Plant Germplasm Registration Notice*

The Plant Germplasm Registration Committee of **ICAR in its XVth meeting held on 29th July 2006** at the National Bureau of Plant Genetic Resources, New Delhi approved the registration of following 47 germplasm lines out of the 135 proposals considered.

DWR51 (IC546940; INGR 06001), a barley (*Hordeum vulgare*) germplasm, with excellent malt quality

RPS Verma, B Sarkar and Sewa Ram
Directorate of Wheat Research, PB No. 158, Karnal-132 001 (Haryana)

A new two-row barley genetic stock DWR51, with better malting quality was developed recently through pedigree breeding method at Directorate of Wheat Research (DWR), Karnal. The genotype is a product of a cross between a two-row barley variety, BCU73 (exotic) with a popular six-row variety PL172 of Punjab. The evaluation of this genotype for three years under All India Coordinated Wheat and Barley Improvement Programme (AICW&BIP) during 2002-03 to 2004-05 crop seasons, showed that it possesses excellent overall malting quality as indicated by the weighted score with specific advantage for important individual grain and malt quality traits like test weight, germinative energy, husk content, grain beta glucan content, hot water extract, malt friability and wort filtration rate, when compared with check DWR28 (Table 1). DWR51 is a high tillering (186/meter) genotype with erect growth habit, medium height (88 cm) and medium maturity duration. The ear is parallel in shape with intermediate density. The ear and awn colour at maturity are light yellow. The leaf sheath and ear are waxy in nature. The grains are medium hard, bold and oval in shape. The average number of grains per spike is 26 with 47g per thousand grain weight. DWR51 is moderately resistant to yellow and brown rusts.

Table 1. Quality traits of DWR51 in comparison to check DWR28 in NWPZ

Traits	DWR51				DWR28 (C)				Desirable limits
	02-03 (8)	03-04 (8)	04-05 (7)	Mean	02-03 (8)	03-04 (8)	04-05 (7)	Mean	
Test weight (Kg/hl)	66.0	65.3	65.0	65.4	62.0	62	61.0	61.6	> 65
Bold (%)	71.0	88.4	87.0	82.1	87.0	91.3	92.0	90.1	> 90
G.E. (%)	98.0	96	97	97	71	90	97	86	> 96
Husk (%)	9.9	9.5	11.2	10.2	10.6	12.2	12.2	11.7	< 10.5
Protein (%)	12.8	12.3	12.2	12.4	12.1	12.3	12.2	12.2	< 11.0
Beta glucan (%)	4.2	4.8	-	4.5	4.9	5.5	-	5.2	< 5.0
H.W.E. (%)	78.2	77.8	79.4	78.5	75.9	74.5	77.4	75.9	> 80.0
Friability (%)	71	65	60	65.3	60	46	40	48.6	> 70
Filtration (ml/hr)	280	244	289	271	221	176	199	198	> 250
Viscosity (mpas)	1.596	1.519	1.533	1.549	1.761	1.721	1.744	1.742	< 1.500
Kolbach Index	0.35	0.40	0.44	0.40	0.34	0.38	0.45	0.39	0.40-0.44
Overall weighted score*	19	19	17	18.3	14	10	10	11.3	-

( ) = number of locations in each year; * = out of maximum possible score of 27

* *Communicated by Dr. Anurudh Kumar Singh, Member Secretary, Plant Germplasm Registration Committee, National Bureau of Plant Genetic Resources, New Delhi-110012*

VSR 8 (IC546941; INGR 06002), a Paddy (*Oryza sativa*) Germplasm, Resistant to Blast

JC Bhatt, CS Reddy, SN Sushil, VP Singh, HS Gupta and RK Sharma
Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora-263 601 (Uttarakhand)

A paddy germplasm VSR-8 was developed through pedigree method of breeding at IARI, New Delhi, from the cross IR 64/P1121-92-8-2-13. The seed initially was received by Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora, as AF2-2-3 in 1998 from IARI, New Delhi where further selections were made based on resistance from F2 onward. The selected resistant plant was multiplied at VPKAS, Almora and DRR, Hyderabad during *kharif* and *rabi* season. The resistant progeny obtained, was tested by the designation SRSN-8 at Almora in 2000 and afterwards by the name VSR-8. VSR-8 possesses good quality characters with intermediate plant height of around 110 cm, medium tillering ability of about 10 effective tillers per plant with well-exerted panicles. In hills it takes on an average 149 days to maturity. The average grain length and width (mm) is 10.46 and 2.48 respectively, with a grain weight of 25.3 g per 1000 grain. Grain yield per plant is 18.47 grams. The leaf length and width is 40 and 1.14 cm respectively (Bhat *et al.* 2003).

It has been evaluated at more than 14 different hot spot locations for leaf blast under Donor Screening Nursery (DSN) of All India Coordinated Improvement Programme of Directorate of Rice Research, Hyderabad (2001, 2002 and 2003). The average severity index of leaf blast for VSR-8 during the three years was 2.5 as compared to 6.45 in the susceptible check HR 12. It also showed tolerance to brown spot disease and scored 3 as against 5 and 7 in TN-1 at Gudlur and Hazaribagh in 2001. In addition, the genotype consistently exhibited neck blast resistance with multiple tolerances to stem borer and leaf folder in the tests at VPKAS, a hot spot location for blast. VSR-8 is therefore, a potential source of blast resistance with multiple tolerance in the medium aromatic background.

References

Directorate of Rice Research (2001, 2002 and 2003) Screening Nurseries (Insect Pests and Diseases), All India Coordinated Rice Improvement Programme (ICAR), Directorate of Rice Research, Rajendranagar, Hyderabad-500030, Andhra Pradesh.

Bhat JC, SN Sushil and RK Sharma (2003) Promising rice genotypes identified. Vivekananda Parvatiya Krishi Anusandhan Sansthan Newsletter, p 4.

VPKAS Annual Reports (2000-01, 2001-02, 2002-03, 2003-04 and 2004-05) Vivekananda Parvatiya Krishi Anusandhan Sansthan, (ICAR), Almora.

NAP HAL (IC354308; INGR 06003), a Wheat (*Triticum aestivum*) Landrace/Traditional Variety, with Glu-D1 Double Null Trait Associated with Weak Gluten and Puroidoline

Sewa Ram, Jag Shoran, B Mishra and S Kundu
Directorate of Wheat Research, PB No. 158, Karnal-132 001 (Haryana)

NAP HAL, an Indian landrace of wheat, contains unique characteristic of double null trait at Glu-D1 locus i.e.; both the X and Y genes for high molecular weight glutenin subunits coded by the locus are absent (Sewa Ram *et al.*, 2003). The material was received from NBPGR, New Delhi with alternate identities PI 176217 and DWR ID No. 3674 in 1993 and subsequently grown and analyzed for genetic, molecular and quality traits at DWR, Karnal. In addition to double null at Glu-D1, NAP HAL exhibited null alleles at Glu-A1 while subunits 7+8 (Glu-B1b) were encoded at Glu-B1 locus. Double null trait at Glu-D1 in NAP HAL is unique in nature and is not available in bread wheat studied so far (Sewa Ram, 2003). It exhibits very low gluten strength as reflected in low sedimentation volume (16.0 cc, 6 g test), lower Farinograph peak time (2.0 minutes) and lower Farinograph tolerance (higher break down 140 BU) to mixing. PCR analysis of puroindoline genes showed the presence of both *pinA* and glycine type *pinB* associated with soft grain texture of wheat (Giroux and Morris, 1997; Sewa Ram *et al.*, 2002)). Wheat with soft grain characteristic and weak gluten are suitable for biscuit making quality (Sewa Ram and Singh, 2004).

On the basis of growth habit, NAP HAL can be grouped as facultative type wheat not exactly as spring wheat, with height around 95 cm. It is very late maturing with profuse tillering, weak stem, light green foliage, light red small size grains, awnletted long ear heads and

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Development of Genetic Stocks in Wheat with Resistance to Rust using Different Sources

Dibendu Dutta, S Tyagi, Jag Shoran, M Parashar, SC Bhardwaj and NVPR Ganga Rao
Directorate of Wheat Research, PB No. 158, Karnal-132 001 (Haryana)

FKW1 (IC546933; INGR 06004) a wheat (*Triticum aestivum*) germplasm, resistant to yellow and black rust

FKW1 is a wheat genetic stock derived from 2338*4/ China 84-40022 at Directorate of Wheat Research, Karnal with resistance to yellow and black rust. In addition to resistance gene from China 84-40022, it also carries genes *Lr*26, *Sr* 31 and *Yr* 9 from UP 2338. It has amber colour bold seed having thousand grain weight 40.1 g. The average height of the plant is around 88 cm and it matures in about 120 days.

FKW3 (IC546934; INGR 06005) a wheat (*Triticum aestivum*) germplasm, resistant to brown rust with genes from durum wheat

FKW3 is a wheat genetic stock derived from cross between a durum wheat variety, HD 4672 and aestivum variety, PBW 343 with brown rust resistance genes from durum wheat. The derived stock is a bread wheat type with complete resistance to all races of leaf rust. It has amber colour seed with bold size having thousand grain weights of 45.0 g. It attains an average height of 110 cm and matures in about 121 days.

TANK (IC398287; INGR 06006), Wheat (*Triticum aestivum*) Germplasm with Long Awns

Arun Gupta, Lakshmi Kant, Vinay Mahajan, HS Gupta and Hari Govind
Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora-263 601 (Uttarakhand)

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and narrow flag leaf (length-14.9 cm, width-1.07 cm). 'Tank' is a tall wheat (140-145 cm) with long and thin peduncle (52.7 cm). Its spikes are small with long awns (7.03 cm), brown glumes, seed is red with immediate plumpness, small (100 seed weight-3.17) with narrow grain width (2.74 mm). It has long maturity duration of 200-210 days. Table 1 presents details of its morphological features.

WH730 (IC546937; INGR 06007), a Wheat (*Triticum aestivum*) Germplasm, Tolerant to Heat

Iqbal Singh, RK Rana, SS Dhanda and Renu Munjal
Chaudhary Charan Singh, Haryana Agricultural University, Hisar-125 005 (Haryana)

WH730 was developed from the progeny of a cross between CPAN 2092/ Improved Lok 1 through pedigree method. In the experiments conducted by Directorate of Wheat, Research, Karnal at various locations, it showed comparatively less reduction in grain numbers, grain weight and biomass. Also, in an experiment conducted at Chaudhary Charan Singh, Haryana Agricultural University, Hisar, Haryana, this variety recorded significantly higher grain yield than check varieties under heat stress environment. The high grain yield under heat stress conditions might have been contributed by membrane thermo-stability index and heat response index of WH730, as indicated by indices. This led to categorization of WH730 into a heat tolerant variety at later stages of plant growth in the Annual Report of All India Coordinated Wheat Improvement Project during the year 2001-02.

It has 110 cm height, dark green foliage; intermediate leaf width, takes 90 days in heading and 135 days in maturity. It does not show any waxiness throughout the growing season. The ears are white in colour, tapering and medium dense with average 1000-grain weight of 40 g. Also, WH 730 was found to have higher C TD (5.6) and keeps its canopy cool even under high ambient temperature. Therefore, it is expected to perform better under late sown environment and had shown higher grain yield in comparison to other genotypes under late sown conditions in All India Coordinated Multi-location Thermo-tolerant Trials (2004-05). Stomatal conductance and hence transpiration cooling has been found higher in WH 730 maintaining better water status. Leaf AGPase were also found to be higher

Reference

Munjal R, SS Dhanda, RK Rana and I Singh (2004) Membrane thermostability as an indicator of heat tolerance at seedling stage in bread wheat. *Natnl. J. Pl. Improv.* **6:** 133-135.

DI-717 (IC546939; INGR 06008) a Wheat (*Triticum aestivum*) Germplasm, Resistant to Lodging

Kushalpal Singh, SK Sharma and RK Behl
Chaudhary Charan Singh, Haryana Agricultural University, Hisar-125 005 (Haryana)

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is susceptible to lodging. At Karnal, it produced shrivelled grains but the harvest from VPKAS, Hawalbagh located at an altitude of 1250 m produced fully plumped grains which were analyzed at DWR, Karnal for chemical, rheological and baking properties as per AACC methods. Therefore, it is adapted to hilly regions with low temperature conditions.

References

Giroux MJ and CF Morris (1997) A glycine to serine change in puroindoline b is associated with wheat grain hardness and low level of starch-surface friabilin. *Theor. Appl. Genet.* **95:** 857.

Sewa Ram (2003) High molecular weight glutenin subunit composition of Indian Wheats and their relationships with gluten strength. *J. Plant Biochem. Biotech.* **12:** 151-155.

Sewa Ram and RP Singh (2004) Solvent retention capacities of Indian wheats and their relationship with biscuit making quality. *Cereal Chem.* **81(1):** 128-133.

Sewa Ram, E Boyko, MJ Giroux and BS Gill (2002) Null mutation in pin A is prevalent in Indian wheats: puroindoline genes are located in the distal part of short arm of 5D chromosome. *J. Plant Biochem. Biotech.* **11:** 79-83.

Sewa Ram, J Shoran, RK Gupta and S Kundu (2003) NAP HAL (Indian land race of wheat) has Glu-D1 double null trait and very low gluten strength. *Indian Wheat Newsletter.* **9(2):** 11.

Development of Genetic Stocks in Wheat with Resistance to Rust using Different Sources

Dibendu Dutta, S Tyagi, Jag Shoran, M Parashar, SC Bhardwaj and NVPR Ganga Rao
Directorate of Wheat Research, PB No. 158, Karnal-132 001 (Haryana)

FKW1 (IC546933; INGR 06004) a wheat (*Triticum aestivum*) germplasm, resistant to yellow and black rust

FKW1 is a wheat genetic stock derived from 2338*4/ China 84-40022 at Directorate of Wheat Research, Karnal with resistance to yellow and black rust. In addition to resistance gene from China 84-40022, it also carries genes *Lr*26, *Sr* 31 and *Yr* 9 from UP 2338. It has amber colour bold seed having thousand grain weight 40.1 g. The average height of the plant is around 88 cm and it matures in about 120 days.

FKW3 (IC546934; INGR 06005) a wheat (*Triticum aestivum*) germplasm, resistant to brown rust with genes from durum wheat

FKW3 is a wheat genetic stock derived from cross between a durum wheat variety, HD 4672 and aestivum variety, PBW 343 with brown rust resistance genes from durum wheat. The derived stock is a bread wheat type with complete resistance to all races of leaf rust. It has amber colour seed with bold size having thousand grain weights of 45.0 g. It attains an average height of 110 cm and matures in about 121 days.

TANK (IC398287; INGR 06006), Wheat (*Triticum aestivum*) Germplasm with Long Awns

Arun Gupta, Lakshmi Kant, Vinay Mahajan, HS Gupta and Hari Govind
Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora-263 601 (Uttarakhand)

Tank is a classical indigenous local landrace of wheat with associated technical knowledge. It was collected and documented while conducting an exploration in parts of Kumaon hills, from village Godiadhar, Block Kapkot, Distt Bageshwar, Uttarakhand (latitude 30° 00'N, longitude 79° 52'E, altitude 1270 m amsl) during May, 2003. This landrace is exclusively grown as border rows in wheat fields to save the main wheat crop from monkey damage. This landrace has long awns and small grains due to which monkeys do not damage the wheat field under the impression that whole field is sown with long awn wheat.

This land race was characterized during *rabi* 2005-06 at Vivekanand Parvatiya Krishi Anusandhan Sansthan experimental farm, Hawalbagh (29°36'N and 79°40'E and 1250 amsl). It has semi-spreading growth habit, small

Table 1. Salient characteristics of local landrace 'Tank'

S.No.	Characters	Tank
1	Coleoptile colour	Purple
2	Days to 75% spike emergence	145
3	Flag leaf length (cm)	14.91± 2.83
4	Flag leaf width (cm)	1.07±0.07
5	Glume colour	Brown
6	Glume pubescence	Absent
7	Spike length (cm)	9.02±0.99
8	Number of spikelets per spike	18.2±1.40
9	Peduncle length (cm)	52.7±4.46
10	Awn type	Awned
11	Awn length (cm)	7.03±0.55
12	Awn width (mm)	0.51±0.55
13	Number of seeds per spikelets	2-3
14	Plant height (cm)	143.3±3.8
15	Number of grains per spike	36.8±3.7
16	Grain colour	Red
17	Seed plumpness	Intermediate
18	100 seed weight (g)	3.17±0.20
19	Grain length (mm)	6.63±0.19
20	Grain width (mm)	2.74±0.10

and narrow flag leaf (length-14.9 cm, width-1.07 cm). 'Tank' is a tall wheat (140-145 cm) with long and thin peduncle (52.7 cm). Its spikes are small with long awns (7.03 cm), brown glumes, seed is red with immediate plumpness, small (100 seed weight-3.17) with narrow grain width (2.74 mm). It has long maturity duration of 200-210 days. Table 1 presents details of its morphological features.

WH730 (IC546937; INGR 06007), a Wheat (*Triticum aestivum*) Germplasm, Tolerant to Heat

Iqbal Singh, RK Rana, SS Dhanda and Renu Munjal
Chaudhary Charan Singh, Haryana Agricultural University, Hisar-125 005 (Haryana)

WH730 was developed from the progeny of a cross between CPAN 2092/ Improved Lok 1 through pedigree method. In the experiments conducted by Directorate of Wheat, Research, Karnal at various locations, it showed comparatively less reduction in grain numbers, grain weight and biomass. Also, in an experiment conducted at Chaudhary Charan Singh, Haryana Agricultural University, Hisar, Haryana, this variety recorded significantly higher grain yield than check varieties under heat stress environment. The high grain yield under heat stress conditions might have been contributed by membrane thermo-stability index and heat response index of WH730, as indicated by indices. This led to categorization of WH730 into a heat tolerant variety at later stages of plant growth in the Annual Report of All India Coordinated Wheat Improvement Project during the year 2001-02.

It has 110 cm height, dark green foliage; intermediate leaf width, takes 90 days in heading and 135 days in maturity. It does not show any waxiness throughout the growing season. The ears are white in colour, tapering and medium dense with average 1000-grain weight of 40 g. Also, WH 730 was found to have higher C TD (5.6) and keeps its canopy cool even under high ambient temperature. Therefore, it is expected to perform better under late sown environment and had shown higher grain yield in comparison to other genotypes under late sown conditions in All India Coordinated Multi-location Thermo-tolerant Trials (2004-05). Stomatal conductance and hence transpiration cooling has been found higher in WH 730 maintaining better water status. Leaf AGPase were also found to be higher

Reference

Munjal R, SS Dhanda, RK Rana and I Singh (2004) Membrane thermostability as an indicator of heat tolerance at seedling stage in bread wheat. *Natnl. J. Pl. Improv.* **6:** 133-135.

DI-717 (IC546939; INGR 06008) a Wheat (*Triticum aestivum*) Germplasm, Resistant to Lodging

Kushalpal Singh, SK Sharma and RK Behl
Chaudhary Charan Singh, Haryana Agricultural University, Hisar-125 005 (Haryana)

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emergence 85.0, days to maturity 130.0, number of grains per pike 61.0 and dwarfing gene Rht_3. It has recorded significantly higher grain yield than C 306 and was at par with other dwarf genotypes.

References

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HDM 04-1 (IC537352; INGR 06009) an Early Pigeonpea (*Cajanus cajan*) Germplasm

Ram Kumar Yadav and RS Waldia

Chaudhary Charan Singh, Haryana Agricultural University, Hisar-125 005 (Haryana)

Genotype HDM 04-1 has been categorized as having shortest maturity duration. It was developed through induced mutation using 10 kR of gamma rays on ICPL 88039 at Chaudhary Charan Singh, Haryana Agricultural University, Hisar. The genotype has 100 cm height, dark green small leaflets, indeterminate growth habit, takes 45-50 days to flower initiation and 100 days to maturity. The flower is yellow in colour. The seed is round, bold and brown in colour. Average 100 seed weight is 8.8 gm (Ram Dhari and Waldia, 2005). It is dwarf, therefore will be useful for insect management and also for drought conditions. This genotype fits well for pigeonpea-wheat rotation and therefore will help in increasing the area under pulses. The per day productivity of this genotype is higher than the popular varieties of the state.

Reference

Dhari R and RS Waldia (2005) Dwarf and extra early mutant of pigeonpea [*Cajanus cajan* (L.) Millsp.] *Natnl. J. Pl. Improv.* **7 (1):** 61.

RG2819 (IC346591; INGR 06010) a Castor (*Ricinus communis*) Germplasm, Resistant to *Macrophomina* Root Rot and *Fusarium* Wilt

K Anjani

Directorate of Oilseeds Research, Hyderabad-500 030 (Andhra Pradesh)

The accession RG 2819 (IC346591) is a unique multiple disease resistant selection from a castor (*Ricinus communis* L.) landrace collected from Tamil Nadu. It showed consistently high resistance reaction against *Macrophomina* root-rot as well as against *Fusarium* wilt over years and locations, in screening trials using wilt sick and root-rot sick plots.

RG 2819 has green colour stem with bloom on it. The primary spike is predominantly female with medium size spiny green non-dehiscent capsules. Seeds are small and mottling on seed is conspicuous. Caruncle is present. As multiple resistance to the above diseases is not available in castor cultivars, this accession would be highly useful to breed castor varieties/parental lines resistant to both the diseases. It would a useful base material to tag genes responsible for resistance to these diseases and study linkage between them, if any.

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Wilt and Reniform Nematode Resistant Parent Germplasm in Castor (*Ricinus communis*)

HC Pathak, KP Chaudhari, MS Patel, SR Chaudhari, DB Patel and PS Patel
Sardarkrushinagar-Dantiwada Agriculture University, Sardarkurshinagar, Banskantha-385 506 (Gujarat)

Castor (*Ricinus communis* L.) is an important non-edible oilseed crop of arid and semi-arid region of the world, having wide range of industrial uses. India has the maximum area and production under this crop. India is principal producer and exporter of castor seed, castor oil and some of its derivatives. The major growing states in India are Gujarat, Andhra Pradesh, Rajasthan, Tamil Nadu, Karnataka and Orissa, Gujarat is the leading castor growing state of the country where the crop is grown in 3.05 lakh hectares of area with 4.65 lakh tones of total production and average productivity of about 2000 kg/ha. For production of hybrids with resistance to some of the major diseases parents described below have been identified.

SKP 84 (IC537353; INGR 06011) a Pistillate Castor (*Ricinus communis*) Germplasm with Resistance to Wilt and Reniform Nematode

SKP 84 is a pistillate line identified with resistance to wilt and reniform nematode at Sardarkrushinagar-Dantiwada Agriculture University, Sardarkurshinagar, Banskantha, Gujarat. It was used as the female parent in development of GCH-7.

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Identification of Useful Germplasm in Rapeseed and Mustard

JN Sachan, Basudeo Singh, SP Singh, DP Pant, Dhirendra Singh and AK Singh
Department of Genetics and Plant Breeding, GB Pant University of Agriculture and Technology, Pantnagar-263145, US Nagar (Uttarakhand)

PRQ-2005-1 (IC546946; INGR 06013)

Brassica oil crops normally contain high levels of erucic acid (40-50%) in oil. Cultivars with little or no erucic acid were first identified in *Brassica napus* L. and in *B. rapa*, and more recently in *B. juncea*. The first low erucic acid rapeseed (LEAR) cultivars developed were Orlo in *B. napus*, Sapn in *B. rapa* and Zem-1 in *B. juncea*. Although, low erucic acid genes are also available in *B. juncea* but only few commercial cultivars of *B. juncea* have low erucic acid content. The research efforts at GB Pant University of Agriculture and Technology, Pantnagar resulted in the development of a low erucic *B. juncea* strain, PRQ-2005-1. It is a transgressive segregant from a cross between *B. juncea* genotypes, RC-781 (high erucic acid, black seeded) and Zem-1 (Australian low erucic acid and yellow seeded cultivar).

PRQ-2005-1 maintained its low erucic characteristics (<1.08%) and its superiority in seed and oil yield, compared to the national checks, Kranti and Varuna in multilocation testing under AICRP trials during 2002-03 and 2003-04 (Anonymous 2003 and Anonymous, 2004). Observations on seed colour and physio-morphological characters recorded at Pantnagar revealed that PRQ-2005-1 contain yellow seed coat colour and is similar to national checks in almost all the physio-morphological characteristics.

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References

Anonymous (2003) Annual progress report on All India Coordinated Research Project on Rapeseed-Mustard. ICAR National Centre on Rapeseed-Mustard, Sewar, Bharatpur, India.

Anonymous (2004) Annual progress report on All India Coordinated Research Project on Rapeseed-Mustard. ICAR National Centre on Rapeseed-Mustard, Sewar, Bharatpur, India.

PAB 9511 (IC 546948; INGR 06014)

A mustard strain developed by pedigree selection from a double cross [(RC 78 x Krishna) x (PHR-1 x Poorbiraya)] at GB Pant University of Agriculture and Technology, Pantnagar, showed moderately resistant reaction to *Alternaria* blight (score 2.39) at leaf stage and resistant (score 1.16) at pod stage in the scale of 0-5 (0=diseases free, 1=highly resistance, 2=resistant, 3=moderately resistance, 4=susceptible and 5=highly susceptible) under multilocation testing in National Screening Nursery of All India Coordinated Research Project (AICRP) between 1996-97 to 1998-99 (Bhartaria PI Patho AICRP R&M 1996). This strain combines *Alternaria* blight (AB) tolerant genes from RC 781 and PHR-1 with enhanced expression for AB resistance and agronomical features from Krishna and Poorbiraya. It was reported as a promising source for *Alternaria* blight resistance. Patini *et al.* (2005) suggest that moderately resistant reaction is due to more incubation and latent periods, less size of spot, less sporulation index and less leaf and cotyledon damage area. It has been recommended for rapeseed-mustard varietal improvement programme to enhance the level of resistance to stabilized/ sustain higher yield (AICRP R&M, Annual Report 2004). The strain PAB 9511 yielded consistently higher than Varuna under protected and unprotected conditions for last four years under AICRP Trials (AICRP R&M Annual Report, 2004).

References

Anonymous (1996-2004) *Annual progress report on All India Coordinated Research Project on Rapeseed-Mustard.* ICAR National Centre on Rapeseed-Mustard, Sewar, Bharatpur, India.

Patini CS, SJ Kolte and RP Awasthi (2005) Screening of Indian mustard (*Brassica juncea* (Berk) sacc. isolates based on infection reducing resistance. *J. Interacad.* **9(4):** 498-507.

VLS 59 (IC 546949;INGR 06015) a Soybean (*Glycine max*) Germplasm, with Low Linolenic Acid

Vinay Mahajan, SK Shukla, HS Gupta, MS Khati, Vineet Kumar, Anita R Kumar, SM Hussain and GS Chauhan

Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora-263 601 (Uttarakhand)

The shelf life of soybean oil depends upon the oxidative stability of soybean oil as determined by its fatty acid composition. Partial hydrogenation, the process to increase oxidative stability, is not only cost-ineffective, but also leads to formation of trans fatty acids that implicates serious health concern (Lichtenstein *et al.* 2003). Monounsaturated (M): poly-unsaturated fatty acids (P) ratio is considered as an indicator of oxidative stability of a vegetable oil. Generally, soybean oil possesses M:P ratio of 0.5 as compared to 7.0, 2.3, 1.0, 0.5, 0.2 values of olive, canola, peanut, corn and sunflower oil, respectively. In order to develop high yielding lines with better shelf life efforts were made to develop genotype with higher M:P ratio. VLS 59 was developed out of the cross "VS 96 x EC 361336" with a selection history as [(VS 96 x EC 361336)-3-1-1-2]. VLS 59 exhibits the lowest linolenic acid i.e. 3.96 (C18:3), which indicates improved oxidative stability of soybean oil. The other quality characteristics for VLS 59 are C16:0 (12.16), C18:1 (3.26), C18:2 (33.06), M:P (0.645), N-6:N-3 (11.9) and 100 seed wt. (13.3g). VLS 59 plants are 73.75 cm tall with average 100-seed weight of 14.28g. In multi-location trials it flowered in 58-69 days (average: 63.5 days) and matured in 119-129 days (124 days). It is tolerant to bacterial blight and *Cercospora* leaf spot (Table 1). VLS 59 can be employed in breeding for high yielding varieties with improved oxidative stability of soybean oil.

Reference

Table 1. Summary of ancillary characters VLS 59 compared to other advance lines

Entries	VLS 59	Bragg	VLS 2	Shivalik	JS 335	VLS 47
Plant height (cm)	73.75	89.66	70.67	73.33	87.75	110.00
Days to flower	63.50	56.34	50.00	57.00	64.34	76.50
Days to maturity	124.00	123.80	121.00	118.33	125.34	131.00
100 seed weight (g)	14.28	16.32	12.93	13.07	12.29	15.05

(Initial Varietal Trial, *kharif* 2003 and Advance Varietal Trial I, *kharif* 2004)

Lichtenstein AH, AT Erkkila, B Lamarche, US Schwab, SM Jalbert and M Ausman (2003) Influence of hydrogenated fat and butter on CVD risk factors remnant like particles, glucose and insulin, blood pressure and C reactive protein. *Atherosclerosis* **171**: 97-103.

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Table 1. Summary of ancillary characters VLS 59 compared to other advance lines

Entries	VLS 59	Bragg	VLS 2	Shivalik	JS 335	VLS 47
Plant height (cm)	73.75	89.66	70.67	73.33	87.75	110.00
Days to flower	63.50	56.34	50.00	57.00	64.34	76.50
Days to maturity	124.00	123.80	121.00	118.33	125.34	131.00
100 seed weight (g)	14.28	16.32	12.93	13.07	12.29	15.05

(Initial Varietal Trial, *kharif* 2003 and Advance Varietal Trial I, *kharif* 2004)

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CSD 123 (IC546953; INGR 06016) a daincha (*Sesbania aculeate*) germplasm, with early maturity

RK Singh, RK Gautam and B Mishra[1]
Central Soil Salinity Research Institute, Karnal-132 001 (Haryana)
[1] *Project Director, Directorate of Wheat Research, Karnal-132 001 (Haryana)*

Sesbania (*dhaincha*) is a very useful source of green manuring for soil enrichment. This also serves as a biological amendment in the salt affected soils. Early maturity in this crop facilitates early vacation of field for the timely sowing of next crop. In the Uttar Pradesh Council of Agricultural Research (UPCAR) funded project on "Screening of Suitable Sodicity Tolerant, Early Maturing and High Foliage Yielding Sesbania Varieties", amongst 140 lines of *Sesbania aculeata* and *S. rostrata*, one line CSD123 was found to possess characteristically distinct and consistent early maturity across locations and years. CSD123 is a local collection from Block Khandauli in District Agra, Uttar Pradesh. Three years of evaluation of this line revealed uniform expression of earliness at Karnal (Haryana), Lucknow and Pratapgarh Uttar Pradesh. This results in early seed harvest by about 25 days than other lines. The earliness trait has been characterized in the CSD123 on molecular basis through RAPD polymorphic bands.

It gives about 16, 91, 154, 160 and 176 g of fresh foliage yield/plant respectively at 40, 45, 50, 55 and 60 days after sowing. With regards to other agro-morphological features, CSD 123 in sodic soils attains about 2.60 m plant height, produce 15 primary branches, 37 secondary branches, 115 pods/plant and 15.0 g test seed weight and takes about 90 days for pod bearing.

A New Apomictic Cytotype with 2n=56 of *Pennisetum squamulatum* (IC546955; INGR 06017)

AK Roy, P Kaushal, SN Zadoo and RN Choubey
Indian Grassland & Fodder Research Institute, Jhansi-284 003 (Uttar Pradesh)

Pennisetum squamulatum Fresen is a very important species, as it contains genes for perenniality, apomixis and tolerance to many abiotic and biotic stresses (Hanna *et al.*, 1989). Considerable success has been reported in transfer of apomixis to pearl millet utilizing *P. squamulatum* as donor species (Ozias-Akins *et al.*, 1998, Roche *et al.*, 2002). Previous reports on cytological as well as in hybridization studies have designated *P. squamulatum* as a hexaploid species with 2n = 6x = 54 chromosomes (Raman *et al.*, 1959, Patil *et al.*, 1961, Dujardin and Hanna, 1989).

Studies at Indian Grassland and Fodder Research Institute, Jhansi have identified a new cytotype of *P. squamulatum* with 2n=56 (Roy *et al.*, 2003). Chromosome number, meiotic behaviour and crossability of the cytotype with *P. glaucum* justifies its octoploid nature based on x =7 and inclusion in the secondary gene pool of *P. glaucum*. The plant exhibits perennial habit. There is good pollen viability (as indicated by pollen staining), but has low seed set. Detailed cytological analysis revealed that bivalent formation is most prevalent and average configuration at diakinesis is 0.06 VI + 3.46 IV + 20.06 II + 1.6 I. Mostly normal disjunction of chromosomes at metaphase and anaphase was seen with occasional laggards and univalents.

The plants are around 2 m tall, average leaf length 37 cm with 1.3 cm leaf width. Leaf sheath is glabrous and average spike length is 18 cm. The mature stigma colour is purple and number of spikelets /spike is up to 270. It often has occurrence of trifid stigma (frequency 16%). It can be propagated by rooted slips or by seeds and harvested 2-3 times per year to provide good biomass for cattle.

References

Dujardin M and WW Hanna (1989) Crossability in pearl millet with wild *Pennisetum* species. *Crop Sci.* **29:** 77-80.

Hanna WW, M Dujardin and WG Monson (1989) Using diverse species to improve quality and yield in the *Pennisetum* genus. *XVI International Grassland Congress*, Nice, France, pp 403-404.

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Agros-4 (IC 546954; INGR 06018) a New Cytotype of *Pennisetum pedicellatum*

SN Zadoo, AK Roy, RN Choubey and P Kaushal
Indian Grassland & Fodder Research Institute, Jhansi-284 003 (Uttar Pradesh)

Pennisetum pedicellatum Trin. popularly known as Dinanath Grass is an annual fodder plant widely cultivated on poor and marginal soil. It produces good and nutritious biomass for cattle consumption. The species having basic chromosome constitution of x = 9 has two known euploid races i.e. tetraploid (2n = 4x =36) and hexaploid (2n = 6x = 54) (Zadoo, 1986) and some aneuploid derivatives (Joshi *et al.*, 1959, Singh *et al.*, 1989, Zadoo, 1986).

The present material is an octoploid cytotype (2n = 8x = 72), which is a new report for the species (Zadoo et al., 1997). The material was obtained from Birsa Agricultural University, Ranchi as Type 'Agros-4'. At IGFRI, Jhansi the cytology was carried out from the germplasm and it was found to be an octoploid cytotype hitherto unreported. Average number of chromosome associations per cell was observed to be 2.2VIII + 1.7VI + 0.05V + 3.15IV + 0.95III + 13.65II + 1.21I.

The plants are perennial as compared to other genotypes of this species which are annual in nature. The material forms tussocks with multi tillering (up to 100 tillers) nature. The plant has good regeneration capacity and can be harvested three to four times in year. It has good seed set with, approximately 60% germination. It can be grown by seeds or by rooted slips. Seeds can be sown in good well drained soil 2-3 cm below surface. It can also be planted by rooted slips usually at 50 x 50 cm distance. It requires less water and can be grown as rainfed crop in *kharif* season. It can be harvested 3-4 times in a year. Nitrogen fertilizer in form of Urea after each cut increases biomass production.

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COVC 2003 165 (IC538549; INGR 06019) a sugarcane (*Saccharum officinarum*) germplasm, with woolly aphid resistance

SN Swamy Gowda and D Rajanna
University of Agricultural Sciences, Dharwad (Karnataka)

COVC 2003 165 is a sugarcane germplasm (*Saccharum officinarum*) with resistance to woolly aphids developed at Agricultural Research Station, University of Agricultural Sciences (UAS), Bangalore and Agricultural Research Station Visweswaraiah Canal Farm, Mandya, Karnataka. It has good agronomic features, such as high tillering capacity, high sucrose contents and high yielding ability.

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The plants are perennial as compared to other genotypes of this species which are annual in nature. The material forms tussocks with multi tillering (up to 100 tillers) nature. The plant has good regeneration capacity and can be harvested three to four times in year. It has good seed set with, approximately 60% germination. It can be grown by seeds or by rooted slips. Seeds can be sown in good well drained soil 2-3 cm below surface. It can also be planted by rooted slips usually at 50 x 50 cm distance. It requires less water and can be grown as rainfed crop in *kharif* season. It can be harvested 3-4 times in a year. Nitrogen fertilizer in form of Urea after each cut increases biomass production.

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University of Agricultural Sciences, Dharwad (Karnataka)

COVC 2003 165 is a sugarcane germplasm (*Saccharum officinarum*) with resistance to woolly aphids developed at Agricultural Research Station, University of Agricultural Sciences (UAS), Bangalore and Agricultural Research Station Visweswaraiah Canal Farm, Mandya, Karnataka. It has good agronomic features, such as high tillering capacity, high sucrose contents and high yielding ability.

KP/AK/77 (IC 415397; INGR 06020), a Spineless Meetha Karela (*Cyclanthera pedata*)

JC Rana, K Pradheep and VD Verma
NBPGR Regional Station, Phagli, Shimla-171 004 (Himachal Pradesh)

Meetha Karela (*Cyclanthera pedata*) is a minor kitchen garden vegetable in mid to high hill areas. In the hills almost every household grows Meetha Karela in their backyards for vegetable purpose. Majority of the cultigens have spines on fruits and are not preferred for cooking as vegetable. The proposed accession named '415397' was collected from Shimla district has almost no spines on the fruits, however, occasionally few (4-5 rudimentary) spines were found in some fruits. A single plant was selected from this accession and multiplied for obtaining the seed. Apart from spineless character the accession was also found to be high yielding and fruits were more straight, pulpy, less seeded and long, compared to commonly available germplasm. Splitting of fruits at maturity was also less and was quite late compared to common types. Splitting at early stage makes the collection of seeds difficult. The morphological features of this accession are summarized in Table 1.

Table 1. Characteristic feature of the germplasm accessions 'IC 415397'

Characters	Mean value	Characters	Mean value
Days to 50% flowering	70.00	Fruit yield/plant (g)	482.00
Leaf length (cm)	9.82	Early plant vigour	Very good
Leaf width (cm)	2.19	Plant growth habit	Spreading
Fruit length (cm)	7.26	Flower colour	Creamish
Fruit diameter (cm)	2.56	Stem branching	Very good
Fruit weight (g)	6.95	Fruit surface	Smooth
No. of fruit/plant	62.00	Fruit shape	Straight
Days to maturity	132.00	Fruit splitting	Less
1000 seed wt. (g)	5.45	At maturity	

JX123 (IC547013; INGR 06021) a Potato (*Solanum tuberosum*) Germplasm, Resistant to Early Blight

Raj Kumar, GS Kang and SK Pandey[1]
Crop Improvement Section, Central Potato Research Station, Jalandhar-144 003 (Punjab)
[1] *Crop Improvement Division, Central Potato Research Institute, Shimla-171 001 (Himachal Pradesh)*

Early blight (*Alternaria solani*) is a disease of potato occurring across the geographic range of crop (Pavek and Cornisi, 1994). It is one of the most common diseases of potato in warm-growing-season/areas of potato production, and is of economic importance in plains of India (Lakra, 1997).

JX 123 is high yielding under early harvest (75 days) and has good general combining ability for yield at very early (60 days) and early (75 days) harvests (Raj Kumar, 2004). It is a selection from the progeny of the cross, JE 812 × CP 2144. The cross was made during 1985 at the Central Potato Research Station, Kufri, Himachal Pradesh. The clone was selected from the progeny of this cross at Central Potato Research Station, Jalandhar, Punjab. The breeding methodology used was clonal selection from the cross between selected parents.

The tubers of JX 123 are oval shape, yellow skined, large sized with shallow eyes and light yellow flesh colour. It flowers moderately at Kufri. The plant is medium tall, leaflets are oval with entire margin and rough surface and flower is white. Under early harvest (75 days), this germplasm yielded at par with best early maturing variety Kufri Ashoka in Indian plains and plateau in multi-location trials under All India Coordinated Potato Improvement Project from 1993-1994 to 1996-1997. This accession is moderately resistant to late blight. This line performs well under early harvest (75 days) in Indian plains and plateau region.

References

Lakra BS (1997) Prevalence of diseases of potato crop in Haryana. *Crop Research* **14**: 357-360.

Pavek JJ and DL Cornisi (1994) Inheritance of resistance to warm-growing-season fungal diseases. In: JE Bradshaw and GR Mackay (eds.) *Potato Genetics*. CAB International, Wallingford, UK, pp 403-410.

Raj Kumar (2004) Estimation of genetic variances and combining ability in potato (*Solanum tuberosum*). *Indian J. Agric. Sci.* **74**: 544-547.

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IC547016; INGR 06022, a Wild Cashew-nut (*Semicarpus kurzii*) Germplasm

DR Singh
Central Agricultural Research Institute, PB No. 181, Port Blair-744 101 (Andaman and Nicobar Islands)

Wild cashew nut, *Semicarpus kurzii* is an endemic species widely distributed in the tropical rain forests of Chidratepu, South Andaman Islands. The tribal and the aborigines are using the exudates of this cashew-nut tree for curing skin allergies. The leaves of this plants are also used for treating malaria and as an anti-helminthetic. The plants of the species are medium sized trees with a height of 4.65 – 6m and light grey glabrous bark. The fruits are orange in colour, drupe sealed in a fleshly receptacle. The nuts are dried and used for extraction of oil. The pulp is rich in Vitamin C. This species can be used as a root stock for cultivated cashew-nut, because of its resistance against soil pathogens.

Identification of Potential Germplasm in Medicinal and Aromatic Plants

KA Geetha, Satyabrata Maiti and Narendra Gajbhiye
National Research Centre for Medicinal & Aromatic Plants, Boriavi, Anand-387 310 (Gujarat)

The genus *Aloe* (family Liliaceae) containing about 300 species (Reynolds, 1966) is native to Africa, Canary Islands, Spain and Mediterranean countries from where it was introduced to India, China, East and West Indies, southern USA, Central America and other countries. Among the different species reported, *Aloe barbadensis* Mill (*A.vera* L.) is well known for its therapeutic values. It is a perennial herb of about 2 feet high having short stem, rosette leaves shallow root system and found in semi-wild state in many parts of the country. Leaves are smooth and irregularly white blotched. Bright orange to saffron coloured small flowers are borne on a simple or a branched raceme. The flowers usually appear during September to March. Aloes are the major sources of anthraquinone glycosides, a bitter yellow juice, which exudes from the leaf. The principal active component of aloe is aloin- a mixture of glucosides, among which barbaloin is the chief constituent. Chemically, it is aloe-emodin anthrone C-10 glucoside and is water-soluble.

The significance of *A. barbadensis* achieved great momentum in medicinal plant cultivation due to the use of aloe gel. Aloe gel-a polysaccharide- is formed in inner parenchyma cells of the leaf, is slightly viscous and clear. The gel is used in topical therapeutic applications and also in many cosmetic products. The gel possesses good moisturizing properties. Germplasm screening at NRCMAP, resulted in the identification of two promising genotypes *i.e.* IC 283932 and NMRM 2, which were high yielding in terms of gel and aloin, respectively.

IC283932; INGR 06023, an aloe (*Aloe barbadensis*) Germplasm with Superior Gel Content

IC 283932 is a gel rich clone which yields about 2191.18 g of gel per plant. The main morphological and agronomic features of this germplasm are summarized in Table 1. The germplasm stocks are maintained in Active Gene Bank of NRCMAP and are under *in vitro* mass multiplication for distribution.

Table 1. Salient morpho-agronomic description of IC 283932 (INGR No. 06023)

Characters	IC 283932
Height of plant (cm)	50.20
Number of leaves/ plant	14
Leaf length (cm)	48.60
Characters	IC 283932
Leaf breadth (cm)	8.75
Leaf thickness (cm)	1.85
Leaf rind thickness (cm)	1.29
Number of spines per leaf margin	44.8
Number of inflorescence per plant	2
Peduncle	Branched or un-branched
Number of flowers per inflorescence	109.41
Inflorescence length (cm)	159
Number of capsules per inflorescence	4
Total leaf yield per plant (g)	2937.53
Weight of gel per plant (g)	2191.18
Dry matter % of gel	3.26
Leaf exudates-dry weight basis (g/ plant)	10.39
Aloin A %	19.13

IC547016; INGR 06022, a Wild Cashew-nut (*Semicarpus kurzii*) Germplasm

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IC 283932 is a gel rich clone which yields about 2191.18 g of gel per plant. The main morphological and agronomic features of this germplasm are summarized in Table 1. The germplasm stocks are maintained in Active Gene Bank of NRCMAP and are under *in vitro* mass multiplication for distribution.

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Characters	IC 283932
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Number of leaves/ plant	14
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Leaf thickness (cm)	1.85
Leaf rind thickness (cm)	1.29
Number of spines per leaf margin	44.8
Number of inflorescence per plant	2
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Dry matter % of gel	3.26
Leaf exudates-dry weight basis (g/ plant)	10.39
Aloin A %	19.13

NMRM2 (IC283932; INGR 06024) an Aloe Germplasm (*Aloe barbadensis*) with Superior Aloin-A content

NMRM 2 is another aloe germplasm (*Aloe barbadensis*) with rich aloin content. It contains about 26.13% aloin-A. Important morphological characters of this clone are presented in Table 1. The germplasm stocks are maintained in Active Gene Bank of NRCMAP and are being under mass multiplied for distribution using *in vitro* techniques.

Table 1. Salient morpho-agronomic description of NMRM 2 (INGR No. 06024)

Characters	NMRM- 2
Height of the plant (cm)	55.13
Number of leaves/ plant	13.63
Leaf length (cm)	51.20
Leaf breadth (cm)	9.09
Leaf thickness (cm)	2.31
Leaf rind thickness (cm)	1.14
Number of spines per leaf margin	49.51
Number of inflorescence per plant	1
Peduncle	Branched or un-branched
Number of flowers per inflorescence	112.25
Inflorescence length (cm)	173.00
Number of capsules per inflorescence	2.5
Total leaf yield per plant (g)	1922.50
Weight of gel per plant (g)	1460.38
Dry matter % of gel	2.25
Leaf exudates-dry weight basis (g/ plant)	8.39
Aloin A %	26.13

Reference

Reynalds GW (1966) The *Aloe* of tropical Africa and Madagascar. *The Aloes Book Fund*, Swaziland.

A Giloe (*Tinospora cordifolia*) Germplasm (IC283959; INGR 06025)

Tinospora cordifolia (Willd.) Hook f. & Thomas is an important medicinal plant recognised as a wonderful immunomodulator in modern medicine (Kapil and Sharma, 1997). The plant belongs to family, Menispermaceae and is widely distributed in India, Bangladesh and Sri Lanka. The plant is also reported from South East Asian countries. Mature stem is reported to be acrid, bitter, hot, restorative, aphrodisiac and alleviative of all the three *doshas* or morbidities and also used as digestive tonic. It cures fever, jaundice, thirst, burning sensation, diabetes, piles, skin ailments, respiratory disorders, neurological diseases and improves intellect. Starch (Giloe-ka-sat or Guduchi satva) from the aqueous extract of the dry stems is used as tonic against several diseases causing debility and is having high demand in Ayurveda industry.

About 45 accessions (21 female plants and 31 male plants) of *T. cordifolia* germplasm collected from different parts of Gujarat are maintained in the field gene bank of National Research Centre for Medicinal & Aromatic Plants. Phyto-chemical screening of the accessions revealed wide variability in starch content. A starch rich-clone (IC 283959) was identified containing about 13.32% starch (dry weight basis). Important morphological characters of the clone were presented in Table 1.

Table1 1. Salient morpho-agronomic features of IC 283959 (INGR No. 06025)

Characters	IC 283959
Gender of the plant	Male
Leaf length/ breadth ratio	0.93
Stem diameter at base (mm)	4.91
Stem diameter at base (range in mm)	3.84 to 6.81
Stem diameter at 30 cm above base (mm)	4.49
Stem diameter at 30 cm above base (range in mm)	3.30 to 5.70

Reference

Kapil A and S Sharma (1997) Immunopotentiating compound from *Tinospora cordifolia*. *J. Ethnopharmaco.* **8**: 89-95.

CLTP123 (IC 547018; INGR 06026) a high caryophyllene black pepper germplasm (*Piper nigrum*)

Sashi Kumar, T John Zacharia, KV Saji, K Johnson George and PN Ravindran
Indian Institute of Spices Research, Chelavoor P.O., Kozhikode-673 012 (Kerala)

Black pepper accessions rich in caryophyllene are useful in breeding black pepper for better quality, as caryophyllene is implicated in aroma and flavour of the commodity. The present note deals with a black pepper accession with 41.8 per cent caryophyllene, collected and conserved at the genebank of Indian Institute of Spices Research, P.O. Marikunnu, Kozhikode, Kerala. It was collected from a farmer's homestead plot in Kottayam district, Kerala. This is being maintained and is being used as donor parent in breeding for high quality black pepper lines. The important quality features of the *line* are given in Table1.

Table 1. Salient quality attributes of the high per cent caryophyllene and other essential oil contents

Accession	Essential oil	Caryo-phyllene	Pinene	Sabinene	Myrene	Limonene
1019 (CLTP-123)	3.2	41.8	7.3	27	2.6	10.3

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Identification of Cardamom Germplasm (*Elettaria cardamomum*) with Different Panicle Types

D Prasath and MN Venugopal
Indian Institute of Spices Research, Cardamom Research Centre, Appangala, Madikeri-571 201 (Karnataka)

Cardamom, "Queen of Spices", is the dried fruits of perennial rhizomatous herb, *Elettaria cardamomum* Maton and belongs to the family Zingiberaceae. This crop is indigenous to South India (Western Ghats) and Sri Lanka (Purseglove *et al.*, 1981) occurring at an altitudes between 600 m and 1500 m. The normal inflorescence in cardamom is a long panicle with few flowered racemes, arising from the base of the matured tillers. However, being a cross-pollinated crop, a lot of phenotypic variants exists in nature (Madhusoodanan *et al.*, 1994) having various types of panicles-branched panicles (compound panicle), branched raceme, female sterility and cleistogamy (Sudarshan *et al.*, 1988; Prasath and Venugopal, 2004). Some useful variant identified are described below

APG248 (IC349541; INGR 06027)

One of the notable variant for panicle characters includes branching in the panicle (basal, terminal and branching through the panicle) instead of normal type. The number of branches per panicle varies from 0 to 25. The compound panicle types directly contribute to yield per plant, and therefore to crop improvement programme. Accession APG 248 (IC 349541) was a clonal selection made at the Indian Institute of Spices Research, Cardamom Research Centre, Appangala, Karnataka from open pollinated progenies in the local plantation with medium bold capsules and highest number of branches per panicle (24.5 branches per panicle). It has branches throughout the panicle with maximum number of branches per panicle and high yield.

The plants are Malabar type with a height of 2.95 m, number of tillers per clump 27, green aerial shoot and leaf length and width of 70.8 x 13.5 cm. Number of panicles per plant 41, number of branches per panicle 24.5, number of racemes per panicle 62.5, number of capsules per raceme 2.5, number of flowers per panicle 525, per cent fruit set 17.55, panicle length 107.5 cm, internode's length 4.25cm, and number of capsules per panicle 93. Fresh capsule colour green, dry capsule colour yellowish green, capsule size 1.95 x 1.25 cm and number of seeds per capsule 22. Seed weight is 67.3 per cent with essential oil of 5.0 per cent. Fresh yield per plant is 2053.5 g, per cent dry recovery 23.5 and yield per hectare 1206 Kg/ha.

APG251 (IC249544; INGR 06028)

This notable variant for panicle characters includes branching in the panicle (basal, terminal and branching through the panicle) instead of normal type. The compound panicle types directly contribute to yield per plant, hence the natural segregants needs attention in crop genetic resources and crop improvement programmes. Accession APG 251 (IC 249544) was a clonal selection made at the Indian Institute of Spices Research, Cardamom Research Centre, Appangala, Karnataka from open pollinated progenies and identified as an elite accession with branching only at the base of the panicle with bold capsules. It has compound panicle with basal branching and bold capsules.

The plants are Malabar type with a height of 2.95 m, number of tillers per clump 39, green aerial shoot and leaf length and width of 71.6 and 14.1 cm. Number of panicles per plant 58.5, number of branches per panicle 3.5, number of racemes per panicle 43.5, number of capsules per raceme 3.25, number of flowers per panicle 207.5, per cent fruit set 44.12, panicle length 77.5 cm, internodes length 4.25cm, and number of capsules per panicle 91.5. Fresh capsule colour green, dry capsule colour green, capsule length and width 2.25 and 1.25 cm and number of seeds per capsule 22. Seed weight is 72.90 per cent with essential oil of 5.0 per cent. Fresh yield per plant is 3541 g, per cent dry recovery 20 and yield per hectare 1771 Kg/ha.

References

Madhusoodanan KJ, KM Kuruvilla and PM Priyadarshan (1994) Genetic resources of cardamom. In: KL Chadha, and P Rethinam (eds), Advances in Horticulture Vol. 9. Plantation and Spice Crops part I, Malhotra Publishing House, New Delhi, pp121-130.

Prasath D and MN Venugopal (2004) Genetic diversity and conservation of cardamom (*Elettaria cardamomum* Maton.) in India. *Plant Genetic Resources Newsletter* **138**: 55-60.

Purseglove JW, EG Brown, CL Green and SRJRobbins (1981) Spices Vol.2. Longman Inc., New York, USA.

Sudharsan MR, KM Kuruvilla and KJ Madhusoodanan (1988) A key to the identification of types in cardamom. *J. Plantation Crops* **18**(Suppl): 52-55.

Identification of Cardamom Germplasm (*Elettaria cardamomum*) with Resistance to Diseases

MN Venugopal and D Prasath
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Cardamom,"Queen of Spices", is the dried fruits of perennial rhizomatous herb, *Elettaria cardamomum* Maton and belongs to the family Zingiberaceae. This crop is indigenous to South India (Western Ghat) and Sri Lanka (Purseglove *et al.*, 1981) occurring naturally at altitudes between 600 m and 1500 m. It suffers from several diseases. Resistance sources have been identified from naturally occurring populations.

APG306 (IC349599; INGR 06029)

The major virus disease of cardamom is mosaic or 'katte' disease caused by *cardamom mosaic virus*. It is a maclura virus, under poty viridae, transmitted by aphid *Pentalonia nigronervosa* f *caladii*. Cardamom being perennial crop the reduction in yield is up to 69% within 2-3 years after infection and the total decline of plants would takes 3-5 years. Resistant sources were identified by collecting 134 disease escapes from hotspots of virus infection in South India and screening them in green house, sick plot and hot spots. Testing of promising collections in four hot spots and also against natural infection confirmed the resistant nature of the 17 collections (Venugopal, 1999). Accession APG 306 (IC 349599) is a clonal selection from open pollinated progenies, collected from mosaic-infected areas by the Indian Institute of Spices Research, Cardamom Research Centre, Appangala. The accession is resistant to mosaic or 'katte' disease and has an average yield of 643 kg/ha. The potential yield is 979 kg/ha. It has 77 per cent capsules with good appearance. It is adapted to Karnataka and Wayanad region of Kerala and recommended for moderate rainfall and moderate to high shaded mosaic infested areas.

The plants are Malabar type with a height of 1.72 m, number of tillers per clump 36, green aerial shoot and leaf length and width of 61 and 11 cm. Number of panicles per plant 34, number of racemes per panicle 23, number of capsules per raceme 2.6, number of flowers per panicle 99, per cent fruit set 41.6, panicle length 43 cm, internodal length 2.82 cm, and number of capsules per panicle 55. Fresh capsule colour green, dry capsule colour yellowish green, capsule length and width 1.62 and 1.22 cm and number of seeds per capsule 17.9. Seed weight is 65.65 per cent with essential oil of 7.9 per cent. Fresh yield per plant is 981 g, per cent dry recovery 22 and yield per hectare 643 Kg/ha.

APG343 (IC349634; INGR 06030)

Rhizome rot also called clump rot is an important disease of cardamom (*Elettaria cardamomum* Maton.) throughout South India (Siddaramaiah *et al.*, 1988). The disease is responsible for partial or total decay of plants of all stages and is caused by *Pythium vexans* de Barry and *Rhizoctonia solani* Kuhn. (Thomas *et al.*, 1988). The leaf blotch is caused by *Colletotrichum gloeosporioides* and is a major problem in low shade open areas. Accession APG 343 (IC 349634) is a clonal selection from open pollinated progenies in the rhizome rot prone areas. The accession was evaluated for its resistance to rhizome rot both under field and artificial inoculation at the Indian Institute of Spices Research, Cardamom Research Centre, Appangala. The accession is resistant to rhizome rot disease and also has resistance to leaf blotch. It has a capacity for higher biomass with dark green leaves.

The plants are Malabar type with a height of 2.29 m, number of tillers per clump 34, green aerial shoot and leaf length and width of 74 and 14.2 cm. Number of panicles per plant 33.1, number of racemes per panicle 19, number of capsules per raceme 2, number of flowers per panicle 88, per cent fruit set 32.6, panicle length 44 cm, internodal length 3.11 cm, and number of capsules per panicle 35.4. Fresh capsule colour green, dry capsule colour yellowish green, capsule length and width 1.61 and 1.12 cm and number of seeds per capsule 18.9. Seed weight is 60.34 per cent with essential oil of 6.1 per cent. Fresh yield per plant is 438 g, per cent dry recovery 20.6 and yield per hectare 345 Kg/ha.

References

Prasath D and MN Venugopal (2004) Genetic diversity and conservation of cardamom (*Elettaria cardamomum* Maton.) in India. *Plant Genetic Resources Newsletter* **138**: 55-60.

Purseglove JW, EG Brown, CL Green and SRJ Robbins (1981) *Spices* **Vol. 2** Longman Inc., New York, USA.

Venugopal MN (1999) Natural disease escapes as source of resistance against cardamom mosaic virus causing *katte* disease of cardamom (*Elettaria cardamomum* Maton.). *J. Spices Aromatic Crops.* **8**: 145 -151.

Siddaramaiah AL, MM Khan and SP Nagaraju (1988) Incidence and management of damping off and clump rot of cardamom. *J. Coffee Res.* **18** (Suppl.): 48–56.

Thomas J, R Naidu and R S Bhai (1988) Rhizome and root rot disease of cardamom -A review. *J. Coffee Res.* **18** (Suppl.): 38-45.

D-3 (IC 370425; INGR 06031) a Chinese Cassia (*Cinnamomum cassia*) Germplasm with High Oil and High Cinnamaldehyde Content

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Cinnamomum cassia Blume (Syn. *C. aromaticum* Nees) (Family: Lauraceae) known as cassia cinnamon or Chinese cassia is a medium sized and straight trunked evergreen tree reaching a height of about 20 m. It has originated in China, which is the main producer and exporter of cassia cinnamon. Chinese cassia is commercially grown for its aromatic bark, used as a spice. Besides bark, cassia oleoresin and cassia oil are the other important products, which can be marketed. It has tremendous potential in the spice industry for flavouring food, beverages and in the manufacture of value added products. Also, it has immense medicinal properties and is used by the pharmaceutical industry. To a limited extent, it is used in the perfume industry.

Indian Institute of Spices Research, Calicut conserves 25 accessions of *Cassia* in the field repository. They were evaluated for various quality parameters. The bark oil content in these accessions, ranged from 1.20 % to 4.90 %. Accession D-3 (IC- 370425) was identified as an elite accession with high bark oil (4.9%) and high cinnamaldehyde content in bark oil (90.5%). This accession could be commercially exploited for production of cassia bark oil because of its high bark oil and high cinnamaldehyde content in the oil.

Morphologically, an eight years old plant is 6 m tall with three main shoots and 44 secondary shoots. The girth of main shoots is 17 cm at one m above ground level. Leaves are lanceolate, light green with velvety texture, may be dark green above and light green below, triplinerved, opposite and alternate. The leaf length is 21 cm, breadth 6.5 cm and ratio 3.23, while the petiole is 1.5 cm long, brown and is very pungent. Bark is spicy, sweet and pungent, bark oleoresin is 8.65 per cent, essential oil 4.90 per cent, leaf essential oil 1.15 per cent, cinnamaldehyde content in bark oil 90.5 and in leaf oil is 75 per cent respectively.

References

Krishnamoorthy B, T John Zachariah, J Rema and PA Mathew (1999) Evaluation of selected Chinese cassia (*Cinnamomum cassia* Blume) accessions for chemical quality. *J. Spices and Aromatic Crops* **8(2)**: 193-195.

Development of Sources of Rust Genes with Good Agronomic Background in Wheat (*Triticum aestivum*)

MK Menon, KA Nayeem, M Sivasamy, AJ Prabakaran, SMS Tomar, M Prashar, A Saikia, Bojan and RK Gupta
IARI Regional Station, Wellington-643 231 (Tamil Nadu)

HW2001 (IC 524288; INGR 06032)

A popular Indian Wheat 'Sonalika' was bred from 1154.383/AN/3/Y154/N 10 B/ LR 64, Mexican cross, simultaneously at IARI, New Delhi and G. B. Pant University of Agriculture and Technology, Pantnagar in early green revolution era (1964-65). It has bold and amber coloured grains and matures in 100-110 days, and found suitable under late sown conditions across the wheat zones of the country. However, the variety has exhibited 90 S to brown rust, 60 S to stem and 60 S to yellow rusts.

A Near Isogenic Line (NIL) of Sonalika with *Lr* 24 and *Sr* 24 has been derived with F (Free) to brown and TMS-S for stem rust, by using the gene source as "TR 380" by Menon and Tomar (2001). The variety has high degree of resistance to brown rust for seedling and adult plant reaction in Wellington conditions. Although 'Sonalika' has shown 40S for Ug 99, but this back cross line due to presence of *Sr* 24, is resistant to this race.

HW2004 (IC 524292; INGR 06033)

HW2004 has been derived through seven back crosses of C 306, after effecting hybrid with R 380 – 14* 7/3 Ag 14, so as to transfer two linked genes for brown and stem rust resistance, namely, *Lr* 24 and *Sr* 24 (Menon and Tomar, 2001). The incorporation of genes has been confirmed at DWR, Shimla with expression of resistance against the most virulent races *viz.*, IRS (12-2), 421-1

D-3 (IC 370425; INGR 06031) a Chinese Cassia (*Cinnamomum cassia*) Germplasm with High Oil and High Cinnamaldehyde Content

B Krishnamoorthy, J Rema and PA Mathew
Indian Institute of Spices Research, PB No. 1701, Marikunnu P.O., Kozhikode-673 012 (Kerala)

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References

Krishnamoorthy B, T John Zachariah, J Rema and PA Mathew (1999) Evaluation of selected Chinese cassia (*Cinnamomum cassia* Blume) accessions for chemical quality. *J. Spices and Aromatic Crops* **8(2)**: 193-195.

Development of Sources of Rust Genes with Good Agronomic Background in Wheat (*Triticum aestivum*)

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R – 63-1 (77-5), 21 R 31-1 (104-1) and 21 R 55 (104 – 2) for brown rust. It has shown high degree of resistance to the four most virulent races viz., 62 G 29, 62 G 29-1, 37 G 79 and 7 G 11. HW 2004 has shown resistance with 'R' type reaction to four most virulent pathotypes of brown rust (leaf rust). Recently, at Najoro, Kenya (2005-06), scientists found *Sr* 23 gene very effective against Uf 99 race.

HW 2004 has been released for the Central Zone mainly for Gujarat, Madhya Pradesh, Chattisgarh and parts of Rajasthan for rain fed timely sown conditions. The optimum sowing time for this variety is between last week of October to first week of November and it responds well up to 60 Kg nitrogen per hectare. The plant height of this variety is 90 cm, and matures in 125 days under Central Zone conditions. The variety possesses white and pubescent glumes with slight clubbing at top of the spike and has good grain appearance, thousand grain weight (39 g) with 12 per cent desirable protein. It has yielding ability of about 25-30 q/ha, under rain-fed conditions.

HW2006 (IC 524294; INGR 06034)

Lok-1, a popular wheat for Central and Peninsular Zones is highly susceptible to all the rusts. In these zones leaf rust is very important and there are losses to wheat crop and production due to incidence of brown rusts. The variety Lok-1 is high yielding, with bold grain showed suitability for both normal sown and late sown conditions of Maharashtra, Gujarat, Rajasthan and Karnataka.

Lok-1 was crossed with TR 380-14 and back crossed with Lok-1 for seven generation to transfer leaf rust resistant gene *Lr* 24 by Menon and Tomar (2001). The gene has been successfully incorporated and its gene postulation has been done in relation to reaction to most virulent rust races of all three rusts at DWR, Shimla. The recombinant line HW 2006, has shown resistance to IR5, 421R63–1, 21R– 31–1 and 21 R 55 races of brown rust. Similarly, the gene *Sr* 24 has exhibited effectiveness against the recently identified pathotype "Ug99" (Uganda-99) at Kenya (Najoro).

Reference

Menon MK and Tomar SMS (2001) Transfer of *Agropyron elongatum* derived rust resistance genes *Sr* 24 and *Lr* 24 in to some Indian bread wheat cultivars. *Wheat Information Service* **92**: 20-24.

HW2015 (IC 524302; INGR 06035)

North Eastern Plain Zone has large area under very late sown wheat and the variety recommended is HUW 234. The variety although high yielding with better adaptation, is highly susceptible to brown rust. Leaf and yellow rust are the main diseases of this area. It is essential to check the spread of leaf rust in this area. The variety is a derivative from IB and IR genomes from rye and completely resistant to stripe rust.

Tomar and Menon (1998) used TR 380–14, as source of brown rust resistance for transfer of effective gene Lr 24, which is linked with stem rust resistant gene Sr 24. After seven back crosses a near isogenic line HW 2006 with all the characters of HUW 234 has been derived. The HW 2006 was subjected to the most virulent brown rust races viz., 12-5, 77-5, 77-7, 77-8 and 104-2 and found resistance to these pathotypes. Similarly, this was also subjected to 62 G 29, 62 G 29-1, 37 G 79 and 7 G 11, the most virulent black rust pathotypes and has exhibited total to moderate resistance reaction to black rust. At Kenya, (Najoro 05-06) wherever *Sr* 24 gene is incorporated it has shown resistant even to the 'Ug99' race of black stem rust.

References

Tomar SMS and MK Menon (1998) Introgression of alien genes for leaf rust (*Puccinia recondita*) resistance in to bread wheat (*Tricum restivum*) cultivars. *Indian J. Agric. Sci.* **68(10)**: 675-81.

F-6050 (IC528034; INGR 06036) a Jointless Tomato (*Lycopersicon esculentum*) Germplasm

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F-6050-1 is a jointless tomato germplasm (*Lycopersicon esculentum*), yielding on an average 4.81 kg. of fruits per plant. On an average it bears around 70 fruits, each weighing 70-80 g with an average of two locules. It has a thick pericarp of around 6.2 mm. The ripening of fruit starts after 100 days of transplanting.

BF-CMS-5-1eB (IC524011; INGR 06047), a Maintainer Line for WA Type CMS Lines with Elongated Uppermost Internode in Rice (*Oryza sativa* L)

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The BF-CMS-5-1eB (IC524011), the country's first elongated uppermost internode maintainer line for WA type CMS lines has been developed by the Barwale Foundation through transferring *'eui-1'* gene into the maintainer line, IR58025B from a donor, IR91-1591-3 using marker-assisted backcross breeding. Newly developed maintainer line, BF-CMS-5-1eB exhibit elongated uppermost internode/higher panicle exertion at flowering time and is comparable to recipient maintainer line, IR58025B for most of the agronomic and grain quality characters.

The maintainer line, BF-CMS-5-1eB can be used as valuable genetic stock by hybrid rice breeders to improve the panicle exertion of existing WA type CMS lines and/or develop new CMS lines with complete panicle exertion which in turn may not require GA_3 application in hybrid rice seed production.

References

Gangashetti MG, S Singh, P Khera and P Kadirvel (2006) Development of STS marker linked to elongated uppermost internode (*eui-1*) gene in rice (*Oryza sativa* L.). *Indian J. Crop Sci.* **1(1-2):** 113-116.

Gangashetti MG, KK Jena, VV Shenoy and WH Freeman (2004) Inheritance of elongated uppermost internode and identification of RAPD marker linked to *eui* gene in rice, *Cur. Sci.* **87(4):** 469-475.

Identification of Post Flowering Stalk Rot Resistant Inbred Lines

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Post Flowering Stalk Rot is one of the most severe causes of reducing maize production in India. The disease is caused by a complex comprising three fungi namely, *Cephalosporium acremonium, Macrophomina phaseolina, Fusarium_moniliforme* and one bacterium *Erwinia carotovora var. zeae.* The diseases symptoms chiefly include premature plant drying after flowering, starting from the basal inter nodes. In severe cases ear formation is hampered. A resistant pool was synthesized at Agricultural Research Station, Amberpet, ANGRAU, Hyderabad, India in 1990, from which 21 lines resistant to PFSR were derived. Full-sib recurrent selection was adopted for improving this pool prior to derivation of the inbred lines by the standard ear-to-row method. Inbreeding was carried out with tooth-pick screening in PFSR disease sick plots that is selfing accompanied by tooth-pick inoculation with causal organisms. The PFSR pool included resistant hybrids composite varieties and synthetics evaluated in All India Co-ordinated Maize Trials. The inbred lines BPTTI 35, BPTTI 37, BPTTI 38 and BPTTI 44 showed higher levels of resistance on 1 to 9 scale, where 1 is healthy and 9 is highly susceptible.

The lines can be adopted across the country. The cultivable seasons are *kharif* and Rabi. The ideal sowing time is 1st week of June to first fortnight of July in *kharif* and October 15th to November 15th in Rabi. The recommended fertilizer dose; $N:P_2O_5:K_2O$ is 120:60:40 Kg./ha. Nitrogen is to be applied half as basal and remaining half in the splits at 30 and 50 days after planting.

BPPTI 35 (IC396388; INGR 06043)

BPPTI 35 (35-1-2-1-1-1-2-0 bulk) is a maize (*Zea mays)* in-bred line with a score of 2.4 on 9 point scale for PFSR resistance. The plant height is 124 cm taking 69 days to silk. Ear length is 47 cm, length 9 cm, girth 10 cm having 12 kernel rows and 16 kernel per row, and 19.5 g 100 kernel weight on an average. It yields 3.5 tons grains per hectare. It has orange flint and belongs to full season maturity.

BPPTI 37 (IC396390; INGR 06044)

BPPTI 37 (37-1-2-1-1-1-2-0 bulk) is a maize (*Zea mays)* in-bred line with a score of 2.8 on 9 point scale for PFSR resistance. The plant height is 116 cm taking 70 days to silk. Ear length is 45 cm, length 10 cm, girth 10 cm having 12 kernel rows and 16 kernels per row, and 28.0 g 100 kernel weight on an average. It yields 4.4 tons grains per hectare. It has orange flint and belongs to full season maturity.

BPPTI 38 (IC396391; INGR 06045)

BPPTI 38 (38-1-2-1-1-2-2-0 bulk) is a maize (*Zea mays)* in-bred line with a score of 2.8 on 9 point scale for PFSR resistance. The plant height is 125 cm taking 74 days to silk. Ear length is 54 cm, length 11 cm, girth 9 cm having 14 kernel rows and 16 kernel per row, and 22.5 g 100 kernel weight on an average. It yields 4.5 tons grains per hectare. It has orange flint and belongs to full season maturity.

BPPTI 44 (IC 396393; INGR 06046)

BPPTI 44 (4-1-1-1-1-2-1-0 bulk) is a maize germplasm (*Zea mays)* in-bred line with a score of 2.8 on 9 point scale for PFSR resistance. The plant height is 112 cm taking 69 days to silk. Ear h is 41 cm, length 10 cm, girth 11 cm having 12 kernel rows and 18 kernel per row, and 24.0 g 100 kernel weight on an average. It yields 3.9 tones grains per hectare. It has yellow flint and belongs to full season maturity.

Reference

Payak MM (1983) "Premature Drying in maize". Bulletin on *Techniques of scoring for resistance to important diseases of maize*. All India Co-ordinated Maize Improvement Project, New Delhi-12, pp. 96-100.

F-7028-1 (IC526807; INGR 06037) a Tomato (*Lycopersicon esculentum*) Germplasm, with High Lycopene and Carotenoids Content

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Indian Institute of Vegetable Research, Varanasi-221 005 (Uttar Pradesh)

VR Tamatar-7028-1 (F-7028-1) is a tomato *Lycopersicon esculentum* germplasm, with high lycopene (7.86 mg per 100g) and carotenoids (12.10 mg. per 100g.) contents. The number of fruits per plant vary from 40-50, each fruit weighs around 80-100 gm. The fruits mature after 90 days of transplanting.

Identification of Tea Clones (*Camellia sinensis*) for Desirable Traits

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UPG-2 (ATK-1) (IC522955; INGR 06038)

In India tea is grown in areas of low rainfall (< 1500 mm) as well as high rainfall (> 4000 mm). Majority of the South Indian tea gardens face drought during February to April with low crop production. The clone ATK – 1 was derived through selection by Boris during 1956–58 from the field of Attikunna division (Gudalur Taluk of Nilgiri District) of present M/S Parry Agro Industries Limited mainly for its good performance even during summer months and is widely grown in South Indian gardens particularly where drought is a problem. The nursery and field performance of this clone is quite acceptable, the rooting of vegetative cutting is faster and high, the establishment of plant in the nursery and field is good. The leaves are medium sized and chinary type (Balasaravanan *et al.*, 2003), light green with semi erect posture. Despite its tolerance to drought, it is fairly tolerant to certain pests and diseases particularly collar canker (Sasidhar and Sanjay, 2000). The average yield potential of this clone is around 4500–5000 kg made tea/ha/year and has moderate cup quality (Babu, 2004). Being a drought tolerant clone it has been used as a better root stock in grafting programmes with high yielding and quality clone scions which are susceptible to drought and to provide better field establishment (Spurgeon Cox and Subair, 1999). Considering all the characters this clone may be adjudged as a desirable parent for future breeding programme for development of drought tolerant seed stocks.

References

Babu S (2004) Tea Descriptor–Series 1. *Planters' Chron.* **100**: 23-26.

Balasaravanan T, PK Pius, R Rajkumar, N Muraleedharan and AK Shasany (2003) Genetic diversity among South Indian tea germplasm (*Camellia sinensis, Camellia assamica* and *Camellia assamica ssp. lasiocalyx*) using AFLP markers. *Plant Sci.* **165**: 365-372.

Sasidhar R and R Sanjay (2000) Incidence of color canker in High range and Anamallais. *Newsl. UPASI TRF* **10**: 4.

Spurgeon Cox and MA Subair (1999) Performance of cultivar ATK-1 in Nilgiri – Wynaad. *Newsl. UPASI TRF* **9**: 3-4.

UPG-4 (C-17) (IC522957; INGR 06039)

UPG-4, clone C- 17 is a variety released by M/S Bombay Burma Trading Corporation during early sixties. It was derived through selection. Being old clone and not very much in use currently, it needs to be maintained in the germplasm bank. The nursery performance of this clone showed that it is a good rooter and establishes well with more than 80 per cent success rate, the growth of the plant in the nursery is quite acceptable. Establishment in the transplanted field is initially slow but picks up well subsequently. It is a chinary type of plant (Balasaravanan *et al.*, 2003) with medium sized leaves. The leaves are smooth, flat and prominently pubescent. The biochemical estimation revealed that the contents of polyphenols, catechins, reducing sugars and amino acids were above normal; black tea has good liquor and flavour characteristics (Babu, 2004). Normally chinary type of plants is compact and tolerant to drought and this also has good quality.

References

Babu S (2004) Tea Descriptors Series – 1. *Planters' Chron.* **100** (12):23-26.

Balasaravanan T, PK Pius, R Rajkumar, N Muraleedharan and AK Shasany (2003) Genetic diversity among South Indian tea germplasm (*Camellia sinensis, Camellia assamica* and *Camellia assamica ssp. lasiocalyx*) using AFLP markers. *Plant Sci.* **165**: 365-372.

UPG-7 (TTL-1) (IC 522960; INGR 06040)

The polyphenol and catechins are very much responsible for the colour and strength of the tea, whereas the reducing sugars and amino acids are responsible for flavour. The clone TTL-1 was selected from the seedling population by M/S Tata Tea Limited and approved as a new planting material with moderate yield and acceptable quality by the Tea Board of India during 2001. The performance of this clone is good considering that the vegetative cuttings root well in the nursery with a success rate of more than 90 per cent. The initial establishment in the transplanted field is also good. The plant possess medium sized (cambod type) leaf, medium dark green in colour (Balasaravanan *et al.*, 2003). The leaf surface is rugose, smooth and flat with prominent pubescence. The shoots are semi-erect with good pluckable shoots. The average yield of the clone is estimated to be around 3000 to 3500 kg made tea/ha/year at a bush population of 10000/ha. The biochemical estimation of this clone revealed that it possesses good liquor colour with medium flavour and the infusion is bright (Babu, 2005).

References

Babu S (2005) Tea Descriptor Series – 2. *Planters' Chron.* **101(1):** 12-15.

Balasaravanan T, PK Pius, R Rajkumar, N Muraleedharan and AK Shasany (2003) Genetic diversity among South Indian tea germplasm (*Camellia sinensis, Camellia assamica* and *Camellia assamica ssp. lasiocalyx*) using AFLP markers. *Plant Sci.*, **165**: 365-372.

UPG-10 (IC522963; INGR 06041)

UPG-10, clone K–18 was released by M/S Tata Tea Limited through selection programme during sixties from clones of Chinese affinity. The nursery performance of this clone by vegetative propagation is good with high success rate of more than 85 per cent. It also roots well in the soil medium with the pH and EC of 4.9 and 0.05 dsm^{-1}, respectively. The initial establishment in the nursery and transplanted area is good and shows moderate tolerance to moisture stress during summer. It has orthotropic branching pattern, medium sized leaf with low pubescence. The leaves are slightly up fold with medium sized flush shoots. The biochemical estimation revealed that the precursor for flavour like reducing sugar and amino acids are slightly higher and it is adjudged as a clone with acceptable flavour and liquor characteristics (Babu, 2005). It has moderate yield, acceptable quality and moderately tolerant to drought.

Reference

Babu S (2005) Tea Descriptor Series – 2. *Planters' Chron.* **101(1):** 12-15.

UPG-16 (IC522969; INGR 06042)

In areas with high relative humidity, low temperature and low sunshine hours, tea suffers from high incidence of the fungal disease, blister blight, which can cause 25–30 per cent yield losses (Radhakrishnan and Baby, 2004). The clone SMP-1 is a selection from the Parvathi division of Sevenmalai estates of M/S Tata Tea Limited, Munnar (presently KDPH Co. Pvt. Ltd.) and known for its high tolerance to blister blight disease (Haridas and Aiyamma, 1988). The nursery and field performance of this clone is fairly good. The initial establishment in the nursery and rooting through vegetative propagation is over 70 per cent. It is initially slow but establishes well in the later stages when transplanted to the field. This clone has medium sized cambod type leaves, rugose, lathery with medium pubescence and moderate quality (Babu, 2005). Despite intolerance to drought and moderate yield and quality this clone is highly suitable for planting in areas prone to blister blight incidence.

References

Babu S (2005) Tea Descriptor Series – 3. *Planters' Chron.* **101(4):** 27-30.

Haridas P and BC Aiyamma (1988) The clone SMP – 1. *Bull. UPASI Tea Sci. Dept.* **42(1):** 8.

Radhakrishnan B and UI Baby (2004) Economic threshold level for blister blight of tea. *Indian Phytopath.* **57(2):** 195-196.