PLANT GERMPLASM REGISTRATION NOTICE

Rice Germplasm from Andamans

Asit B Mandal and R Elanchezhian
Central Agricultural Research Institute, Port Blair (Andamans)

Black Burma Rice (INGR No. 01019, IC 296798)

Black Burma rice, *Oryza sativa* is a very tall (174.4 cm), traditional, indica cultivar grown in middle and south Andamans. It has been identified to be tolerant to aluminium toxicity and moderately tolerant to salinity. The cultivar flowers after 150 days and matures within 190 days. Each plant possesses lesser tillers (6.8) with an average of 5 panicles indicating moderate tillering capacity. The flag leaf area is 38.25 cm^2. Panicles are small (25.9 cm) with low spikelet sterility (25.35%). Average grain yield is 2.1 tons/ha. The grain length is around 9.7 mm, while the width is 3.85 mm with a length/width ratio of 2.52. The dehusked rice is creamy white in colour with a length/width ratio of 2.2. The grains possess opaque endosperm. On cooking the grain showed 6.67% elongation, and 2.22 times volume expansion. Alkali digestion value was found to be high with low amylose content and low gelatinisation temperature. Gel consistency value was scored as 3 with very soft texture on a scale of 0-9.

The genotype is found to be tolerant to sheath blight (caused by *Rhizoctonia solani*), bacterial leaf spots (caused by *Cercospora oryzae*), sheath rot (caused by *Xanthomonas campestris* pv. *oryzae*), and neck and leaf blight (caused by *Pyricularia oryzae*), and tolerant to leaf folder (*Cnaphalocrocis medinalis*), gundhi bug (*Leptocorisa oratoria*), while moderately tolerant to stem borer (*Scirphophaga incertulas* Walker) under field conditions.

It has violet coloured ligules with pink margin. It is specially suited for preparation of breakfast items. In Andamans it is used for *lasa* preparation (a local food item). It can be a source for improving nutritional quality, and tolerance to excess salt and aluminium toxicities.

Nona Rice (INGR No. 01020, IC 296799)

Nona is a traditional dwarf (66 cm) variety of rice, *Oryza sativa* grown in north, middle and south Andamans. It belongs to indica group. In was identified to be moderately tolerant to salinity and iron toxicities. The cultigen's flowers after 80 days and matures within 110 days. Each plant possesses moderate number of tillers (8) with an average number of 7 panicles indicating abundance of productive tillers. Panicles are small (20.0 cm) with test weight of 36.0 g. The average yield of the Nona rice is 1.5 tons/ha. The grains are bold with light brownish coloured husk. The endosperm of the grain was opaque with chalkiness at the centre. The grain elongates up to 33.4% and expands 1.87 times on cooking. The alkali digestion and gelatinisation temperature values were found to be intermediate with soft gel consistency.

The cultigen is moderately tolerant to bacterial leaf blight (*Xanthomonas campestris* pv. *oryzae*), bacterial leaf spot (*Cercospora oryzae*), *Helminthosporium* leaf spot and blast (*Pyricularia oryzae*), and tolerant to stem borer caused by *Scirphophaga incertulas* Walker.

Basmati Quality Cytoplasmic Male Sterile Rice

FU Zaman, AK Singh, A Hariprasad, MJ Abraham, Anju Mehendru, F Mohammad, RA Singh, Jagbir Singh, G Ravindran, AK Mittal, A Haque, Mahadev Mahto, R Paramsivam
Division of Genetics, Indian Agricultural Research Institute (IARI), New Delhi-110012

PUSA 4A (INGR No. 01021, IC 296800)

PUSA 4A is a basmati type cytoplasmic male sterile line of paddy, *Oryza sativa* derived from IR 58025A/IET 10649 through back crossing and selection. The plant height is 95 cm with purple base. The grains possess ideal basmati characteristics and pollen grains are completely sterile. It is a semi-dwarf, high tillering type with dark green leaves and purple stigma with better exsertion. Number of spikelets are 175 per panicle. Days to 50 per cent flowering is between 95 to 100 and to maturity 135.

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Thermo-Sensitive Genic Male Sterile Rice

JP Singh, SC Mani, MP Pandey, Harpal Singh, Surendra Singh, Li Rongbai
Department of Genetics and Plant Breeding, G B Pant University of Agriculture & Technology, Pantnagar-263 145, U S Nagar (Uttaranchal)

Two-line hybrid breeding system, utilizing thermo-sensitive genic male sterility (TGMS) is simpler and highly efficient for hybrid seed production and obtaining heterotic combinations than three-line hybrid breeding in rice, *Oryza sativa*. TGMS line should combine important features of low critical temperature for fertility transformation and high critical temperature for sterility induction. To achieve this the G B Pant University of Agriculture and Technology, Pantnagar developed two TGMS lines viz., UPRI 95-140 TGMS and UPRI 95-167 TGMS.

UPRI 95-140 TGMS (INGR No. 01022, IC 296801)

UPRI 95-140 TGMS is a spontaneous thermo-sensitive genic male sterile line identified from UPRI 95-140. It was a single plant selection. The plants are semi-dwarf (72 cm), early maturing (107 days from seed to seed) with purple base and narrow erect flag leaves. The plants are vigorous and have high tillering capacity. The panicles are fully exserted and awnless. The grains are long and slender. UPRI 95-140 TGMS expresses thermo-sensitive reaction with male fertility. The average thermo-sensitive temperature for complete sterility is 27.1^0C in dry season (DS) to 28.7^0C wet season (WS) and 21.8^0C in DS to 26.2^0C in WS under northwestern Indian conditions. Optimum spikelet fertility is more than 40% and the period of complete male sterility is 104 days (May-Sept). These features are desirable for two-line hybrid rice breeding programme.

UPRI 95-167 TGMS (INGR No. 01023, IC 296802)

UPRI 95-167 TGMS has been developed from *in vitro* non-pollinated F_1 ovary culture of the cross between UPRI 95-140 TGMS and UPRI 95-117. The plant type is semi-dwarf (73 cm), early maturing type (107 days from seed to seed) with good panicle and stigma exsertion and long slender grains. It transforms from complete sterility to fertility between an average temperature of 24.2 and 28.7^0C respectively during late wet season, while transformation of fertility to complete sterility occurs at mean minimum or average temperatures of 18.2^0C and 26.5^0C respectively during dry season. UPRI 95-167 TGMS has stable and long male sterility stage between May 1 to September 5, suitable for hybrid development in early wet season and partial line multiplication during dry season and late wet season. It is an ideal TGMS line of commercial potential for two lines hybrid development.

Moth Bean Germplasm

D Kumar
Central Arid Zone Research Institute (CAZRI), Jodhpur-342 003 (Rajasthan)

CZM-32 (INGR No. 01024, IC 296803)

CZM-32 is a mutant of moth bean *Vigna aconitifolia* (Jacq.) Marechal variety Jadia, developed by treating seeds with 30 kR Co^{60} gamma ray. The mutant was isolated in M_3 generation during 1992 at CAZRI, Jodhpur. The mutant exhibited higher drought tolerance potential in terms of maintaining high y plant (-1.50) than RMO-40 and Maru Moth-1 (-1.35 and 1.30 y plant, respectively) at 9th day of water stress (Garg *et al.*, 2001). CZM-32 has erect and upright growth behaviour, early partitioning (28-30 days) and maturity (58-60 days). It has higher productivity per day (10.3 g day^{-1}) than the parental line (4.5 g day^{-1}). In All India Co-ordinated trials during *Kharif* seasons of 1995 and 1996, it yielded 450 kg ha^{-1} retaining green foliage till maturity, making it, suitable both for grain and fodder. Due to early maturity it can escape yellow mosaic virus.

Two-year evaluation of 3 moth bean genotypes, including CZM-32, Maru Moth-1 and RMO-40 under rainfed conditions at CAZRI confirmed higher grain and fodder yield (Anonymous, 1997). This was attributed to better utilization of available soil moisture and nutrient, leading to higher photosynthetic efficiency and better leaf metabolism. Also, the mutant requires lesser macro-

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nutrients compared to spreading and late type checks (GMO-9102 and GMO-9103) and more or less the same or higher in comparison to erect but late type mutants in unfertilised rainfed arid lands (Table 1); depicting better nutritional partition towards sinks (Kumar, 1996). CZM-32, therefore, is a good example of fine source-sink relation in terms of nutritional partitioning and higher productivity.

Table 1. Nutrient requirement for one kg seed of moth bean (Kharif 1996 CAZRI, Jodhpur)

Group	Strains	N	P	K	Ca (mg g^{-1})	Mg	Cu	Fe	Mn (m g^{-1})	Zn
Spreading	GMO-9102	2.69	0.09	0.91	1.07	0.56	1.01	42.48	4.63	3.58
and late	GMO-9103	1.34	0.08	0.23	0.27	0.09	2.48	22.79	1.93	0.96
	Mean	**2.01**	**0.09**	**0.57**	**0.67**	**0.33**	**1.75**	**32.64**	**3.28**	**2.27**
Erect and	CZM-32 E	0.38	0.03	0.28	0.16	0.22	0.40	3.69	1.37	1.51
early	CZM-18 E	0.24	0.03	0.30	0.36	0.05	0.48	18.33	1.44	2.43
	Mean	**0.31**	**0.03**	**0.29**	**0.26**	**0.14**	**0.44**	**11.01**	**1.41**	**1.97**
Erect, late,	CZM-225	1.12	0.09	0.65	0.84	0.18	1.1	39.92	9.01	4.75
unbranched	CZM-170	0.86	0.02	0.62	0.53	0.14	1.4	3.86	2.64	2.82
	Mean	**0.99**	**0.06**	**0.64**	**0.69**	**0.16**	**1.3**	**21.89**	**5.83**	**3.79**

References

Anonymous, 1997. Annual Progress Report, 1997, CAZRI, Jodhpur, pp 44.

Kumar D (1996) Breeding dew bean [*Vigna aconitifolia* (Jacq.) Marechal] for improved yield and nutrient efficiency in arid conditions. Second Intern. Crop Sci. Cong., 17-24 Nov., Delhi, Abst No. P17-004, pp 380

Garg BK, S Kathju and U Burman (2001) Influence of water stress on water relations, photosynthetic rate and nitrogen metabolism of moth bean genotypes. *Biol. Planta.* **44**:289-292

Cytoplasmic Genic Male Sterile Line and their Restorers in Pigeonpea

SS Tikka, RM Chauhan and PT Patel

Main Pulses Research Station, Gujarat Agricultural University, Sardar Krushinagar-385 506 (Gujarat)

Cytoplasmic Genic Male Sterile Line of Pigeonpea, GT 290A (INGR No. 01025, IC-296804)

GT 290A is the second stable cytoplasmic genic male sterile line of pigeonpea, *Cajanus cajan* developed at S.K. Nagar. It has been developed from a cross between *C. scarabaeoides* x *C. cajan,* wherein F_2 was back-crossed with GT 100, followed by repeated back-crossing with GT 290 until BC_8 generation. The screening for restorer has resulted in identification of a restorer line designated as GT 290B.

Morphologically, it has determinate growth habit with plant height ranging from 115-130 cm. It matures between 140 to 150 days and produces pods in bunch with an average of 150-180 pods per plant. The pods are 4 to 5 cm long, green in colour with black strip, while the seeds are red. Average number of seeds per pod is 4, and 100 seed weight is 10 g.

Fertility Restorer, GTR-3 (INGR No. 01026, IC 296805) for GT 288A

GTR-3 is a fertility restorer line identified for a stable cytoplasmic genic male sterile line GT 288A. It is a selection from SKNP-9902 and can be used for developing commercial hybrids.

Morphologically, it has non-determinate growth habit with plant height ranging from 140-150 cm. It matures between 130 to 140 days and produces pods in scattered fashion with an average of 162-180 pods per plant. The pods are 5 to 6 cm long and green in colour, while the seeds are white in colour. Average number of seeds per pod is 4, and 100 seed weight is 10 g.

Fertility Restorer, GTR-4 (INGR No. 01027, IC 296806) for GT 288A

GTR-4 is a fertility restorer line of stable cytoplasmic genic male sterile line GT 288A. It is a selection from SKNP-9813.

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Morphologically, it has determinate growth habit with plant height ranging from 115-130 cm. It matures between 140 to 150 days and produces pods in bunch with an average of 150-180 pods per plant. The pods are 4 to 5 cm long, green in colour with black strip, while the seeds are red. Average number of seeds per pod is 4, and 100 seed weight is 10 g.

Fertility Restorer, GTR-3 (INGR No. 01026, IC 296805) for GT 288A

GTR-3 is a fertility restorer line identified for a stable cytoplasmic genic male sterile line GT 288A. It is a selection from SKNP-9902 and can be used for developing commercial hybrids.

Morphologically, it has non-determinate growth habit with plant height ranging from 140-150 cm. It matures between 130 to 140 days and produces pods in scattered fashion with an average of 162-180 pods per plant. The pods are 5 to 6 cm long and green in colour, while the seeds are white in colour. Average number of seeds per pod is 4, and 100 seed weight is 10 g.

Fertility Restorer, GTR-4 (INGR No. 01027, IC 296806) for GT 288A

GTR-4 is a fertility restorer line of stable cytoplasmic genic male sterile line GT 288A. It is a selection from SKNP-9813.

Morphologically, it has non-determinate growth habit with plant height ranging from 130-150 cm. It matures between 120 to 140 days and produces pods in scattered fashion with an average of 150-160 pods per plant. The pods are 6 to 7 cm long and green in colour, while the seeds are red in colour. Average number of seeds per pod is 5, and the 100 seed weight is 10.5 g.

Fertility Restorer, GTR-5 (INGR No. 01028, IC 296807) for GT 288A

GTR-5 is a fertility restorer line of stable cyptoplasmic genic male sterile line GT 288A. It has been developed from cross *C. scarabaeoides* x *C. cajan* followed by back-crossing of F_2 progenies with ICPL- 87119 until BC_6 generation.

Morphologically, it has non-determinate growth habit with plant height ranging from 140-150 cm. It matures between 160 to 180 days and produces pods in scattered fashion with an average of 170-180 pods per plant. The pods are 5 to 6 cm long and green in colour with black strips, while the seeds are red in colour. Average number of seeds per pod is 4, and 100 seed weight is 10 g.

Fertility Restorer, GTR-6 (INGR No. 01029, IC 296808) for GT 288A

GTR-6 is a fertility restorer line of stable cytoplasmic genic male sterile line GT 288A. It has been developed from cross *C. scarabaeoides* x *C. cajan* followed by back crossing of F_2 progenies with GT-100 and further back-crossing with GUT 88-9 until BC_8 generation.

Morphologically, it has non-determinate growth habit with plant height ranging from 170-180 cm. It matures between 150 to 160 days and produces pods in scattered fashion with an average of 180-200 pods per plant. The pods are 5 to 6 cm long and green in colour with dark strips, while the seeds are white in colour. Average number of seeds per pod is 4, and 100 seed weight is 8.5 g.

Fertility Restorer, GTR-2 (INGR No. 01030, IC 296809) for GT 288A

GTR-2 is a fertility restorer line of stable cytoplasmic genic male sterile line GT 288A. It has been developed from cross *C. scarabaeoides x C. cajan* followed by back crossing of F_2 progenies with QMS-2 until BC_8 generation.

Morphologically, it has non-determinate growth habit with plant height ranging from 125-140 cm. It matures between 160 to 180 days and produces pods in scattered fashion with an average of 170-180 pods per plant. The pods are 5 to 6 cm long and green in colour with black strips, while the seeds are brown in colour. Average number of seeds per pod is 4, and 100 seed weight is 9.5 g.

Foliar Disease Resistant Spanish Bunch, Derived from Interspecific Derivative of Groundnut

MVC Gowda, BN Motagi, GK Naidu, R Sheshagiri and SB Diddimani
Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwar (Karnataka)

GPBD 4 (INGR No. 01031, IC 296810)

GPBD 4 (D39d), (*Arachis hypogaea* L. Subsp. *hypogaea* var. *fastigiata*), is an improved Spanish bunch line resistant to late leaf spot [*Phaeoisariopsis personata* (Berk. & M. A. Curtis) Deighton] and rust (*Puccinia arachidis* Speg.). It was developed at the Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwad. It scores 3.0 and 4.0 for rust and late leaf spot respectively on a 0-9 scale, compared to 8.0 and 9.0 for JL 24, a susceptible check at Dharwad. GPBD 4 is derived from a cross between KRG 1 (selection from cultivar Argentine), an early maturing, Spanish bunch and an interspecific derivative, CS16 (ICGV 86855) involving wild *Arachis* species, *A. cardenasii*, a virginia bunch foliar disease resistant interspecific derivative developed at International Crops Research Institute for Semi-Arid Tropics (ICRISAT). GPBD 4 was developed by pedigree selection method in F_2 generation.

GPBD 4 has erect growth habit and sequential branching with medium sized wide-elliptical dark green leaves (IBPGR and ICRISAT, 1992). On an average

Morphologically, it has non-determinate growth habit with plant height ranging from 130-150 cm. It matures between 120 to 140 days and produces pods in scattered fashion with an average of 150-160 pods per plant. The pods are 6 to 7 cm long and green in colour, while the seeds are red in colour. Average number of seeds per pod is 5, and the 100 seed weight is 10.5 g.

Fertility Restorer, GTR-5 (INGR No. 01028, IC 296807) for GT 288A

GTR-5 is a fertility restorer line of stable cyptoplasmic genic male sterile line GT 288A. It has been developed from cross *C. scarabaeoides* x *C. cajan* followed by back-crossing of F_2 progenies with ICPL- 87119 until BC_6 generation.

Morphologically, it has non-determinate growth habit with plant height ranging from 140-150 cm. It matures between 160 to 180 days and produces pods in scattered fashion with an average of 170-180 pods per plant. The pods are 5 to 6 cm long and green in colour with black strips, while the seeds are red in colour. Average number of seeds per pod is 4, and 100 seed weight is 10 g.

Fertility Restorer, GTR-6 (INGR No. 01029, IC 296808) for GT 288A

GTR-6 is a fertility restorer line of stable cytoplasmic genic male sterile line GT 288A. It has been developed from cross *C. scarabaeoides* x *C. cajan* followed by back crossing of F_2 progenies with GT-100 and further back-crossing with GUT 88-9 until BC_8 generation.

Morphologically, it has non-determinate growth habit with plant height ranging from 170-180 cm. It matures between 150 to 160 days and produces pods in scattered fashion with an average of 180-200 pods per plant. The pods are 5 to 6 cm long and green in colour with dark strips, while the seeds are white in colour. Average number of seeds per pod is 4, and 100 seed weight is 8.5 g.

Fertility Restorer, GTR-2 (INGR No. 01030, IC 296809) for GT 288A

GTR-2 is a fertility restorer line of stable cytoplasmic genic male sterile line GT 288A. It has been developed from cross *C. scarabaeoides x C. cajan* followed by back crossing of F_2 progenies with QMS-2 until BC_8 generation.

Morphologically, it has non-determinate growth habit with plant height ranging from 125-140 cm. It matures between 160 to 180 days and produces pods in scattered fashion with an average of 170-180 pods per plant. The pods are 5 to 6 cm long and green in colour with black strips, while the seeds are brown in colour. Average number of seeds per pod is 4, and 100 seed weight is 9.5 g.

Foliar Disease Resistant Spanish Bunch, Derived from Interspecific Derivative of Groundnut

MVC Gowda, BN Motagi, GK Naidu, R Sheshagiri and SB Diddimani
Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwar (Karnataka)

GPBD 4 (INGR No. 01031, IC 296810)

GPBD 4 (D39d), (*Arachis hypogaea* L. Subsp. *hypogaea* var. *fastigiata*), is an improved Spanish bunch line resistant to late leaf spot [*Phaeoisariopsis personata* (Berk. & M. A. Curtis) Deighton] and rust (*Puccinia arachidis* Speg.). It was developed at the Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwad. It scores 3.0 and 4.0 for rust and late leaf spot respectively on a 0-9 scale, compared to 8.0 and 9.0 for JL 24, a susceptible check at Dharwad. GPBD 4 is derived from a cross between KRG 1 (selection from cultivar Argentine), an early maturing, Spanish bunch and an interspecific derivative, CS16 (ICGV 86855) involving wild *Arachis* species, *A. cardenasii*, a virginia bunch foliar disease resistant interspecific derivative developed at International Crops Research Institute for Semi-Arid Tropics (ICRISAT). GPBD 4 was developed by pedigree selection method in F_2 generation.

GPBD 4 has erect growth habit and sequential branching with medium sized wide-elliptical dark green leaves (IBPGR and ICRISAT, 1992). On an average

it has four primary and two secondary branches and matures between 100-110 days. It has medium sized pods (22.3 and 8.9 mm average pod length and width) with slight reticulation and beak, and moderate constriction. The majority of pods are two-seeded with few one-seeded with an average shelling out-turn of 76%. The seeds are tan in colour with 100 seed weight of 42 g. The seeds contain 48% oil with a 1.76 oleic/ linoleic acid ratio (Motagi et al. 2000c). In trials conducted at three locations in northern transitional tract of Karnataka during the 1998, 1999 and 2000, crop seasons, GPBD 4 out-yielded the national check variety JL 24 for pod (16.0%), kernel (18.0%), oil (18.75%) and fodder (19.2%) yield (Motagi et al. 2001 and 2000a).

Further, it was also found free from early leaf spot (*Cercospora arachidicola* S. Hori) and moderately efficient in iron absorption efficiency (Motagi *et al.* 2000b).

References

IBPGR and ICRISAT (1992) *Descriptors for groundnut*, IBPGR, Rome, Italy and ICRISAT, Patancheru, India 22p.

Motagi BN (2001) Genetic analyses of resistance to late leaf spot and rust vis-à-vis productivity in groundnut (*Arachis hypogaea* L.) Ph.D. Thesis, University of Agricultural Sciences, Dharwad 217 p.

Motagi BN, MVC Gowda and GK Naidu (2000a) Resistant genotypes to stabilize productivity in foliar disease epidemics in Spanish type groundnuts. In: *National Seminar on Oilseeds and Oils Research & Development Needs in the Millennium*, 2-4 February 2000, Directorate of Oilseeds Research, Rajendranagar, Hyderabad, AP, India pp. 222-223.

Motagi BN, MVC Gowda and GK Naidu (2000b) Screening foliar disease resistant groundnut genotypes for tolerance to lime-induced iron chlorosis. *International Arachis Newsletter*, **20**: 22-23.

Motagi BN, MVC Gowda and SN Naidu 2000c) Oil recovery and quality as influenced by foliar diseases in groundnut. *International Arachis Newsletter*, **20**: 87-88.

Iron-chlorosis Tolerant Groundnut Line

P Manivel, A Bandyopadhyay, RK Mathur and MY Samdur

National Research Centre for Groundnut, Ivnagar Road, P. O. Box. 5, Junagadh-362 001 (Gujarat)

PBS-24004 (INGR No. 01032, IC 296811)

PBS 24004, is a high yielding elite groundnut, *Arachis hypogaea* L. subsp. *hypogaea* var. *hypogaea* germplasm line with tolerance to lime induced iron-deficiency. Screening for iron-chlorosis tolerance along with resistant and susceptible checks in calcareous soil having soil pH of 7.9, 29.6 per cent calcium carbonate, 6 ppm available P and 1.35 ppm available Fe at National Research Centre for Groundnut, Junagadh during summer 1999 resulted in identification of PBS 24004. The comparative data on visual chlorotic rating (VCR) on a 1 to 5 scale (1=tolerant and 5=susceptible) is given in the Table.

It was developed from a cross between Latur 33 and Tifrun, using combination of pedigree and bulk method. Tifrun (ICG 9937) is a released variety from USA belonging to *A. hypogaea* L. subsp. *hypogaea* var. *hypogaea*. Early generation were handled through pedigree selection and later generations through bulk method. From F_5 bulk, green plants were tagged, grouped and bulked based on similar plant type, pod, maturity and reaction to iron chlorosis. In subsequent generations similar process was followed until F_8 resulting in development of a stable, uniform advanced breeding culture, PBS 24004.

PBS 24004 has a decumbent–3 growth habit (IBPGR and ICRISAT 1992), alternate branching, with medium-sized, oblong, dark green leaves with acute leaf tip and moderate pubescence. It has six primary and 6-8 secondary branches. It matures in 115-120 days in the rainy season and 110-115 days in summer season. The pods are slightly reticulated, constricted and beaked. The average length and width of pod was 25 and 11 mm, respectively. The pods are mostly two-seeded with

Table 1. Visual chlorotic rating (VCR), chlorophyll a (Chl a) and total chlorophyll content (mg/g on dry weight basis) and pod yield of PBS 24004 compared checks

Culture name	VCR	Chl a (mg/g dwt)	Total chl (mg/g dwt)	Pod yield (g/plant)
PBS 24004	1.25	6.42	8.55	11.26
I_1 (tolerant check)	1.00	7.67	9.86	9.31
VRI 3 (susceptible check)	3.16	4.06	5.24	6.79

it has four primary and two secondary branches and matures between 100-110 days. It has medium sized pods (22.3 and 8.9 mm average pod length and width) with slight reticulation and beak, and moderate constriction. The majority of pods are two-seeded with few one-seeded with an average shelling out-turn of 76%. The seeds are tan in colour with 100 seed weight of 42 g. The seeds contain 48% oil with a 1.76 oleic/ linoleic acid ratio (Motagi et al. 2000c). In trials conducted at three locations in northern transitional tract of Karnataka during the 1998, 1999 and 2000, crop seasons, GPBD 4 out-yielded the national check variety JL 24 for pod (16.0%), kernel (18.0%), oil (18.75%) and fodder (19.2%) yield (Motagi et al. 2001 and 2000a).

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average shelling of 67%. The average length and width of seed was 13.3 and 7.6 mm, respectively. The seeds are tan coloured with average 100-seed weight of 67g. The seeds contain 49.6% oil and 18.2% protein.

Also, PBS 24004 is moderately resistant to early leaf spot (*Cercospora arachidicola* Hori) and rust (*Puccinia arachidis* Spegazzini) and scores 5.0 and 5.1 respectively on 1-9 scale under field conditions.

References

IBPGR and ICRISAT (1992) Descriptors for groundnut, IBPGR, Rome, Italy and ICRISAT, Patancheru, India 22p.

Narrow Leaf Mutant of Groundnut

RK Mathur, P Manivel, MY Samdur and A Bandyopadhyay
National Research Centre for Groundnut, Ivnagar Road, P.O. Box 5, Junagadh-362 001 (Gujarat)

Girnar 1 nlm (INGR No. 01033, IC 296812)

Girnar 1 nlm (PBS 30008) is a small narrow leaved groundnut, *Arachis hypogaea* L. ssp. *hypogaea* var. *hypogaea* mutant. This mutant was identified in M_2 generation of ethyl methane sulphonate (EMS) and diethyl sulphonate (DES) treated Spanish bunch groundnut cultivar, Girnar 1, *Arachis hypogaea* sub-species *fastigiata* var. *vulgaris* at National Research Centre for Groundnut, Junagadh. The mutant bred true in subsquent M_3 and M_4 generations and was designated as Girnar 1 nlm. The first four leaves are normal and the narrow leaflet character is manifested at fifth or sixth leaf stage of initial growth.

The genetics of narrow leaf trait was studied in F_1 and F_2 of the cross between Girnar 1 nlm and Girnar 1. In F_1 generation, all plants were similar to Girnar 1. In F_2 generation 189 plants had normal leaf and 66 had narrow leaf, fitting in the segregation ratio of 3 normal: 1 narrow leaf (c^2 value = 0.11 with P value ranging between 0.7 and 0.8). This indicated that a single recessive gene governs the narrow leaf character. The gene symbols for this character could be $\mathbf{I^N I^N}$ for normal leaf and $\mathbf{I^n I^n}$ for narrow leaf.

Girnar 1 nlm has erect growth habit (IBPGR and ICRISAT, 1992), alternate branching, and small sized linear lanceolate leaves with moderate pubescence. It has 5-6 primary and 6-8 secondary branches. It matures in 90-95 days in the rainy season in Junagadh, Gujarat, India. The pods are mostly three-seeded with shelling out turn of 64%. The pods have slight constriction, moderate reticulation and medium beak. The seeds are tan coloured with 100 seed weight 20 g, containing 49.6% oil. Compared to the parent, the narrow leaf mutant is dwarf with shorter internodes and more branching and peculiar small, narrow and pointed leaflets. Girnar 1 has Spanish, *Arachis hypogaea* ssp *fastigiata* var. *vulgaris* growth habit, while the mutant has a shift towards Virginia bunch growth habit, *Arachis hypogaea* ssp. *hypogaea* var. *hypogaea* (Table). The mutant is early in maturing, has low specific leaf area (SLA) and is moderately resistant to rust (*Puccinia arachidis*).

References

IBPGR and ICRISAT 1992. Descriptors for Groundnut, IBPGR, Rome Italy, and ICRISAT, Patancheru, India.

Table 1. Salient features of the Girnar 1 nlm mutant and its parent Girnar 1

Salient Characteristics	Girnar 1 nlm	Girnar 1
Growth habit	Virginia bunch	Spanish
Flowering habit	Alternate	Sequential
Height of main axis (cm)	9.30	15.30
Maximum branch height (cm)	10.90	20.30
Number of primary branches	4.00	4.07
Number of secondary branches	7.00	1.30
Number of nodes on main axis	9.90	9.90
Number of leaves per plant	80.00	43.00
Inter-nodal length (cm)	0.94	1.55
Leaflet length (cm)	2.00	3.50
Leaflet width (cm)	0.73	1.70
Petiole length (cm)	2.20	4.40
Specific leaf area (cm^2)	53.18	96.38
Days to maturity	90 days	100 days
Number of pods/plant	7.00	15.33
Number of seeds/plant	10.13	28.47
Pod length (cm)	1.20	3.20
Pod weight/plant (g)	2.86	10.39
Seed weight/plant (g)	1.77	6.05
100 seed weight (g)	20.00	29.00
Shelling out turn (%)	64.00	68.00

average shelling of 67%. The average length and width of seed was 13.3 and 7.6 mm, respectively. The seeds are tan coloured with average 100-seed weight of 67g. The seeds contain 49.6% oil and 18.2% protein.

Also, PBS 24004 is moderately resistant to early leaf spot (*Cercospora arachidicola* Hori) and rust (*Puccinia arachidis* Spegazzini) and scores 5.0 and 5.1 respectively on 1-9 scale under field conditions.

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Narrow Leaf Mutant of Groundnut

RK Mathur, P Manivel, MY Samdur and A Bandyopadhyay
National Research Centre for Groundnut, Ivnagar Road, P.O. Box 5, Junagadh-362 001 (Gujarat)

Girnar 1 nlm (INGR No. 01033, IC 296812)

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The genetics of narrow leaf trait was studied in F_1 and F_2 of the cross between Girnar 1 nlm and Girnar 1. In F_1 generation, all plants were similar to Girnar 1. In F_2 generation 189 plants had normal leaf and 66 had narrow leaf, fitting in the segregation ratio of 3 normal: 1 narrow leaf (c^2 value = 0.11 with P value ranging between 0.7 and 0.8). This indicated that a single recessive gene governs the narrow leaf character. The gene symbols for this character could be $\mathbf{I^N I^N}$ for normal leaf and $\mathbf{I^n I^n}$ for narrow leaf.

Girnar 1 nlm has erect growth habit (IBPGR and ICRISAT, 1992), alternate branching, and small sized linear lanceolate leaves with moderate pubescence. It has 5-6 primary and 6-8 secondary branches. It matures in 90-95 days in the rainy season in Junagadh, Gujarat, India. The pods are mostly three-seeded with shelling out turn of 64%. The pods have slight constriction, moderate reticulation and medium beak. The seeds are tan coloured with 100 seed weight 20 g, containing 49.6% oil. Compared to the parent, the narrow leaf mutant is dwarf with shorter internodes and more branching and peculiar small, narrow and pointed leaflets. Girnar 1 has Spanish, *Arachis hypogaea* ssp *fastigiata* var. *vulgaris* growth habit, while the mutant has a shift towards Virginia bunch growth habit, *Arachis hypogaea* ssp. *hypogaea* var. *hypogaea* (Table). The mutant is early in maturing, has low specific leaf area (SLA) and is moderately resistant to rust (*Puccinia arachidis*).

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Number of nodes on main axis	9.90	9.90
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Inter-nodal length (cm)	0.94	1.55
Leaflet length (cm)	2.00	3.50
Leaflet width (cm)	0.73	1.70
Petiole length (cm)	2.20	4.40
Specific leaf area (cm^2)	53.18	96.38
Days to maturity	90 days	100 days
Number of pods/plant	7.00	15.33
Number of seeds/plant	10.13	28.47
Pod length (cm)	1.20	3.20
Pod weight/plant (g)	2.86	10.39
Seed weight/plant (g)	1.77	6.05
100 seed weight (g)	20.00	29.00
Shelling out turn (%)	64.00	68.00

Lemon Yellow Colour Leaf Mutant of Groundnut

RK Mathur, P Manivel, MY Samdur and A Bandyopadhyay
National Research Centre for Groundnut, P.O. Box 5, Junagadh-362 001 (Gujarat)

Girnar 1 Lym (INGR No. 01034, IC 296813)

Girnar 1 lym (PBS 30017), *Arachis hypogaea* L. spp. *hypogaea* var. *vulgaris* is a lemon yellow colour leaf groundnut mutant. This mutant was identified in M_2 generation progeny of a Spanish bunch groundnut cultivar, Girnar 1, whose seeds were treated with 0.10% ethyl methane sulphonate (EMS) at National Research Centre for Groundnut, Junagadh. The mutant bred true in subsequent M_3 and M_4 generations and was designated as Girnar 1 lym. The lemon yellow colour leaf started expressing from fourth to fifth leaf stage onwards and continued till maturity, resulting in lemon yellow appearance of the plant.

Based on F_2 generation segregation of the cross between Girnar 1 lym and Girnar 1, this trait appears to be governed by a monogenic recessive gene (Table 1). The gene symbols proposed are **Ly** for green and **ly** for lemon yellow.

Girnar 1 lym has erect growth habit (NBPGR and ICRISAT, 1992), sequential branching, and medium sized wide elliptic lemon yellow colour leaves. It has 6 primary and occasionally 1-2 secondary branches. It matures in 95 days in the rainy season at Junagadh, Gujarat, India. The pods are mostly three-seeded, with shelling out turn of 75%. The pods have slight constriction, moderate reticulation and medium beak. The seeds are tan colour with 100 seed weight of 37g and contain 47% oil and 13% protein. Based on field screening during two rainy seasons, Girnar 1 lym is moderately resistant/tolerant to early leaf-spot, late leaf-spot, and rust scoring 5 on 1-9 scale.

Table 1. F_2 segregation of lemon yellow leaf trait in cross, Girnar 1 lym x Girnar 1

Families	Number of F_2 phenotypes*			χ^2 (3:1 ratio)	Probability
	Normal green	Lemon yellow	Total		
1.	58	15	73	0.7717	0.5-0.3
2.	47	13	60	0.3556	0.7-0.5
3.	76	20	96	0.8889	0.5-0.3
4.	60	19	79	0.3890	0.9-0.8
5.	30	11	41	0.0732	0.8-0.7
6.	52	17	69	0.0048	0.95-0.9
Pooled	323	95	418	1.1515	0.3-0.2
Hetero-geneity	–	–		0.9806	0.95-0.90

*F_1 had normal green leaves like male parent, Girnar 1

Vegetable Type Soybean

VD Verma
National Bureau of Plant Genetic Resources (NBPGR), Regional Station, Phagli, Shimla-171 004 (Himachal Pradesh)

P-1366 (INGR No. 01035, IC 296814)

P-1366 is a vegetable type bold seeded soybean, *Glycine max* L. Merr. collected during 1988 by Mr. KC Pant, NBPGR, Regional Station, Bhowali from Pithoragarh district of Uttar Pradesh (Now Uttaranchal). P-1366 has determinate growth habit with thick dark green leaves. The plant height is 30-35 cm at Bhowali and 35-40 cm at Akola. It has tawny pubescence with normal density and white flowers. It flowers between 32-34 days at Bhowali and 30-32 at Akola and matures between 105-108 days. It has thick brown pods containing 2-3 seeds/pod. The seeds are creamish yellow with black hilum and contain 20.13% oil and 40.20% protein on dry weight basis. It was evaluated at NBPGR, Regional Station, Akola, Maharashtra (1991-1997) and at Bhowali (1988-2000) for agronomic features. Grain yields of 18-22 q/ha with bold seeds were recorded. The seeds are sweet in taste and have no beany flavour during pod filling stage. Hundred seed weight is 44-46 g at Akola and 36-38 g at Bhowali.

Lemon Yellow Colour Leaf Mutant of Groundnut

RK Mathur, P Manivel, MY Samdur and A Bandyopadhyay
National Research Centre for Groundnut, P.O. Box 5, Junagadh-362 001 (Gujarat)

Girnar 1 Lym (INGR No. 01034, IC 296813)

Girnar 1 lym (PBS 30017), *Arachis hypogaea* L. spp. *hypogaea* var. *vulgaris* is a lemon yellow colour leaf groundnut mutant. This mutant was identified in M_2 generation progeny of a Spanish bunch groundnut cultivar, Girnar 1, whose seeds were treated with 0.10% ethyl methane sulphonate (EMS) at National Research Centre for Groundnut, Junagadh. The mutant bred true in subsequent M_3 and M_4 generations and was designated as Girnar 1 lym. The lemon yellow colour leaf started expressing from fourth to fifth leaf stage onwards and continued till maturity, resulting in lemon yellow appearance of the plant.

Based on F_2 generation segregation of the cross between Girnar 1 lym and Girnar 1, this trait appears to be governed by a monogenic recessive gene (Table 1). The gene symbols proposed are **Ly** for green and **ly** for lemon yellow.

Girnar 1 lym has erect growth habit (NBPGR and ICRISAT, 1992), sequential branching, and medium sized wide elliptic lemon yellow colour leaves. It has 6 primary and occasionally 1-2 secondary branches. It matures in 95 days in the rainy season at Junagadh, Gujarat, India. The pods are mostly three-seeded, with shelling out turn of 75%. The pods have slight constriction, moderate reticulation and medium beak. The seeds are tan colour with 100 seed weight of 37g and contain 47% oil and 13% protein. Based on field screening during two rainy seasons, Girnar 1 lym is moderately resistant/tolerant to early leaf-spot, late leaf-spot, and rust scoring 5 on 1-9 scale.

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3.	76	20	96	0.8889	0.5-0.3
4.	60	19	79	0.3890	0.9-0.8
5.	30	11	41	0.0732	0.8-0.7
6.	52	17	69	0.0048	0.95-0.9
Pooled	323	95	418	1.1515	0.3-0.2
Hetero-geneity	–	–		0.9806	0.95-0.90

*F_1 had normal green leaves like male parent, Girnar 1

Vegetable Type Soybean

VD Verma
National Bureau of Plant Genetic Resources (NBPGR), Regional Station, Phagli, Shimla-171 004 (Himachal Pradesh)

P-1366 (INGR No. 01035, IC 296814)

P-1366 is a vegetable type bold seeded soybean, *Glycine max* L. Merr. collected during 1988 by Mr. KC Pant, NBPGR, Regional Station, Bhowali from Pithoragarh district of Uttar Pradesh (Now Uttaranchal). P-1366 has determinate growth habit with thick dark green leaves. The plant height is 30-35 cm at Bhowali and 35-40 cm at Akola. It has tawny pubescence with normal density and white flowers. It flowers between 32-34 days at Bhowali and 30-32 at Akola and matures between 105-108 days. It has thick brown pods containing 2-3 seeds/pod. The seeds are creamish yellow with black hilum and contain 20.13% oil and 40.20% protein on dry weight basis. It was evaluated at NBPGR, Regional Station, Akola, Maharashtra (1991-1997) and at Bhowali (1988-2000) for agronomic features. Grain yields of 18-22 q/ha with bold seeds were recorded. The seeds are sweet in taste and have no beany flavour during pod filling stage. Hundred seed weight is 44-46 g at Akola and 36-38 g at Bhowali.

P-1366 is resistant to yellow mosaic virus and moderately resistant to bacterial pustules (*Xanthomonas campestris*), but susceptible to pod blight (*Colletotrichum dematium*). Being bold seeded it has poor seed storability.

Table 1. Nutritional profile of P1336 compared with nationally released varieties

Cultivars	100-seed weight (g)	Oil (%)	Protein (%)	Major fatty acids				
				Palmitic	Stearic	Oleic	Linoleic	Linolenic
PK-416	10.20	20.88	41.60	10.88	4.13	23.85	52.80	6.98
Pusa 16	12.50	19.45	41.68	11.20	3.60	19.58	54.57	7.82
P 1336	36.38	20.13	40.20	10.29	3.33	24.89	50.75	8.12

Crotolaria Germplasm

N R Das, N Ghosh, S Mitramajumdar and D Panda
Agronomy/Seed Science & Technology Department, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur-741 252 (West Bengal)

Bidhan Shan (INGR No. 01036, IC 296815)

Bidhan Shan is an improved self-compatible sunnhemp, *Crotolaria juncea* L. germplasm developed at Bidhan Chandra Krishi Viswavidyalaya, West Bengal. It was selected from the bulk seed obtained from local market (Chinsurah, West Bengal) and was further improved and fixed by the repeated bulk selection method (1998-99 and 1999-2000).

In April/May planting, the stem height of Bidhan Shan is 3.3 m with less branches and flowers, while in rabi planting, the stem height is about 1 m with higher number of branches and more number of flowers per branch. It requires 60 days for green manure and 120 days for fibre production in summer planting, while 125-130 days in *rabi* planting for seed production. It possesses kidney shaped glossy blackish coloured seeds, with 1000-seed weight of about 25-30 g. It can smother the weeds in field. In yield trials conducted at BCKV Farm, Kalyani (1997-98) Bidhan Shan out yielded ST 55, by nearly 200% with an average seed yield of 6.2 quintal and stover yield of 33.3 q/ha.

This germplasm is highly resistant to diseases and pests and could be cultivated as a *paira/utera* crop in rice-fallows. Also, it can be utilized as annual bast fibre, fodder and green manure crop in the drier areas.

Watermelon Germplasm

JP Luthra and VS Yadav
Melon Scheme, Department of Horticulture, Agriculture Research Station, Durgapura, Jaipur-18 (Rajasthan)

Yellow Flesh Watermelon, RW 187-2 (INGR No. 01037, IC 296816)

Watermelon 'RW 187-2' has been selected from the local germplasm material available at Agriculture Research Station, Durgapura, Jaipur. Individual plant progenies were advanced to establish the pure line. The vines are 2.5-3 meters long. It takes 105-110 days for first picking. The fruits are oval, light green with dark linings on rind, with yellow/saffron colour flesh and white colour medium sized seeds. Sweetness is 9-11 per cent and average fruit weight is 3-5 kg. Fruit yield is 350-500 q/ha, 56.10 per cent higher than the best checks, Sugarbaby (local check) and Arkamanik (national check) in trials conducted under All India Co-ordinated Vegetable Improvement Project (Table). RW 187-2 is suited to well drain sandy loam soil. RW 187-2 is moderately resistant to powdery mildew and blight under field conditions.

P-1366 is resistant to yellow mosaic virus and moderately resistant to bacterial pustules (*Xanthomonas campestris*), but susceptible to pod blight (*Colletotrichum dematium*). Being bold seeded it has poor seed storability.

Table 1. Nutritional profile of P1336 compared with nationally released varieties

Cultivars	100-seed weight (g)	Oil (%)	Protein (%)	Major fatty acids				
				Palmitic	Stearic	Oleic	Linoleic	Linolenic
PK-416	10.20	20.88	41.60	10.88	4.13	23.85	52.80	6.98
Pusa 16	12.50	19.45	41.68	11.20	3.60	19.58	54.57	7.82
P 1336	36.38	20.13	40.20	10.29	3.33	24.89	50.75	8.12

Crotolaria Germplasm

N R Das, N Ghosh, S Mitramajumdar and D Panda
Agronomy/Seed Science & Technology Department, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya (BCKV), Mohanpur-741 252 (West Bengal)

Bidhan Shan (INGR No. 01036, IC 296815)

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Table 1. Performance of RW 187-2 in station (1989-95) and in coordinated (1992-96) trials

S. No	Selected entries	Station trials (1989-91, 95)	Co-ordinated trials (1992-96)	Pooled	Per cent increase in trials				
					Station	Co-ordinated	Pooled mean		Average
1	RW-187-2	401.09 (4)	271.48 (15)	336.28	116.65	18.26	23.56	56.1	53.06
2	Sugarbaby	185.13 (4)	229.50 (15)	215.43	00.00	0.00	-	00.0	-
3	Arkamanik	-	219.71 (15)	219.71	-	-	00.00	-	00.0

Figures in parenthesis are number of locations

Simple Un-lobed Leaf Watermelon, RW 177-3 (INGR No. 01038, IC 296817)

Watermelon RW 177-3 (Durgapura Lal), was a selection from segregating population of a cross between Sugarbaby and K-3566, a Russian culture at A.R.S. Durgapura, Jaipur. The vines are 3.0–3.5 meters long. The leaves are simple and un-lobed unlike other varieties. The fruits are round, dark green with darker linings and thin and hard skin. The flesh is dark red in colour with 10–11% sugar. The fruit size is medium, weighing 4 to 5 Kg and easy to transport. It takes 110 days for first picking. The seeds are less in number, small and brown in colour with black spots. The 1000 seed weight is 44g. Fruit yield is 350-450 q/ha, 27 per cent higher over the best national check, Arkamanik and 41 per cent over the local check, Sugarbaby (Table). The portion of fruit that touches the ground turns pale yellow on maturity. It is suitable for irrigated areas.

Table 1. Performance of watermelon culture RW-177-3 in station trials

S. No.	Cultures	Yield (q/ha) 1995	Pooled Mean 1996	1997	1998	2001	Percent Increase over Sugarbaby	Arkamanik	
1	RW-177-3	381.94 (8.5)	355.55 (11.0)	327.77 (11.00)	462.47 (10.5)	369.75 (11.0)	379.50 (10.40)	40.94	26.72
2	Sugarbaby (Local check)	236.11 (9.0)	224.00 (9.0)	224.07 (9.5)	338.87 (9.5)	323.30 (10.50)	269.27 (9.50)	-	-
3	Arkamanik (National check)	222.03 (8.0)	327.78 (9.0)	214.81 (9.0)	433.30 (9.5)		299.40 (8.67)	-	-
	CD at 5%	47.57	62.25	37.65	20.22	27.54			
	CV (%)	12.01	11.86	8.36	3.22	6.28			

Figures in parenthesis are total soluble sugar in per cent.

Hybrid Coffee Germplasm

RL Narasimhaswamy and S Vishveshwara, M Ramchandran and VB Suresh Kumar
Central Coffee Research Institute, Coffee Research Station, Post 577 177, Chikmagalur District (Kerala)

Genus *Coffea* of the family Rubiaceae contains about 100 species of which two are commercially cultivated namely *Coffea arabica* L. (arabica coffee) and *C. canephora* Pierre ex Froehner (robusta coffee). Most of the species are native of Africa. *C. arabica* was introduced to India in 1600 A.D. and *C. canephora* in about 1900 A.D. Arabica is the only allotetraploid in this genus with 2n=44 and is predominantly self-pollinated, while *C. canephora* is diploid (2n=22) and an obligate cross-pollinator. After the establishment of Central Coffee Research Institute (CCRI) in 1925 near Chikmagalur in Karnataka, organised research on coffee breeding was undertaken and several new genotypes of arabica and robusta were developed and established through inter-specific hybridisation. The seeds of these genotypes were distributed for cultivation.

A Compact Hybrid of Coffee, Congensis x Robusta (INGR No. 01039, IC 296818)

It is an interspecific hybrid between *Coffea congensis*, Froehner and *C. canephora* cv. S-274 robusta, developed by back crossing to *C. canephora* followed by pedigree selection and sib-mating. It is compact, bush type with shorter internodes than robusta and drooping to semi-

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drooping branches. Thirty to 50 fruits occur at each node in tight clusters, which are orange to crimson red in colour with prominent and projected nanel. The fruits are bold in size with protruding honey disc. Seeds are bold giving 60 per cent 'A' type grade (retained on 6.65 mm screen). Cup quality is superior to robusta with soft neutral and light acidity, which is normally absent in other robustas. It is cross-pollinated and seeds are produced by inducing blossom through irrigation in seed blocks. Most of the plants are resistant to leaf rust with tolerance to drought.

Leaf Rust Resistant Arabica Coffee Selections

RL Narasimhaswamy and S Vishveshwara
Central Coffee Research Institute, Coffee Research Station, Post 577 177, Chikmagalur District (Kerala)

S.795 (INGR 01040, IC 296819)

S. 795, is a selection from the F_2 progenies of a cross between S. 288 and Kent's arabica, both of which have originated in India. Majority of plants show resistance to common races I and II of leaf rust caused by *Hemileia vastatrix*. S 795 is characterised by vigorous growth, spreading habit and profuse cropping wood. The internodes are short being 1.5 – 3.5 inches long. Leaves are linear-oblong, thick and leathery, dark green and shining with prominent wavy margin, and longish acuminate apex. Fruits are borne in thick clusters. Seeds are oblong, bold with small to broad navel and 60-65 per cent 'A' grade. Yields vary from 1000 to 2000 kg/ha with an all India average of 975 Kg/ha. It is predominantly self-pollinated.

Leaf Rust Resistant Arabica Selections, 5B (INGR No. 01041, IC 296820)

5B (S. 2931 & S. 4422), is a selection identified from a cross between S 333 and Devamachy hybrid. Devamachy is a spontaneous Indian hybrid originated from a cross, robusta x arabica. For development of this genotype pedigree method was practised from F_2 to F_5 and progenies showing uniformity for bush, vigour and resistance to leaf rust caused by *Hemileia vastatrix* was selected. The bush has medium internodes, spreading primaries with dark green broad elliptic leaves, and bronze apex. Fruits are medium bold, squarish with flush and small honey disc. Seeds are medium bold. Yield potential is 1500 Kg/ha. Pollination is predominantly autogamous.

Self-Pollinating Hybrid, Selection 6 (INGR No. 01042, IC 296821)

Selection 6 is a hybrid selected from an interspecific cross between between *C.canephora* cv. S 274 (robusta) and *C. arabica* Kent. backcrossed twice with arabica. The third generation progeny from BC_2 showed better uniformity for bush size and vigour; with high resistance to leaf rust caused by *Hemileia vastatrix*, with yield, bean size and cup quality similar to arabica. Chromosome number is 2n=44. Yield potential is 1000 to 1500 Kg/ha and pollination is predominantly autogamous.

Drought Tolerant Selection 7.3 (INGR No. 01043, IC 296822)

The selection 7.3, is an interspecific hybrid evolved out of step by step crossing first between San Ramon (dwarf mutant of arabica isolated in Colombia and introduced into India from Guatemala in 1953) and S.795, followed by crosses with Agaro and Hibrido-de-Timor in subsequent steps to improve leaf rust resistance. It is tolerant to drought. It segregated into 70 per cent dwarfs and 30 per cent tall. Dwarfs can be used for closer planting (1.5 x 1.5 m). The plant height is 2 m, internodes are extremely short with lateral branches of reduced length, and leaves are wide elliptic and dark green. Also, it is resistant to drought and produces fruits with delayed ripening. Suited to low rainfall areas, its yield potential 1000-1500 Kg/ha.

Drought Tolerant Selection 9 (INGR No. 01044, IC 296823)

The selection has evolved out of cross between Hibrido-de-Timor (a natural hybrid of robusta x arabica from Timor, introduced to India from Portugal in 1967) and Tafarikela, an Ethiopian arabica. This was an F_3 progeny showing high uniformity. The plants are tall, vigorous with drooping to spreading branches. Internodal distance is more in spreading type. Fruits are bold with often persistent calyx. It is an early ripening variety and

drooping branches. Thirty to 50 fruits occur at each node in tight clusters, which are orange to crimson red in colour with prominent and projected nanel. The fruits are bold in size with protruding honey disc. Seeds are bold giving 60 per cent 'A' type grade (retained on 6.65 mm screen). Cup quality is superior to robusta with soft neutral and light acidity, which is normally absent in other robustas. It is cross-pollinated and seeds are produced by inducing blossom through irrigation in seed blocks. Most of the plants are resistant to leaf rust with tolerance to drought.

Leaf Rust Resistant Arabica Coffee Selections

RL Narasimhaswamy and S Vishveshwara
Central Coffee Research Institute, Coffee Research Station, Post 577 177, Chikmagalur District (Kerala)

S.795 (INGR 01040, IC 296819)

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Leaf Rust Resistant Arabica Selections, 5B (INGR No. 01041, IC 296820)

5B (S. 2931 & S. 4422), is a selection identified from a cross between S 333 and Devamachy hybrid. Devamachy is a spontaneous Indian hybrid originated from a cross, robusta x arabica. For development of this genotype pedigree method was practised from F_2 to F_5 and progenies showing uniformity for bush, vigour and resistance to leaf rust caused by *Hemileia vastatrix* was selected. The bush has medium internodes, spreading primaries with dark green broad elliptic leaves, and bronze apex. Fruits are medium bold, squarish with flush and small honey disc. Seeds are medium bold. Yield potential is 1500 Kg/ha. Pollination is predominantly autogamous.

Self-Pollinating Hybrid, Selection 6 (INGR No. 01042, IC 296821)

Selection 6 is a hybrid selected from an interspecific cross between between *C.canephora* cv. S 274 (robusta) and *C. arabica* Kent. backcrossed twice with arabica. The third generation progeny from BC_2 showed better uniformity for bush size and vigour; with high resistance to leaf rust caused by *Hemileia vastatrix*, with yield, bean size and cup quality similar to arabica. Chromosome number is 2n=44. Yield potential is 1000 to 1500 Kg/ha and pollination is predominantly autogamous.

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produces 60 to 65 percent 'A' grade beans, which are bold in size and bettering cup quality. This selection has good drought tolerance with resistance to common races I and II of leaf rust caused by *Hemileia vastatrix* It is predominantly self-pollinated and yields 1200-1500 Kg/ha.

Novel Non-Narcotic Poppy

JR Sharma, RK Lal, AP Gupta, HO Misra and V Pant
Central Institute of Medicinal and Aromatic Plants, (Central Institute for Medicinal and Aromatic Plants (CIMAP), Lucknow-226 015 (Uttar Pradesh)

Sujata (INGR No. 01045, IC 296824)

An opium-less, alkaloid-free (non-narcotic) var. *Sujata* (LL34) of opium poppy (*Papaver somniferum*) was developed for the first time at CIMAP, Lucknow. It is a fine example of genetic conversion of a narcotic crop, like 'opium' poppy into non-narcotic 'seed' poppy. It does not exude latex (raw opium) on lancing (incision) of the capsule (Fig. 1). The straw (capsule hull) is also free from opium alkaloids, viz. morphine, codeine, thebaine and papaverine, etc.

It was developed by mutation breeding through a combined mutagenic treatment of 20 Kr gamma rays and 0.4 per cent Ethyl Methane Sulphonate on the high opium yielding parental strain, Mass-2B (var. *Sampada*). A latex-less mutant, LL34 was detected by 'ray-pluck' method (JR Sharma *et al.*, 1999) in M_2 generation, stabilized by M_7 generation and was finally re-christened as var. *Sujata*. The table summarises the morphological features of the mutant. It was evaluated for seed yield and non-latex production in initial evaluation (replicated, paired rows), bench scale (replicated, 5 x 3m plot size), and pilot scale trial (200 m^2 plot size) at Central Institute of Medicinal and Aromatic Plants for three years; giving 10-20 per cent higher seed yield (Table 1) than parent.

References

Sharma JR, RK Lal, AP Gupta, HO Misra, V Pant, NK Singh and V Pandey (1999) *Plant Breeding* (Berlin) **118**:449-452.

Sharma JR, RK Lal, HO Misra, AA Naqvi and DD Patra 1999. *Curr. Sci.* **77(12)**: 1584 -1589.

Table 1. The comparative features of *Sujata* and its parent Mass-2B

S. No.	Quali-quantitative traits	Sujata	Mass-2B
1.	Days to mid-flowering	100-105	100-104
2.	Plant height (cm)	80-100	85-110
3.	Capsule surface	Glabrous	Waxy
4.	Number of stigmatic rays per capsule	10-12	12-14
5.	Latex-flow on incision	Absent	Profuse
6.	Alkaloids in straw (capsule hulls)	Absent	Present
7.	Seed count per g of weight	3040-3310	4410-4520
8.	Seed size	Bold	Medium
9.	Estimated average seed yield (q/ha)	8-10	7-8
10.	Protein content in seeds (%)*	24.0	24.5
11.	Oil content in seeds (%)*	58.9	59.4
12.	Oleic + Linoleic fatty acids in oil (%)*	82.1	81.1
13.	Ca in seeds (mg/100g)*	1702	1213
14.	Fe in seeds (mg/100g)*	9.5	7.9
15.	Mg in seeds (mg/100g)*	405	286

*Analysed by ESAQC Lab., Central Food Technology Research Institute, Mysore

produces 60 to 65 percent 'A' grade beans, which are bold in size and bettering cup quality. This selection has good drought tolerance with resistance to common races I and II of leaf rust caused by *Hemileia vastatrix* It is predominantly self-pollinated and yields 1200-1500 Kg/ha.

Novel Non-Narcotic Poppy

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Central Institute of Medicinal and Aromatic Plants, (Central Institute for Medicinal and Aromatic Plants (CIMAP), Lucknow-226 015 (Uttar Pradesh)

Sujata (INGR No. 01045, IC 296824)

An opium-less, alkaloid-free (non-narcotic) var. *Sujata* (LL34) of opium poppy (*Papaver somniferum*) was developed for the first time at CIMAP, Lucknow. It is a fine example of genetic conversion of a narcotic crop, like 'opium' poppy into non-narcotic 'seed' poppy. It does not exude latex (raw opium) on lancing (incision) of the capsule (Fig. 1). The straw (capsule hull) is also free from opium alkaloids, viz. morphine, codeine, thebaine and papaverine, etc.

It was developed by mutation breeding through a combined mutagenic treatment of 20 Kr gamma rays and 0.4 per cent Ethyl Methane Sulphonate on the high opium yielding parental strain, Mass-2B (var. *Sampada*). A latex-less mutant, LL34 was detected by 'ray-pluck' method (JR Sharma *et al.*, 1999) in M_2 generation, stabilized by M_7 generation and was finally re-christened as var. *Sujata*. The table summarises the morphological features of the mutant. It was evaluated for seed yield and non-latex production in initial evaluation (replicated, paired rows), bench scale (replicated, 5 x 3m plot size), and pilot scale trial (200 m^2 plot size) at Central Institute of Medicinal and Aromatic Plants for three years; giving 10-20 per cent higher seed yield (Table 1) than parent.

References

Sharma JR, RK Lal, AP Gupta, HO Misra, V Pant, NK Singh and V Pandey (1999) *Plant Breeding* (Berlin) **118**:449-452.

Sharma JR, RK Lal, HO Misra, AA Naqvi and DD Patra 1999. *Curr. Sci.* **77(12)**: 1584 -1589.

Table 1. The comparative features of *Sujata* and its parent Mass-2B

S. No.	Quali-quantitative traits	Sujata	Mass-2B
1.	Days to mid-flowering	100-105	100-104
2.	Plant height (cm)	80-100	85-110
3.	Capsule surface	Glabrous	Waxy
4.	Number of stigmatic rays per capsule	10-12	12-14
5.	Latex-flow on incision	Absent	Profuse
6.	Alkaloids in straw (capsule hulls)	Absent	Present
7.	Seed count per g of weight	3040-3310	4410-4520
8.	Seed size	Bold	Medium
9.	Estimated average seed yield (q/ha)	8-10	7-8
10.	Protein content in seeds (%)*	24.0	24.5
11.	Oil content in seeds (%)*	58.9	59.4
12.	Oleic + Linoleic fatty acids in oil (%)*	82.1	81.1
13.	Ca in seeds (mg/100g)*	1702	1213
14.	Fe in seeds (mg/100g)*	9.5	7.9
15.	Mg in seeds (mg/100g)*	405	286

*Analysed by ESAQC Lab., Central Food Technology Research Institute, Mysore

Early Rice

SN Chakrabarti
Division of Genetics, Indian Agricultural Research Institute (IARI), Pusa, New Delhi-110 012

Jaldi Dhan 8 (INGR No. 01046, IC 296825)

Jaldi Dhan 8 is an extra early (80 days), medium tall upland rice, developed from cross between mutants Dular and N-22, having marked tolerance to moisture stress and coastal salinity. It is an improved plant type of medium tall stature with extra-early maturity, long glume opening period and ability to maintain cytoplasmic male sterility with wide abortiveness, making it a potential parent for hybrid rice breeding involving tropical japonica restorers. Also, it has been identified as an improved source for wide compatibility gene (WCG) to overcome sterility barriers in crosses between indica and japonica.

Table 1. Grain yield (q/ha) of Jaldi Dhan 8 under co-ordinated trials (1988-1991)

Variety	Direct seeded rainfed	Transplanted	Direct seeded irrigated
Jaldi Dhan 8	17.35 (60)*	32.29	38.19
Checks			
Sattari	12.89 (54)	24.03	–
Heera	15.93 (54)	20.59	17.51
Aditya	8.76 (68)	29.45	22.88

* days to 50% flowering

It is widely adapted to rainfed upland situation that has low inherent fertility status and frequent droughts. It possesses tolerance for Brown spot disease and pests like Gall midge biotype I, and leaf folder.

Powdery Mildew Resistant Hybrid, Hexaploid Triticale x Bread Wheat

GS Sethi and P Plaha
Biotechnology Centre, Chaudhury Saran Kumar Himachal Pradesh Krishi Vishwavidhyalaya (CSKHPKV), Palampur-176 062 (Himachal Pradesh)

RL 22 (INGR No. 01047, IC 296896)

One hundred true-breeding derivatives of triticale (X *Triticosecale* Wittmack, 2n=6x-42) x bread wheat (*Triticum aestivum* L. m. Thell, 2n=6x-42) were screened for their reaction against powdery mildew (*Erysiphe graminis* DC. Ex Merat f. sp. *tritici*), at the Himachal Pradesh Krishi Vishva Vidyalaya, Palampur and its regional research station, Kukumseri (Lahaul valley). One derivative, RL 22, was found to be free from powdery mildew. It has been maintaining its resistance since 1983.

Twenty-one diverse single-colony cultures of *Egt*, collected from North India, were used to characterize the resistance in RL 22. Seventeen lines/cultivars with known resistance genes and RL 22 was subjected to infection-typing technique. The RL 22 was resistant to all the cultures, but due to the non-differential response, the resistance gene could not be ascertained. Based upon the reaction of different cultures, it is inferred that the resistance gene in RL 22 is other than Pm 2, Pm 3a, Pm 3b, Pm 3c, Pm 4a, Pm 5, Pm 6, Pm 7, Pm 8, Pm (Ma), Pm 17 and Pm 20. All the 25 genes reported for powdery mildew resistance in wheat (McIntosh *et al.* 1998) are dominant, except Pm 5. In RL 22, the inheritance pattern of powdery mildew resistance revealed the presence of a single recessive gene governing resistance. Allelic test revealed that the resistance gene in RL 22 is different from Pm 5. Meiotic analysis of the F_1 of RL 22 with normal 42-chromosome wheat and *in situ* hybridisation pattern of mitotic metaphase chromosomes of RL 22 using labeled total genomic DNA as probe showed the presence of a pair of rye (*Secale cereale* L., 2n=2x=14) chromosomes. The C-binding analysis revealed this rye chromosome to be 6R, substituting the corresponding homoeologue 6D. This substituting rye chromosome might be imparting resistance to powdery mildew.

RL 22 is semi-spreading type with dark green, coarse leaves, pubescent glumes, late maturing, and has red and laterally compressed grains. However, considering a wide range of resistance to *Egt* isolates of northern India, RL 22, having a new resistance gene, can potentially be involved in the hybridisation programme to broaden the genetic base of wheat cultivars and impart a wide

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spectrum of resistance to powdery mildew.

The derivative was also free from the disease at the seedling stage as ascertained by inoculating with single-colony cultures of *Egt*. The triticale parent 'TL 68' of this line was free from powdery mildew, whereas, the bread wheat parent 'Shailaja' was susceptible.

References

McIntosh RS, GE Hart, KM Devos, MD Gale and WJ Rogers (1998) Catalogue of gene symbols for wheat. Proc 9th Int Wheat Genet Symp (Vol. 5), Saskatoon, Saskatchewan, Canada, pp 123-127

Early Maturing Gobhi Sarson

SP Landge

Botany Department, Nagpur University, Nagpur and National Dairy Development Board (NDDB), Anand, Gujarat

The exotic double zero cultivars of Gobhi sarson (*Brassica napus*) introduced in India are very late. These cultivars are not suitable for cultivation in mustard growing areas of the country. Therefore, an induced mutation-breeding programme was initiated to develop early maturing double zero genotypes suitable to agro-climatic conditions of the country.

NUDB-38 (INGR No. 01048, IC 296827)

NUDB-38 is an early maturing mutant of exotic Canadian variety Westar (*B. napus* L.) developed at the Botany Department, Nagpur University, Nagpur. Seeds of variety Westar of '00' quality (12 m moles/g seed and less than 1% erucic acid) were treated with sodium azide (pre-soaked in water for 12 hrs followed by Sodium azide, 0.06 % for 6 hrs). In M_2 generation 12 early flowering and maturing plants were isolated. They were subsequently tested for breeding behaviour. In M_3 generation, selection NUDB-38 was isolated from one of the mutants with early maturity (Table 1).

NUDB-38 has ovate dark green leaves, glabrous white coating, and undulate margin and dentations. Petiole is grooved with leafy wings at the base. Seed coat colour is blackish dark brown. Scanning Electron Microscopy showed two types of reticulation i.e., primary and secondary and pits shallow and circular in shape. It has shown early maturity across the locations. The '00' quality characters are similar to that of the parent variety 'Westar' (0 erucic acid with glucosinolate about 9.4 m moles/g of seed). Under multi-location trial in 1988-99 it gave an average yield of 1815 kg/ha as against 1319 kg/ha of HPN-3 and 1838 kg/ha of Pusa Bold and 1940 kg/ha of Varuna (Table 2).

Table 1. Salient characteristics of NUDB-38 compared to its parent

Genotype	Height (cm)	50% flowering (days)	Maturity (days)	1000-seed weight (g)	Reaction to disease
NUDB-38	109.6± 2.2	49.0± 2.0	110.0± 3.0	4.0 ± 0.39	Resistant to white rust
Westar	129.0 ± 2.2	75.0 ± 3.0	169.0± 3.0	4.2 ± 0.22	Resistant to white rust

Table 2. Yield data of NUDB-38 under multi-location trial

Line	Salon	Mehsana	Nagpur	Bharatpur-I	Bharatpur-II	Chandigarh	Anand	Gwalior	Delhi	Average
NUDB-38	1765	1760	936	1212	1904	1892	2209	2863	1797	1815
Varuna	1067	2132	908	1616	1942	1164	3246	3305	2082	1940
Pusa Bold	1032	1662	1080	1122	2079	1235	3304	3051	1980	1838
HPN-3	680	555	515	755	1887	1649	1894	1960	1976	1319

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The derivative was also free from the disease at the seedling stage as ascertained by inoculating with single-colony cultures of *Egt*. The triticale parent 'TL 68' of this line was free from powdery mildew, whereas, the bread wheat parent 'Shailaja' was susceptible.

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NUDB-42 has ovate, dark green leaves with glabrous white coating, margin is undulate with dentation and petiole is grooved with leafy wings at the base. Seed coat colour is blackish dark brown and Scanning Electron Microscopy observations indicate primary and secondary reticulation and pits shallow and circular in shape. It has shown early maturity across the locations as compared to parent. The '00' quality characters of NUDB-42 are similar to that of the parent variety 'Westar' with zero erucic acid in oil and about 11.1 m moles of glucosinolate in per gram of seed. Under multi-location trials conducted by NUDB during 1988-99, the NUDB-42 yielded 1758 kg/ha as against 1319 kg/ha of HPN-3, 1838 kg/ha of Pusa Bold and 1940 kg/ha of Varuna (Table 2).

Table 1. Some characteristic features of NUDB-42

Genotype	Height (cm)	50% flowering (days)	Maturity (days)	1000 seed weight(g)	Reaction of disease
NUDB-42	102.1± 3.6	44.0± 2.0	100.0 ± 3.0	3.7 ± 0.37	Resistant to white rust
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Table 2. Yield evaluation of NUDB-42 under multi-location trial

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Yellow Seeded Indian Mustard

GG Nayar
Anantham, N. Paravur-683513, Ernakulam Dist., Kerala

TM-1 (INGR No. 01050, IC 296829)

Mustard (*Brassica juncea*) is being grown in our country from times immemorial for the seeds and oil that are used for various purposes, in medicine, food, industry etc. It is a seasonal crop and cultivated primarily during *Rabi* season. All the varieties of Indian mustard under cultivation possess black or blackish brown seeds. A mutant TM-1 having yellow seeds was developed for the first time in the country following irradiation of the seeds of a popular black seeded variety, Rai-5 of West Bengal. The mutant is identified for yellow seeds as a source for breeding yellow mustard that can restrict adulteration of mustard with similar looking seed of other crops. The features characterising the genotype are presented in Table 1.

Table 1. Characteristic features of Yellow Seeded Indian Mustard, TM-1

Pedigree	An artificially induced mutant from mustard variety Rai-5 of West Bengal
Plant type	Medium
Stem	Moderately branched, hairy
Leaves	Alternate, petiolate and hairy. Tender leaves are taken as a vegetable
Flowering	30-35 days after planting
Flowers	In raceme, bisexual, self-compatible. Sepals and petals-4, yellow in colour, hypogynous
Pods	Siliqua, beaked
Seeds	One seriate, yellow, seed coat reticulate, non-mucilaginous in water
Oil	25 to 30 per cent, golden yellow in colour
Maturity	100-110 days after planting
Pests and diseases	Moderately resistant to aphids, *Alternaria* blight and droughts
Chromosome number	2n=36

maturity from one of the mutants (Table 1).

NUDB-42 has ovate, dark green leaves with glabrous white coating, margin is undulate with dentation and petiole is grooved with leafy wings at the base. Seed coat colour is blackish dark brown and Scanning Electron Microscopy observations indicate primary and secondary reticulation and pits shallow and circular in shape. It has shown early maturity across the locations as compared to parent. The '00' quality characters of NUDB-42 are similar to that of the parent variety 'Westar' with zero erucic acid in oil and about 11.1 m moles of glucosinolate in per gram of seed. Under multi-location trials conducted by NUDB during 1988-99, the NUDB-42 yielded 1758 kg/ha as against 1319 kg/ha of HPN-3, 1838 kg/ha of Pusa Bold and 1940 kg/ha of Varuna (Table 2).

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