods and are major constraints in dolichos bean production.

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Multiple resistance

Out of the germplasm screened, the genotype IC383192 was one of the two promising accessions showing consistent reaction with nil incidence to aphids during the both the seasons and also showing 0 and 1 rating scales against anthracnose during 2003-04 and 2004-05 respectively. This genotype, a Dolichos bean (*Lablab purpureus* (L.) Sweet var. *typicus*) assumes importance in view of it's resistance to anthracnose and aphids and also having impressive qualitative and quantitative traits.

About the dolichos bean accession IC383192

This particular germplasm accession originated from Chattisgarh was characterized by vigorous plant type, mid early flowering, high fresh pod (10 fresh pod weight- 92.2 g) and 100 seed weight (45.9 g) and attractive bold seed. The genotype IC383192 identified as resistant to aphids and anthracnose through field screening was purified and multiplied from single plant selection. This source is ideal for utilization in the crossing programmes for incorporation of resistance into desirable backgrounds for developing resistant varieties. The finding gains all the more significance in view of lack of stable resistance sources against these two serious pests in a single genotype.

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Sarath Babu B, K Anitha, SR Pandravada, SK Chakrabarty, N Sivaraj, N Sunil and RDVJ Prasada Rao (2005) Reaction of *Lablab purpureus* germplasm from peninsular India to *Colletotrichum lindemuthianum* and *Aphis craccivora*. *J. Mycol. Plant Pathol.* **34:** 888-890.

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25. Ankur Goldy (IC0586943; INGR11032), a Dolichos Bean (*Lablab purpureus*) Germplasm, for Bushy Plant Type

SS Alkari and LP Aurangabadkar

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Dolichos bean, *Lablab purpureus* belongs to the family Fabaceae and is the most ancient crop among cultivated plants. Dolichos bean is prominently in-determinate /viny in habit and requires support/stacking, which increase the cost of cultivation for farmers.

Ankur Goldy is indigenously developed by Research Department, Ankur Seeds Pvt. Ltd, at Ankur research farm Kinhi, by Varietal Improvement Program. Breeding objective for development of this variety is to develop determinate, bushy, early, high yielding variety which does not require stacking/support. ARDL-12 is an indeterminate / viny female parent and Konkan Bhushan (ARDL-2) is a dwarf / determinate male parent used in this varietal improvement program. Breeding method employed was Hybridization followed by Pedigree selection.

Morpho-agronomic characteristics

Characterization of Ankur Goldy was done as per the botanical characterisation done by GKVK, Bangalore and AVRDC for Indian beans. The detailed description is submitted herewith under Table 2.

Cultivation practices

For rainy season sowing can be done in June-July where as for *rabi* September-October is the suitable time. The

Table 1. Ankur Goldy performance on important traits for yield and yield components

Rep	Ger. %	Days to 50 % flower	Days to pod		Pod		No. of inflore-scence/ plant	No. of pods/ inflore-sence	No. of pods/ plant	Yield/ plant (gm)	Yield / acre (qt)
			Formation	Maturity	Length (cm)	Breadth (cm)					
I	95	43	57	64	11.1	6.4	24	2	43	179	16.6
II	92	43	57	65	11.1	6.2	33	1	44	231	24.9
III	91	45	57	65	10.4	5.8	28	1	35	201	21.7
M	93	44	57	65	10.9	6.1	28	1	41	204	21.1

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Table 2. Characters of Ankur Goldy [Dolichos beans]

Morphological characters of Ankur Goldy			Economical characters of Ankur Goldy		
S.No.	Character	Type	S.No.	Character	Type
1	Emerging cotyledon colour	green	1	No. of flower buds/raceme	40-45
2	Hypocotyl colour	green	2	No. of racemes per plant	8-10
3	steam pigmentation	Extensive	3	Racemes length in cm	30-35
4	Vein colour	green	4	Peduncle length in cms	1-1.5
5	Leaf anthocyanin	present	5	No. of nodes/raceme	10-12
6	Leaf colour	Pale green	6	No. of buds/node	3-5
7	Leaf hairiness	Moderately pubescent	7	Days to 50% flowering	38-40
8	Leaf length(CM)	8	8	Pod length (cm)	12-15
9	Leaf width(CM)	7	9	Pod width (cm)	3-3.2
10	Leaf let length(cm)	15	10	Pod thickness (cm)	0.4
11	Leaf shape	Round	11	Pod constriction	Slightly constricted
12	Leaf persistence	Intermediate	12	No. of pods/plant	30-35
13	Growth habit	semi determinate	13	No. of locules/pod	6-7
14	Primary branches	12-14	14	No. of seeds per pod	4-5
15	Secondary branches	9-10	15	Plant height in cms.	70-80
16	Branch orientation	Perpendicular to main steam	16	Green pod yield/plant	260-265 gm
17	Flower bud length (CM)	1.6 cm	17	Seed length(fresh)	1-1.5 cm
18	Flower bud width (CM)	0.5	18	Seed width(fresh)	0.8-1 cm
19	Flower bud colour	light yellow	19	Seed thickness(fresh)	0.3cm
20	Standard petal colour	white	20	Seed shape(fresh)	Flat
21	wing petal colour	white	21	100 seed weight (g) fresh	80-85
22	Raceme position	Intermediate	22	Pod coat thickness in cm(fresh)	0.4
23	Pod curvature	slightly curved	23	Seed coat thickness(fresh)	0.3 cm
			24	Seed colour dry	Brown
			25	Seed length(dry)	1 cm
			26	Seed width	0.7 cm
			27	Seed thickness(dry)	0.3 cm
			28	Seed shape(dry)	ovate
			29	100 seed weight (g) dry	40-45

crop should be planted at a spacing of 60x30 cm in medium soil and 60x45 cm in heavy soils. 24-30 kg seed is sufficient for one hectare plantation. Application of 60:60:60 kg NPK per hectare is recommended. The attack of lepidopterous and dipterous pod borers are of considerable importance can be controlled by use of systematic insecticides like oxydemanton-methyl, dimethoate or emidacloprid. Occurrence of anthracnose can be noticed on leaf and pods in humid season.

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26. RH 0116 (IC0584669; INGR11033), an Indian Mustard *(Brassica juncea)* Germplasm, with Tolerance to Salinity (10 ds/m) at Seedling Stage

D Singh, ML Chhabra, NK Thakur, N Chandra and A Singh
Choudhary Charan Singh Haryana Agricultural University, Hisar-125004, Haryana
(E-mail:oilseeds@hau.ernet.in)

A line of Indian mustard having tolerance to salinity at 10 ds/m. It is also thermo tolerant at seedling stage as its 50% mortality takes more than 3hr when exposed at 45± 1º C under lab. conditions.

27. Kachahalli Jack Fruit (IC0566526; INGR11034), a Jack Fruit (*Artocarpus heterophyllus*) Germplasm, with Pink Colour Pulp/Flakes, Excellent Taste and aroma, Less Cellulose Content

K Narayana Gowda, K Narasimhaiah, Doddahanumaiah, S Shyamalamma, SV Suresha, KN Srinivasappa, Babu RM Ray, DS Ashwathanarayana and MS Gangadhara
University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bangalore-560065, Karnataka
(E-mail: knarayanagowda@yahoo.co.in)

The fruit of this tree have excellent taste. The tree produces around 250-300 fruits per year and each fruit weights around 45-50 kgs. On an average the fruits weighing 10 kgs may contain 25-30 bulbs and the one weighing 40-50 kgs may contain 350-500 bulbs. The bulb colour is deep pink. It has less aril and even the arils are tasty. The fruiting season starts from March to April and fruits are available up to August. There is lot of demand for this fruit and the farmer is getting 20,000 to 30,000 rupees per year.

28. DPO-14 (IC0586947; INGR11035), an Isabgol (*Plantago ovata*) Germplasm, with Early Maturing (80-85 days) and High Harvest Index (>22%)

P Manivel and R Saravanan
Directorate of Medicinal and Aromatic Plant Research, Anand-387301, Gujarat
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Isabgol is wonderful bulking fibre for constipation besides it is used for treatment of diarrhea, constipation and hemorrhoids. India is the sole exporter of this crop in the world market and earns considerable foreign exchange every year. It is being cultivated in arid and semi-arid regions of Gujarat, Rajasthan and parts of Madhya Pradesh as rainfed *rabi* crop (November to March) with supplementary irrigations and harvested at 110-120 days after sowing. Downy mildew is the major disease usually its occurrence starts during January (approximately 60 days after sowing) and progress to severe level during February (during peak flowering and seed formation stage) depending on the weather factor and micro climates and considerably reduce the yield. In such situation, the presently developed early maturing mutant DPO-14 may be the best alternative as it may escape from the disease as it mature before the disease occurrence or severe progress. Further, as this mutant is having higher harvest index and uniform maturity and it may be a good source parent for development of high yielding and early maturing isabgol varieties.

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29. UHFVAL-1 (IC0584665; INGR11036), an Indian Valerian/Mushkbala (*Valeriana jatamansi*) Germplasm, with High Valeportriates Content (approx. 4%)

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Valeriana jatamansi (Valerianaceae), widely distributed in sub-temperate Himalayas (Anonymous, 1976), is valued for its use both in traditional and modern medicines. Traditionally it is used for treating hysterical fits, hypochondriasis, nervous unrest, emotional troubles, epilepsy, asthma, leprosy, cholera and skin disease (Kirtikar and Basu, 1975; Anonymous, 1976; Husain, 1993). According to Wagner *et al.* (1980) and Grusla *et al.* (1986), most of the therapeutical properties like sedative and tranquilizing effect are due to the presence of a group of compounds known as valepotriates that are present in its rootstock. Essential oil mostly present in its roots is used in flavouring tobacco, honey etc and also in perfumery (Anonymous, 1976).

Rootstock of this species is being massively wild extracted and in the absence of any cultivation activity, the species is under stress. Need is increasingly being felt to introduce the species into the farming activity which shall not only conserve its natural stock but also provide assured supply to the users. However, such initiative shall necessitate identifying high yielding strains both in terms of active content and biomass.

During the course of extensive studies on this species, UHFVAL-1 (IC0584665; INGR11036) strain was isolated and multiplied (with about 4 per cent valepotriates' content) under AINRP M&APs centre at Dr. Y.S. Parmar University of Horticulture & Forestry Nauni, Solan.

Morpho-agronomical characters

Plants of Valeriana jatamansi are perennial and gynodioecious (female and bisexual flowers born on separate plants) (Raina & Srivastava 1992). Chemotype UHFVAL-1 (IC0584665; INGR11036) has been found to be superior in terms of valepotriates' content (about 4 %) present in its rootstock. The phenomenon of gynodioecism present in this species bestows an advantage as female flowered plant can be directly used as female parent in any hybridization programme without the need of emasculation which otherwise would have been difficult in this species as the floral size is very small. Pollination studies conducted here have revealed that the species is both cross and self compatible producing fertile seeds.

Associated characters and cultivation practices

The species can be grown on hill slopes as an understory as well as open cultivated. However biomass yield has been found to be higher under open cultivation conditions. It can be propagated both by seeds as well as by rhizome splits. Commercial production of biomass is attained after two years. On an average about 1000 kg/ha of dry rootstock can be obtained after two years of plantation. Rootstock yields valepotriates' and roots contain essential oil (1.8 %).

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