Plant Germplasm Registration Notice*

The Plant Germplasm Registration Committee of ICAR in its XXXth meeting held on September 4th, 2014 at the National Bureau of Plant Genetic Resources, New Delhi approved the registration of following 18 germplasm lines out of 108 proposals considered. The information on registered germplasm is published with the purpose to disseminate the information to respective breeders for utilization of these genetic stocks in their crop improvement programmes. Upon request, the developer(s)/author(s) is/are obliged to distribute the material for crop improvement programme of National Agricultural Research System.

1. HI-8708 (IC0611303; INGR 14042), a Wheat (*Triticum turgidum* ssp.*durum*) Germplasm with Leaf Rust Resistance

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Leaf rust caused by *Puccinia triticina* is one of the most important diseases affecting durum wheat cultivation. Many Indian durums are susceptible to several leaf rust pathotypes particularly 12-5 and 104-2 (Mishra *et al.,* 2009). Central zone (CZ) is the migratory route of leaf rust urediospores (Nagarajan and Joshi, 1985) and rust inoculum built up on any susceptible variety in CZ could be a serious threat to later sown crop in the Indian wheat bowl, North Western Plains Zone. Hence, broadening of genetic base for resistance by developing the varieties with different leaf rust resistance genes is one of the most important strategies for leaf rust management. Hence, a leaf rust resistant durum wheat genetic stock was developed at Indian Agricultural Research Institute, Regional Station, Indore, MP by crossing agronomically superior and popular durum variety, HI 8498 with an advanced line HG 822 (both were developed at Indore station).

Durum wheat genotype, HI 8708 (HG 822/ HI 8498), was identified as resistant to leaf rust in multi-location testing *viz.,* Plant Pathological Screening Nursery (PPSN), Elite PPSN and Multiple Disease Screening Nursery (MDSN) from 2009 to 2012. It showed high levels of adult-plant resistance to most prevalent and virulent leaf rust pathotypes 77-5 and 104-2 of leaf rust (Table 1). It showed both seedling and adult plant resistance to all the leaf rust pathotypes tested (Table 2). It may be noted that most of the known examples of durable rust resistance in wheat are of adult-plant type.

Hence, this genotype can be used as potential resistance donor to breed varieties against prevalent and most virulent leaf rust pathotypes.

Table 1. Field responses of HI 8708 to wheat Leaf rust

Year of testing	Trial	Mixed pathotypes				APR to specific pathotypes	
		South		North		77-5	104-2
		HS	ACI	HS	ACI	Delhi	Delhi
2008–09	NIVT 5B	10S	2.1	TR	0.0	-	-
2009–10	AVT I	10MS	2.1	TMS	0.2	TR	10R
2010–11	EPPSN	TR	0.1	TMR	0.1	-	-
2011–12	MDSN	TR	0.1	TR	0.0	-	-

Source: AICW&BIP – Crop Protection report (2009-12)

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Table 2. Seedling responses of HI 8708 to individual pathotypes of wheat rusts (2009-10)

Leaf rust pathotypes																						
11	12-2	12-3	12-5	12-7	12-9	77	77-1	77-2	77-5	77-7	77-8	77-10	77-11	77A-1	104-2	104-3	104-4	104B	106	107-1	108-1	162-1
R	R	R	R	R	-	R	R	R	R	R	R	R	-	R	R	-	-	MR	R	R	R	R

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2. AHMM/BR-8 (IC0599709; INGR 14043), a Muskmelon (*Cucumis melo* L.) Germplasm with Monoecious Sex Form

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Muskmelon (*Cucumis melo* L.) is an important cucurbitaceous crop grown as a 'Dessert Crop' throughout the warmer parts of world. Being cross pollinated crop it showed heterosis for earliness, fruit size, fruit weight, flesh thickness, total soluble solids, fruit flavour, transportability and fruit yield. Presently the main attention is being paid on the development of F_1 hybrids due to high yield, uniform fruit shape, size as well as consistently excellent quality. Muskmelon is predominantly andromonoecious in sex expression however, monoecious sex form is also found in natural populations (More *et al*., 1980). The cost of hybrid seed production is high due to emasculation in the available andromonoecious cultivars of muskmelon. The use of genetic male sterile lines also involves difficulties in identification and rouging of 50% male fertile plants and maintenance of male sterile plants which makes the hybrid seed production costly. Therefore, the breeders are interested in the development of female parent with monoecious sex expression to minimize the cost of hybrid production in muskmelon.

Table 1. Salient characteristics of IC0599709

Character	Description
Sex form	Monoecious
Days taken to produce 50% female flower from sowing	43.80-46.13 days
Days to first fruit harvest from sowing	70.20-73.87 days
Fruit diameter	11.32-12.76 cm
Flesh thickness	3.43-4.00 cm
Width of seed cavity	4.37-5.12 cm
Total soluble solids (TSS)	10.8-11.3%
Flesh hardness	478-570 g/cm^2
Fruit weight	0.8-1.10 kg
Number of fruits/plant	3.47-4.27

Keeping in view, a monoecious line of muskmelon was identified and purified through inbreeding from the genetic stock collected from Sirohi district of Rajasthan (Choudhary, 2013). Single plant selection was exercised based on earliness, fruit size, flesh colour and TSS. Finally, the obtained population was tested for stability and observed stable monoecious sex form (Choudhary *et al.*, 2013). Plants of IC0599709 produced round fruits with salmon orange coloured flesh and develop full slip at ripening. The biochemical analysis has been done for total sugar (336.97 mg/g), tannin content (0.12 mg/g), phenol content (34.73 mg/g) and flavonoid content (1.05 mg/g) on dry weight basis (Haldhar *et al.*, 2013). Thus, the presence of stable monoecious sex form in IC0599709 could be utilized in F_1 hybrid production of muskmelon.

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3. Phoobsering-1258 (IC0610194; INGR 14044), a Tea (*Camellia sinensis* (L.) O. Kuntze) Hybrid with Thick Cuticle

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P 1258 (*Camellia sinensis* L. var. P1258) is a China hybrid which was developed and released by Tocklai Tea Research Institute, Tea Research Association, in 1987 for cultivation in the hills of Darjeeling (Singh, 1989). The progeny selection method of plant breeding was applied to develop the hybrid.

Morpho-agronomic characteristics: The bush frame of the hybrid is compact and spreading. The leaf is ovate in shape. Apex of the leaf is acuminate and leaf base is obtuse in nature. The clone is high yielding but of average flavour.

Associated characters and cultivation practices: The clone is a drought tolerant and grows luxuriantly in lower elevation compared to high and mid elevations of Darjeeling hills (Barman, 2013). The clone is resistant to virulent diseases of tea especially in the hills of Darjeeling, the Blister Blight, possibly because of its thick cuticle in leaf (Debnath and Paul, 1994). It is fairly tolerant to red spider and other mites (Singh, 1989)

References

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4. Phoobsering-1404 (IC0610195; INGR 14045), a Tea (*Camellia sinensis* (L.) O. Kuntze) Hybrid with Thickest Epidermal Cell Layer

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Phoobsering-1404 (*Camellia sinensis* L. var. P1404)-Assam hybrid tea variety which was developed through progeny selection and released in 1985 by the Tocklai Tea Research Institute, Tea Research Association, for commercial cultivation in the hills of Darjeeling (Singh, 1985). It is interesting to note that it contains the thickest epidermal cell layer among all the Darjeeling clones released by the institute for commercial cultivation (Debnath and Paul, 1994).

Morpho-agronomic characteristics: The clone is early flusher and vigorous in growth with semi erect, medium size, light colour yellowish green leaf. The leaf is ovate in shape. Apex of the leaf is acuminate and downturned whereas leaf base is obtuse. The clone prefers the agro-climatic condition of lower elevation than high and mid elevations of Darjeeling hills.

Associated characters and cultivation practices: The rooting ability of the clone is high and resistance to drought. It is fairly tolerant to mites and blister blight disease (Singh, 1989).

References

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5. Rungali Rungliot-4/5 (IC0610203; INGR 14046), a Tea (*Camellia sinensis* (L.) O. Kuntze) Hybrid with Highest Number of Stomata/mm^2 area

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Rungali Rungliot-4/5 (*Camellia sinensis* L. var. RR4/5) - A China hybrid tea variety. The variety was developed through progeny selection method. It was released in 1975 by the Tocklai Tea Research Institute, Tea Research Association for large scale commercial cultivation in the hills of Darjeeling (Sharma *et al*., 1975). Among all of the Darjeeling clones, RR4/5 contains the highest number of stomata in per unit leaf area (Debnath and Paul, 1994).

Morpho-agronomic characteristics: The leaves of the clone are semi-erect and dark green in colour. The leaf shape is lanceolate with acuminate leaf apex and attenuate leaf base (Barman, 2013). The young shoots have thick pubescence. The long and slender internodes of the growing shoots are the specific shoot morphology of the clone.

Associated characters and cultivation practices: The clone is drought tolerant but susceptible to all mites and fairly tolerant to blister blight (Singh, 1989). The clone grows well in low elevation of Darjeeling hills.

References

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6. Happy Valley-39 (IC0610207; INGR 14047), a Tea (*Camellia sinensis* (L.) O. Kuntze) Hybrid with Rose like Sweety Aroma Synthesises Highest Hexanal and t-2-Hexanal

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Happy Valley-39 (*Camellia sinensis* L. var. HV-39) is a China hybrid which was developed and released by the Tocklai Tea Research Institute, Tea Research Association, in 1987 for cultivation in the hills of Darjeeling (Singh, 1989). The progeny selection method of plant breeding was applied to develop the variety. It synthesized the highest Hexanal and t-2-Hexanal among cultivars of Darjeeling hills and produces a attractive rose like sweet aroma (Bhuyan *et al*., 2012)

Morpho-agronomic characteristics: The bush frame of the variety is widely spreading and compact. The leaves are semi- erect, grayish dark green in colour. Shoot pubescence is very high. The leaf shape is lanceolate with acuminate leaf apex and attenuate leaf base. The flavour produced by this clone is above average.

Associated characters and cultivation practices: The clone has good rooting ability and can withstand at higher degree of soil moisture deficit. It has fairly resistant to red spider mites but susceptible to blister blight disease (Singh, 1989). The clone grows luxuriantly in lower elevation compared to high and mid elevations of Darjeeling hills.

References

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7. IIHR CA H13A (IC0610420; INGR14048), a China aster (*Callistephus chinensis* (L.) Nees.) Pure line with Early flowering and Higher Number and Weight of Flowers/Plant

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China aster [(*Callistephus chinensis* (L.) Nees] is commercially important popular annual flowering plant belonging to the family Asteraceae. In India, it is grown traditionally for its loose flowers, cut flower, landscape, floral decorations, making garlands and *venis*. The Pureline IIHR CA H13A is unique in early flowering, higher number and weight of flowers per plant. It is derived from the open pollinated seeds of Line No.173 through Individual Plant Selection developed at IIHR, Bengaluru, Karnataka (13^{o} 58' N Latitude, 78^{o}E Longitude and 890 m above mean sea level) (IIHR Annual Report, 2013-14).

Morpho-agronomic characteristics: The plants are spreading type, medium in height. It is floriferous, flowers are pink (RHS 62.A) in colour, semi-double, 5.48 cm in diameter with 5-6 rows of ray florets. It produces more number of branches per plant and has extended blooming period.

Table 1. Morpho-agronomic description of China aster Pureline IIHR CA H13A (pooled data of three years)

Characters	IIHR CA H13A
Plant height (cm)	50.62
Plant spread (cm)	44.45
Number of branches/plant	16.30
Days to flowering	66.44
Stalk length (cm)	41.39
Flower head diameter (cm)	5.48
Number of flowers/plant	71.89
Loose flower yield/plant (g)	178.56
Blooming period (days)	16.11
Shelf life (days)	4.28
Flower colour (RHS)	62.A
Utility	Loose flower and bedding

Associated characters and cultivation practices: It has field tolerance to lodging and does not require additional staking, and flowers have higher shelf life. It grows best in open and well drained loamy soil with soil pH 6-7. A temperature of 20^{o} to 30^{o}C during day and 15^{o} to 17^{o}C during night with relative humidity of 50-60% is most suitable for flower production. Seeds are sown thinly on raised bed in rows across the length at 10-12 cm apart or in pro-trays with cocopeat as a substrate media. Thirty days seedlings should be transplanted at a spacing of 30 cm x 30 cm in four rows. Plants are pinched 35 to 40 days of transplanting. The China aster is extensively grown in Karnataka, Tamil Nadu, West Bengal and Maharashtra by marginal and small farmers (Rao *et al.*, 2012).

References

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8. IIHR CA J17 (IC0610421; INGR14049), a China aster (*Callistephus chinensis* (L.) Nees.) Pure Line with Early flowering, Higher Number and Weight of Flowers/Plant

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China aster [*Callistephus chinensis* (L.) Nees] is commercially important popular annual flowering plant belonging to the family Asteraceae. In India, it is grown traditionally for its loose flowers, cut flower,

landscape, floral decorations, making garlands and *venis*. The Pureline IIHR CA J 17 is unique in early flowering, higher number and weight of flowers per plant. It is derived from self seeds of Line No.15 through Individual Plant Selection at IIHR, Hessaraghatta Lake Post, Bengaluru-560 089, Karnataka (13^{o} 58' N Latitude, 78^{o}E Longitude and 890 m above mean sea level) (IIHR Annual Report, 2013-14).

Morpho-agronomic characteristics: Plants are spreading type, medium in height. It is floriferous, flowers are white (RHS NN155.C) in colour, semi-double, 4.92 cm in diameter with 4 rows of ray florets. It produces more number of branches and flowers per plant. Flowers remain in blooms for about 18.44 days.

Table 1. Morpho-agronomic description of China aster Pureline IIHR CA J17 (pooled data of three years)

Character	IIHR CA J 17
Plant height (cm)	47.21
Plant spread (cm)	46.92
Number of branches/plant	19.90
Days to flowering	69.40
Stalk length (cm)	45.20
Flower head diameter (cm)	4.92
Number of flowers/plant	84.34
Loose flower yield/plant (g)	222.62
Blooming period (days)	18.44
Shelf life (days)	3.55
Flower colour (RHS)	NN155.C
Utility	Loose flower and bedding

Associated characters and cultivation practices: It has field tolerance to lodging and does not require additional staking, and loose flowers have good shelf life. It grows best in open and well drained loamy soil with pH 6-7. A temperature of 20^{o} to 30^{o}C during day and 15^{o} to 17^{o}C during night with relative humidity of 50-60% is most suitable for development of flowers. Seeds are sown thinly on raised bed in rows across the length at 10-12 cm apart or in pro-trays with cocopeat as a substrate media. Thirty days seedlings should be transplanted at a spacing of 30 cm × 30 cm in four rows. Plants are pinched 35 to 40 days of transplanting. The China aster is extensively grown in Karnataka, Tamil Nadu, West Bengal and Maharashtra by marginal and small farmers (Rao *et al.*, 2012).

References

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9. IIHR-35 (IC0610422; INGR14050), a China aster (*Callistephus chinensis* (L.) Nees.) Pure Line with Violet (83.A) Flower Colour and Pompon Flower Type

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China aster [*Callistephus chinensis* (L.) Nees] is commercially important popular annual flowering plant belonging to the family Asteraceae. In India, it is grown traditionally for its loose flowers, cut flower, landscape, floral decorations, making garlands and venis. The flowers of pureline IIHR-35 have unique colour Violet (RHS 83.A) and pompon type. It is an advanced pedigree selection of the cross between 'Local Pink' × 'AST-2' developed at IIHR, Hessaraghatta Lake Post, Bengaluru-560 089, Karnataka (13^{o}58' N Latitude, 78^{o}E Longitude and 890 m above mean sea level) (IIHR Annual Report, 2013-14).

Morpho-agronomic characteristics: The plants are erect type, medium in height. It flowers 130 days after sowing. It produces Pompon type of flowers having 4-5 rows of ray florets with tubular disc of 4.5 cm diameter. On an average its flowers weigh 2 g each with stalk length of 19 cm.

Associated characters and cultivation practices: It produces high flower yield (113 g flowers/plant) and cut flowers have vase life of 8 days. It grows best in open and well drained loamy soil with pH 6-7. A temperature 20 to 30^{o}C during day and 15 to 17^{o}C during night

Table 1. Morpho-agronomic description of China aster Pureline IIHR-35

Characters	IIHR-35
Plant height (cm)	57
Stalk length (cm)	19
Flower diameter (cm)	4.5
Flower weight (g)	2
Number of flowers/plant	70
Flower yield/plant (g)	113
Days to flower	130
Vase life (days)	8
Flower type	Pompon
Flower colour (RHS)	Violet (83.A)
Utility	Garland, floral decoration and cut flower

with relative humidity of 50-60% is most suitable for development of flowers. Seeds are sown thinly on raised bed in rows across the length at 10-12 cm apart or in pro-trays with cocopeat as a substrate media. Thirty days seedlings should be transplanted at a spacing of 30 cm × 30 cm in four rows. Plants are pinched 35 to 40 days of transplanting. The China aster is extensively grown in Karnataka, Tamil Nadu, West Bengal and Maharashtra by marginal and small farmers (Rao *et al.*, 2012).

References

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10. IIHR-42 (IC0610423; INGR14051), a China aster (*Callistephus chinensis* (L.) Nees.) Pure Line with Creamy White Flower Colour and Powderpuff Flower Type. Resistant to Rootknot Nematode (*Meloidogyne incognita* race 1)

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China aster [*Callistephus chinensis* (L.) Nees] is commercially important popular annual flowering plant belonging to the family Asteraceae. In India, it is grown traditionally for its loose flowers, cut flower, landscape, floral decorations, making garlands and *venis*. The flowers of pureline IIHR-35 have unique colour Creamy white (RHS 4.B), Powderpuff type, and resistant to root knot nematode (*Meloidogyne incognita* race 1). It is an advanced pedigree selection of the cross between 'Local Pink' x 'AST-2' developed at IIHR, Hessaraghatta Lake Post, Bengaluru-560 089, Karnataka (13^{o} 58' N Latitude, 78^{o} E Longitude and 890 m above mean sea level) (IIHR Annual Report, 2013-14).

Morpho-agronomic characteristics: The plants are erect type, medium in height and flowers 124 days after sowing. On an average its flowers weigh 2.37 g each, having 24.68 cm of flower stalk.

Associated characters and cultivation practices: It produces 44 flowers per plant, yields 104 g loose flowers per plant and cut flowers have vase life of 9 days. It

Table 1. Morpho-agronomic description of China aster Pureline IIHR-42

Characters	IIHR-42
Plant height (cm)	56.13
Stalk length (cm)	24.68
Flower diameter (cm)	5.76
Flower weight (g)	2.37
Number of flowers/plant	44.17
Flower yield/plant (g)	104.41
Days to flower	124.42
Vase life (days)	9.00
Flower type	Powderpuff
Flower colour (RHS)	Creamy white (4.B)
Utility	Cut flower, floral decoration and garden display

grows best in open and well drained loamy soil with soil pH 6-7. A temperature 20 to 30^{o}C during day and 15 to 17^{o}C during night with relative humidity of 50-60% is most suitable for development of flowers. Seeds are sown thinly on raised bed in rows across the length at 10-12 cm apart or in pro-trays with cocopeat as a substrate media. Thirty days seedlings should be transplanted at a spacing of 30 cm × 30 cm in four rows. Plants are

pinched 35 to 40 days of transplanting. The China aster is extensively grown in Karnataka, Tamil Nadu, West Bengal and Maharashtra by marginal and small farmers (Rao *et al.*, 2012).

References

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11. P-16-1 x Eurovision (IC0611879; INGR 14052), an Early Blooming Gladiolus (*Gladiolus hybridus* Hort.) Germplasm which Flowers in 76-80 days after Planting and Florets Colour in Red Group

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Gladiolus is one of the most important bulbous ornamentals for garden display, floral arrangements and cut flowers (Lepcha *et al.,* 2007). Multiplication of gladiolus is most important on large scale for availability of good quality germplasm/planting materials (Barman *et al.*, 2005). It is also essential to develop Indian hybrids/lines and evaluate them in comparision to the existing cultivars for their superior desirable characters (Archana *et al.,* 2007).

The fifteen gladiolus hybrids/lines along with check were evaluated for three years for earliness, higher multiplication and other unique characters. The germplasm was developed from the Melody Open (A selection among the open pollinated seedlings of the variety melody and another germplasm was a cross between P-16-1 x Eurovision. Initially this material was received at IARI, from secondary sources.

The two developed germplasms were evaluated in randomized block design with three replications. The evaluation revealed that among the 15 hybrids/lines, the most promising germplasm IC-14156 and IC14156 were identified as early to medium flowering and higher multiplier. The key morphological features of both the germplasm are provided here under:

It is early flowering (76-80 days after planting). Spikes are straight and long with good rachis length (48-59 cm) and close arrangement of florets on spike. Florets colour in red group (41 C, RHS colour chart) with dark stripes on inner two tepals (42 A, RHS colour chart) and red spots on outer throat which makes them more attractive. It produces straight and long spikes with more than 16 florets/spike. (Table. 1 a, b and c)

Table 1. Performance of P-16-1 × Eurovision for growth and flowering (2011, 2012 and 2013)

a. Performance over parents during 2011

Character	P-16-1 × Eurovision	Parents		C D at 5%
		P-16-1	Eurovision	
Plant height (cm)	119.0	107.33	111.66	4.32
Number of leaves	6.33	7.33	6.33	0.33
Number of shoots/corm	2.00	1.66	2.00	0.29
Days to flowering (days)	80.00	83.00	85.33	1.87
Spike length (cm)	92.33	89.00	90.00	1.10
Rachis length (cm)	59.33	50.33	46.00	2.91
Number of florets/spike	17.00	13.33	13.00	2.19
Floret diameter (cm)	10.26	9.66	10.00	0.21
Stem thickness (cm)	1.88	1.75	1.82	NS
Spike longevity (flowering days in field)	33.33	25.00	30.00	2.33
Number of corms/plant	2.00	1.66	1.33	0.22
Number of cormels/plant	45.00	35.00	43.00	2.60
Spike vase life in tap water (days)	8.66	7.33	7.66	NS

b. Performance over parents during 2012

Character	P-16-1 × Eurovision	Parents		CD at 5%
		P-16-1	Eurovision	
Plant height (cm)	117.66	110.33	115.67	1.65
Number of leaves	6.33	6.33	7.00	NS
Number of shoots/corm	2.33	1.99	2.00	0.23
Days to flowering (days)	76.00	81.00	78.00	1.61
Spike length (cm)	98.33	90.00	93.00	7.38
Rachis length (cm)	57.33	53.33	51.00	2.37
Number of florets/spike	15.66	14.33	14.00	0.17
Floret diameter (cm)	9.50	9.16	9.33	NS
Stem thickness (cm)	1.86	1.75	1.80	NS
Spike longevity (flowering days in field)	28.00	27.00	28.00	NS
Number of corms/plant	2.33	1.66	2.00	0.25
Number of cormels/plant	42.33	37.00	40.00	1.87
Spike vase life in tap water (days)	9.00	8.33	8.00	NS

c. Performance over parents during 2013

Character	P-16-1 × Eurovision	Parents		CD at 5%
		P-16-1	Eurovision	
Plant height (cm)	112.66	109.33	111.67	0.33
Number of leaves	6.00	5.99	6.00	NS
Number of shoots/corm	2.66	1.99	2.00	0.07
Days to flowering (days)	78.00	82.00	79.00	1.33
Spike length (cm)	88.66	86.00	85.00	0.43
Rachis length (cm)	48.33	47.33	46.00	0.22
Number of florets/spike	16.66	14.33	14.00	0.99
Floret diameter (cm)	9.83	9.11	9.50	NS
Stem thickness (cm)	1.88	1.73	1.80	0.03
Spike longevity (flowering days in field)	29.00	24.00	27.00	0.32
Number of corms/plant	2.33	2.00	2.00	0.08
Number of cormels/plant	35.00	30.00	32.00	0.66
Spike vase life in tap water(days)	9.00	8.33	8.50	NS

12. Melody Open (IC0611878; INGR 14053), a Very Early Flowering (74 days after planting) Gladiolus (*Gladiolus hybridus* Hort.) Germplasm with Florets Colour in Red Group

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Melody Open: This hybrid is very early and comes in flowering about 74 days. The outer florets are in red group (50C, RHS colour chart) and inner tepals (49B, RHS colour chart), with red spots on the centre of two tepals and white stripes on all tepals. Spikes are straight and long with good rachis length and close arrangement of florets on spikes. It has good spike length (more than 100 cm), rachis length more than 62.00 cm and number of florets/spike are 18.44. Further it is a higher multiplier and produces more than 2 corms and 42.55 cormels from each mother corm. (Table 2 a, b and c)

Both the germplasm/lines are recommended for NCR of Delhi and Northern plains of India.The soil pH 6-7 is recommended for the cultivation of gladiolus. At the time of planting, the soil should have sufficient moisture. The best time of planting in North Indian plains is first week of October. Healthy corms of 5-6 cm diameter should be selected. The quantity of corms depends on the planting distance, size of corms and method of planting. Generally 50-60 thousands corms/acre or 1.25-1.50 lakh corms/ hectare are to be planted at 45 cm in single row system and 60 cm in double row system keeping plant to plant

Table 2. Performance of "Melody Open" for growth and flowering (2011, 2012 and 2013)

a. Performance over parents during 2011

Character	Melody Open	Parent variety ('Melody')	CD at 5%
Plant height (cm)	122.00	98.33	4.66
Number of leaves	6.33	6.00	0.16
Number of shoots/corm	2.99	2.00	0.33
Days to flowering (days)	74.00	72.00	1.33
Spike length (cm)	104.00	70.66	5.66
Rachis length (cm)	62.00	42.66	3.33
Number of florets/spike	18.33	14.33	1.22
Floret diameter (cm)	10.00	8.50	1.13
Stem thickness (cm)	2.00	1.94	NS
Spike longevity in field (day)	39.00	32.00	1.99
Number of corms/plant	2.66	2.00	0.23
Number of cormels/plant	42.66	25.00	5.99

b. Performance over parents during 2012

Character	Melody Open	Parent variety ('Melody')	CD at 5%
Plant height (cm)	124.00	107.00	10.10
Number of leaves	6.33	6.33	NS
Number of shoots/corm	2.66	2.00	0.32
Days to flowering (days)	75.00	73.33	1.13
Spike length (cm)	114.00	88.33	7.11
Rachis length (cm)	64.86	49.33	6.22
Number of florets/spike	19.00	16.67	1.36
Floret diameter (cm)	11.10	8.66	0.99
Stem thickness (cm)	2.10	1.97	NS
Spike longevity (Flowering in field days)	41.00	33.00	3.66
Number of corms/plant	2.99	2.11	0.33
Number of cormels/plant	45.00	28.00	3.22

c. Performance over parents during 2013

Character	Melody Open	Parent variety ('Melody')	CD at 5%
Plant height (cm)	118.66	99.00	3.07
Number of leaves	6.66	6.33	NS
Number of shoots/corm	2.66	1.99	0.22
Days to flowering (days)	73.33	71.00	0.36
Spike length (cm)	103.00	73.66	3.46
Rachis length (cm)	65.00	45.00	2.29
Number of florets/spike	18.00	15.66	1.05
Floret diameter (cm)	10.95	8.44	1.06
Stem thickness (cm)	2.11	1.89	NS
Spike longevity (Flowering in field days)	40.00	31.00	4.11
Number of corms/plant	3.00	2.33	0.31
Number of cormels/plant	40.00	27.00	6.33

distance at 15 cm. Planting depth may be kept as 5-8 cm in soil. The corms after planting should be covered at least 4 cm by adjoining soil. Well rotten F.Y.M. @ 300 quintal/ha should be added in the soil at the time of field preparation. Chemical fertilizers application depend upon the fertility of the field, however, according to a general recommendation it is applied as 80-120 kg N, 80-100 kg P and 100 kg K/ha.

There are two major disease, *Fusarium* wilt which causes geotropic bending of plants and yellowing, and finally corm rotting. Another disease *Botrytis* which infects during cold, windy and humid weather, but can be controlled by weekly spraying with Dithane M-45 @ 0.2 % spraying. Gladiolus is attacked by insects and mites and sometimes aphids, termite, thrips etc. also attack in gladiolus which can be controlled by spraying of Malathion @0.2 % or Nuvan 0.2 %. For local market, when first floret is open and for distant markets when bottom florets showing colour should be harvested by leaving 4 leaves intact on the plants. Spikes should be packed in corrugated sheet in bundles of dozen each, which stand well at the atmospheric temperature for short distances and overnight journey.The number of corms would be doubled (one plant produces two corms), hence about 1, 20,000 spikes/acre will be produced.

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13. Sel-5 (IC0610820; INGR 14054), a Makhana (*Euryale ferox* Salisb.) Germplasm with White flowers

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Makhana *(Euryale ferox* Salisb), also known as Gorgon nut or Fox nut, is a prickly water plant with gigantic floating leaves (Das and Patnayak, 2003). In lowland areas of eastern India (north Bihar and parts of Assam, West Bengal and Orissa), makhana is grown as an important cash crop for its popped seeds.

Table 1. Descriptor and descriptor state of Sel-5 (IC0 610820, INGR14054) line of makhana (average over 4 years)

Descriptor	Descriptor state
Days to seedling emergence	31.2
Seedling vigor	High
Leaf shape	Orbicular
Leaf diameter	127.3 cm
Flower size	Small
Flower colour	White
Days to 50% flowering	126 days
Fruit shape	Spheroid
Fruit colour	Brown
Status of fruit prickles	Very dense
Size of fruit prickles	1.3 cm
Fruit diameter	5.5 cm
Number of seeds/fruit	68.5
Number of fruits/plant	14.2
Seed yield /fruit	40.3 g
Seed yield /plant	547.9 g
Seed colour	Black
Seed shape	Spherical
100-seed weight	66.8 g
Seed diameter	6.6 mm

Morpho-agronomic characteristics: Purple is the characteristic color of flowers in makhana (Kumar *et al*., 2011). Contrary to purple flowers, this line possesses white flowers. In addition to white flowers, it is unique due to high number of fruits/plant. Fruits are brown in colour and covered with dense prickles.

Traits of interest: It can be used to study the inheritance pattern of flower color in makhana. Further, it can be utilized in breeding programmes for incorporating the trait of high number of fruits/plant

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14. Korgut (IC0599689; INGR 14055), a Rice (*Oryza sativa* L.) Germplasm Tolerant (SES score 3) to Salinity Stress (EC=12 dS/m) at Seedling Stage

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Korgut, a traditional rice landrace from the State of Goa, was collected during *kharif* 2010 in farmers' field at Chorao Island of North Goa District (Manohara and Singh, 2013). It is being conserved and maintained at

ICAR Research Complex for Goa. Phenotyping for salt stress tolerance at seedling stage under hydroponics culture with EC = 12 dS/m was conducted at CRRI, Cuttack in *kharif* 2012 and repeated in *kharif* 2013. It showed tolerance (SES score 3) to salinity stress at seedling stage. Its tolerance was associated with low ratio of Na^+-K^+ (0.18) in shoot as compared to susceptible check IR29 (0.68) (CRRI Annual report 2011-12; Nath *et al.,* 2013; NICRA, 2012).

Morpho-agronomic characteristics: Based on the data recorded during *kharif* 2012 & 2013, the mean values of different agro-morphological and yield and its components are given in Table 1.

Associated characters and cultivation practices: Korgut is cultivated during *kharif* season between June to October month. It shows an additional trait of early seedling vigour which aids in establishment under the stress situation. Farmers' cultivate this rice accession by direct sowing with limited use of chemical inputs. Hence, the packed rice of this landrace fetches premium price in the market. Apart from this, the accession has various other uses such as suitability for parboiled rice; for ganji preparation; and has a property of slow digestion upon consumption. This germplasm can be used as a genetic stock for future breeding programmes aiming at development of high yielding salt tolerant rice varieties for coastal saline soils.

Table 1. Agro morphological description of the rice germplasm Korgut

Characteristics	Description
Basal leaf sheath colour	Green
Early plant vigour	Intermediate
Days to 50% flowering	92
Days to maturity	123
Plant height (cm)	145
Leaf length (cm)	49.03
Leaf width (cm)	1.26
No. of tillers/plant	7-8
Panicle type	Semi erect
Panicle length (cm)	29.80
Panicle exertion	Mostly exerted
Awning	Fully awned
Apiculi colour	Brown
Stigma colour	White
100 grain weight (g)	3.26
Decorticated grain length (mm)	6.19
Decorticated grain width (mm)	2.56
L/B ratio	2.54
Hull colour	Brown
Grain yield (t/ha)	1.5 - 2.0

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15. IC0144901 (IC0144901; INGR 14056), a Black gram (*Vigna mungo* (L.) Hepper.) Germplasm Resistant to Mungbean Yellow Mosaic Virus (MYMV)

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Yellow mosaic disease (YMD) is a major constraint in improving the productivity of a variety of leguminous crops including blackgram. In order to identity potential sources of resistance that could serve as valuable genetic resource for future disease resistance breeding programme a part from national collection of blackgram germplasm was screened against mungbean yellow mosaic virus (MYMV) and IC-144901 a collection from Kanpur, Uttar Pradesh, India, was identified as highly resistant germplasm. Field experiments were conducted at NBPGR experimental farm, New Delhi (geographical co-ordinates 28°64' N, 77°15' E). Two popular blackgram cultivars namely Barabanki Local (highly susceptible) and T-9 (high yielder) were included as checks. The response of 344 blackgram germplasm accessions against the MYMV virus was examined based on incidence and

severity of the symptoms under field conditions with natural disease pressure and the response was different among the accessions during three cropping seasons (*Kharif* 2010-2012). Germplasm accessions indicating resistance response during three consecutive years under natural disease pressure were subjected to further screening through artificial inoculation using viruliferous whiteflies. Those germplasm accessions which showed resistance response after whitefly inoculation were further tested for validation of the resistance through agro inoculation with the infectious cloned DNA-A and DNA-B components of a New Delhi isolate of MYMV. Yield attributing traits of selected accessions were also recorded along with susceptible (Barabanki local) and agronomic checks (T-9) and on this basis IC144901 germplasm was observed as an erect, short (25cm), early maturing (70 days), medium grain yielding (8.5 to 10g/plant) having medium seed size (100 seed weight 4.3g). The germplasm accession can be used in YMD resistant breeding programme or can be released directly for cultivation after verifying its adaptation to various regions and accepting quality traits.

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16. DOGR-1203-DR (IC0598327; INGR 14057), an Onion (*Allium cepa* L.) Germplasm with Very Early Maturity (harvested within 90 days after transplanting during *rabi*) and 100% Uniform Neck-fall

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The onion varieties developed by different organizations in the country, generally mature in 120-140 days after transplanting in *rabi* season. There is no common onion variety of early maturity in India for *rabi* season. There is need to develop early maturing varieties of onion. The work in this direction led to development of an early maturing elite line DOGR-1203-DR. This has been registered with NBPGR, New Delhi.

The genotype DOGR-1203-DR was developed through mass selection in germplasm collected from Rukatpur, Sukhsagar and Murshidabad (WB). It is better than parental population in respect of uniformity, earliness and yield parameters. It matures in 85-90 days after transplanting and is thus 30-50 days earlier than other onion varieties grown in India (DOGR 2010, 2012 & 2013; AINRPOG 2014). Further, this genotype has dark red bulbs which are in demand. Most of the varieties in cultivation during *rabi* have light red bulbs.

Morpho-agronomic characteristics: Plants are erect of 40-50 cm height with 8-10 leaves/plant. Foliage is dark green, waxy and has no cranking. Bulb diameter is 4.0-4.5 cm; height 3.5-4.0 cm and neck thickness 0.4-0.6 cm. Bulbs are very shiny dark red and oval in shape tapering towards neck. These are symmetrical with single axis non-splitting type and have exerted root disc. Bulb skin has strong adherence, rings are medium, purplish with strong firmness of flesh.

It was evaluated along with onion germplasm maintained at DOGR during *rabi* 2010-11, 2011-12 and 2012-13 at Rajgurunagar (Table 1). Complete and uniform neck-fall was observed in this at 85-90 days after transplanting (DOGR 2010 & 2012) (Fig.1). Its average yield is 20-22 t/ha and total soluble solids is 11-12^{0}B. Storability of bulbs is very good. It can be stored up to 5-6 months (DOGR 2011). No crop establishment is observed during *kharif* due to early sets formation in the nursery.

Table 1. Earliness and neck-fall performance of DOGR-1203-DR and checks

Entry	Days to 75% neck fall after transplanting				Days to harvest after transplanting				Percentage of neck-fall at time of harvesting			
	Rabi 2010-11	*Rabi* 2011-12	*Rabi* 2012-13	Mean	*Rabi* 2010-11	*Rabi* 2011-12	*Rabi* 2012-13	Mean	*Rabi* 2010-11	*Rabi* 2011-12	*Rabi* 2012-13	Mean
DOGR-1203-DR(Dark Red, oval bulbs)	80.00	84.00	77.00	80.33	92.00	96.00	84.00	90.66	100.00	100.00	100.00	100.00
Agrifound Light Red (C) (Light Red, globe bulbs)	119.00	122.00	117.00	119.33	119.00	126.00	118.00	121.00	70.00	75.00	73.00	72.66
Bhima Kiran (C)(Light Red, globe bulbs)	108.00	121.00	113.00	114.00	111.00	125.00	116.00	117.33	76.00	74.00	75.00	75.00

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17. CNH CB 211 (IC0597397; INGR 14058), a Cotton (*Gossypium hirsutum*) Germplasm with Cluster Boll Bearing Habit, Deeply Palmate Leaf Lobe

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CNH CB-211(*Gossypium hirsutum*) is having unique feature cluster boll bearing habit and coupled with deeply palmate leaf lobed developed single boll progeny selection.

Morpho-taxonomical characters : Leaf–deeply palmate and lanceolate; bracteoles-3 broad, heart shaped, persistant and anterior portion serrated, gossypol glands present on abaxial and adaxial surfaces; calyx-cup shaped, five lobed, gossypol glands distributed in linear fashion; corolla-five petals, imbricate, yellow, petal blotch absent and gossypol glands distributed randomly; ovary-superior and composed of 3-4 united carpels; bolls/capsules-oval and moderately tapering apex and developed in the form of clusters. Economic features and fibre quality traits are presented in Table 1. The developed genetic stock could ideally serve as a resourceful donor for cluster boll bearing trait, which can serve as an essential component of a breeding programme.

Table 1. Economic features and fibre quality traits of IC 0597397; INGR 14058

Average seed cotton yield/plant (g)	54.9
Average boll weight (g)	4.2
Ginning outturn (%)	32.0
Seed index (g)	9.0
Lint index (g)	4.2
Staple length (mm)	27.1
Uniformity ratio (%)	51.0
Micronaire (µg/inch)	3.3
Fibre bundle strength (g/tex)	19.2
Fibre elongation (%)	4.8

18. CNH CB 212 (IC0597398; INGR 14059), a Cotton (*Gossypium hirsutum*) Germplasm with Cluster Boll Bearing Habit, Zero Monopodia and Compact Habit

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CNH CB-212 is a cluster boll bearing genetic stock developed through single boll progeny selection and differs from CNH CB-212 in the features *viz.,* presence of unique distinct morpho-marker traits *viz.,* normal palmate leaf lobed, shorter monopodia coupled with short internodal length and forms a compact plant stature. Economic features and fibre traits are presented in Table 1. This genetic stock developed for compactness can serve as an essential component in a breeding programme.

Table 1. Economic features and fibre quality traits of IC0597398; INGR 14059

Average seed cotton yield/plant (g)	65.3
Average boll weight (g)	4.0
Ginning outturn (%)	29.5
Seed index (g)	9.2
Lint index (g)	3.8
Staple length (mm)	27.4
Uniformity ratio (%)	48.0
Micronaire (µg/inch)	3.0
Fibre bundle strength (g/tex)	21.7
Fibre elongation (%)	4.6