

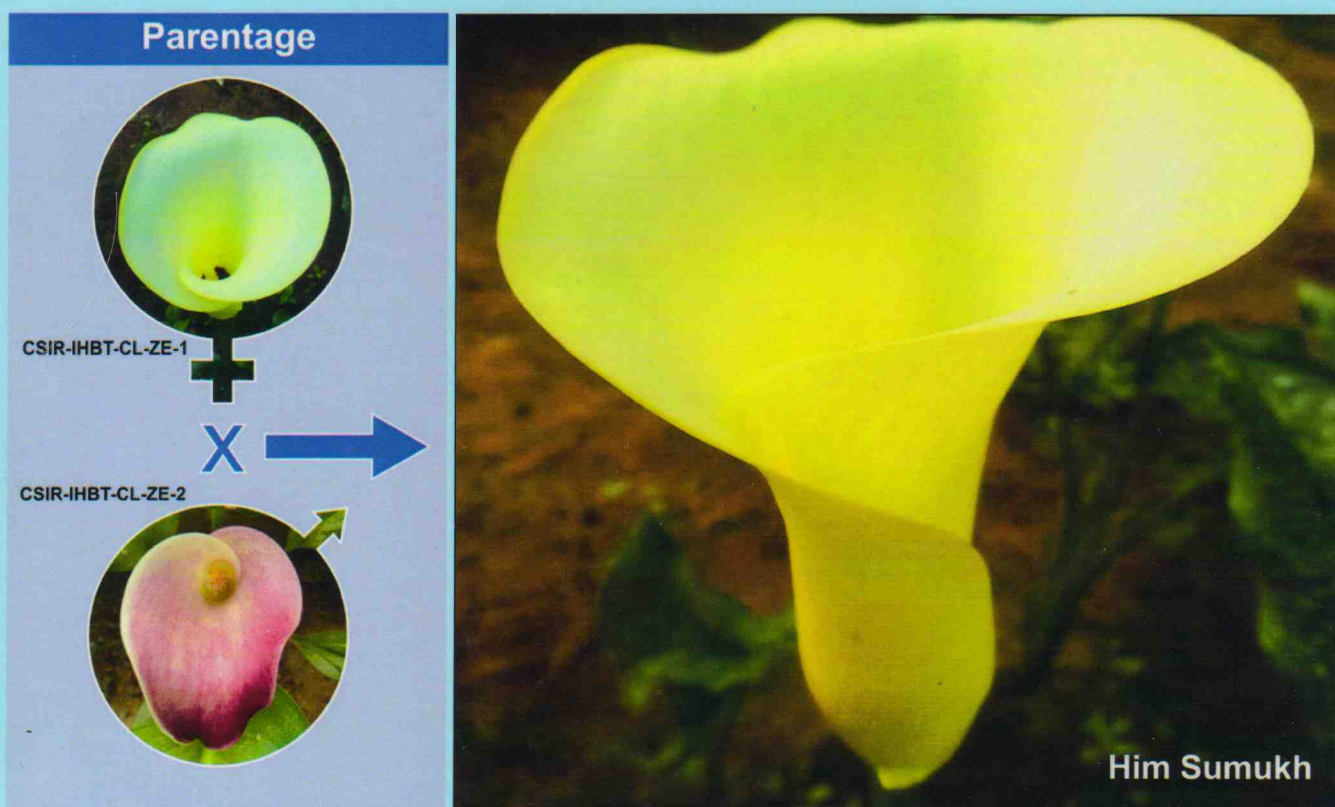
# Calla lily cultivars

## Him Sumukh and Him Shweta

Calla lilies are popular floriculture plants which are cultivated for their exotic blooms and glossy foliage. Two species of calla lilies viz., *Z. elliotiana* (coloured blooms) and *Zantedeschia aethiopica* (white blooms) are of commercial importance and used both as cut flowers as well as flowering potted plants. The leaves are very attractive and used in floral arrangements. Being moisture loving plants, white calla lilies are often used in landscape along bog gardens and damp borders.

### Him Sumukh (CSIR-IHBT-CL-Y-1)

The cultivar Him Sumukh (CSIR-IHBT-CL-Y-1) of *Zantedeschia elliotiana* has been developed by CSIR-Institute of Himalayan Bioresource Technology, Palampur through hybridization and selection approach. The parental genotypes CSIR-IHBT-CL-ZE-1 and CSIR-IHBT-CL-ZE-2 were crossed and variable colours of calla lilies were obtained in the progenies, which were morphologically characterized for floral traits. The selection was made for its unique cylindrical trumpet flower shape and attractive bright yellow colour. These selections were evaluated for two years with respect to flower production potential and other agronomic attributes under field and protected conditions. The cultivar has excellent nursery performance, vigorous in growth and suitable for both protected as well as partial shade field conditions.



### Salient features of the cultivar Him Sumukh

Morphological Traits	Protected cultivation		Field condition	
	Mean	Range	Mean	Range
Number of flowers	3.3	1.0 - 4.0	3.2	1.0 - 4.0
Flower stalk length (cm)	88.4	44.3 - 97.6	48.2	37.5 - 64.3
Flower stalk diameter (mm)	8.6	4.82 - 10.4	6.7	3.9 - 8.9
Plant height(cm)	124.5	81.4 - 134.5	94.3	56.4 - 102.3
Leaf length(cm)	25.4	18.7 - 31.5	22.2	15.4 - 26.2
Leaf width (cm)	17.3	12.4 - 21.4	12.1	9.3 - 13.1
Number of shoots	4.6	2.0 - 5.0	5.0	1.0 - 6.0
Number of leaves	20.3	16.0 - 25.0	28.2	5.0 - 32.0





## Him Shweta (CSIR-IHBT-CL-W-1)

The cultivar Him Shweta (CSIR-IHBT-CL-W-1) of *Zantedeschia aethiopica* has been developed by CSIR-Institute of Himalayan Bioresource Technology, Palampur through hybridization followed by selection for flower shape and white colour. The hybridization programme in calla lilies was undertaken using two parental genotypes CSIR-IHBT-CL-ZA-1 and CSIR-IHBT-CL-ZA-2. Variable floral shapes of calla lilies were obtained in the progenies which were evaluated for agronomic traits under protected and field conditions. The evaluation of selections was done for two years with respect to flower production and agronomic parameters. The cultivar has excellent nursery performance, vigorous in growth and suitable for open field conditions.



### Salient features of the cultivar Him Shweta

Morphological Traits	Field condition		Protected cultivation	
	Mean	Range	Mean	Range
Number of flowers	6.7	4.0-10.0	5.0	4.0-6.0
Flower stalk height (cm)	90.3	81.4-104.5	107.5	98.5-118.0
Flower stalk diameter (mm)	10.2	6.9-16.5	13.1	10.1-17.8
Plant height (cm)	62.2	49.0-72.5	85.6	81.5-95.1
Leaf length (cm)	22.7	16.4-28.4	42.5	38.0-45.5
Leaf width (cm)	11.4	7.6-17.5	21.5	17.3-26.2
Number of shoots	10.3	6.0-14.0	12.4	10.0-16.0
Number of leaves	33.0	26.0-37.0	38.0	34.0-45.0

### Propagation

The conventional method of propagation in *Z. aethiopica* callas is through division of underground rhizomes, whereas in case of *Z. elliotiana* it is through tubers. Tissue culture can also be used for mass multiplication.





## Growth conditions

Callas are perennial in nature. They grow best in temperate to subtropical climate. They prefer full sunlight, cool and moist conditions. A temperature range of 13-24°C is required for satisfactory growth and flowering. A well-drained, loam soil, rich in organic matter and having pH 6.0-6.5 is ideal for calla lily cultivation. Good drainage is vital to avoid root rot and fungal diseases. *Z. elliotiana* essentially requires direct sunlight for brighter blooms, however in warmer areas it requires 50% shade to prevent early fading of colours and increased scape length and spathe.

## Land preparation and planting

For cut flower production, planting is done on raised beds as it helps to produce quality blooms. The soil is dug about 30 cm deep and mixed with well rotten farm yard manure (FYM) at the rate of 5kg/sqm area. The planting density in coloured callas (*Z. elliotiana*) is based on tuber size as given in the table below. There are three grades of tubers based on its diameter viz., Grade I (5.0 to 6.0 cm), Grade II (4 to 4.5 cm), and Grade III (2.5 to 3.5 cm). A tuber of grade I gives best flower production followed by grades II and III. Tuber of size less than 2 cm diameter usually produces only foliage. Tubers need to be treated with 1% Carbendazim + 2% Mancozeb solution for an hour before planting. Tubers are planted at 5 cm depth keeping their growing tips upright. In mid hills, rhizomes of white calla lily (*Z. aethiopica*) should be planted in September-October whereas, tubers of *Z. elliotiana* cultivars should be planted in February- March.

### Planting density of calla lily

Tuber grades	Tuber size (diameter in cm)	Plant density (per sqm)
Grade I	5.0-6.0 cm	6
Grade II	4.0-4.5 cm	8
Grade III	2.5-3.5 cm	10



## Irrigation, nutrition and interculture operations

During active growth callas require adequate moisture. At early growth of the plants, light irrigation is required whereas, fully grown plants require frequent irrigation. In *Z. elliotiana*, avoid water logging in the beds. Fertilizer dose of 20kg nitrogen, 4.5 kg phosphorus, 40 kg potassium per 1000 sqm should be applied as a basal dose whereas, 20kg of nitrogen should be applied after 30 days of sprouting. Regular weeding and hoeing should be done. After harvesting of flowers the frequency of irrigation should be reduced.

## Flower harvesting and Post-harvest management

*Z. aethiopica* produces flowers from October to March whereas *Z. elliotiana* bloom in the months of June to July. Flowers are cut from the base when they are fully open before anthesis. When plants of *Z. elliotiana* complete two years growth cycle and their foliage has turned yellow, the tubers are dug out in September-October, washed, graded and treated with fungicides (1% Carbendazim + 2% Mancozeb). They can be divided to obtain more tubers. Tubers are then shade dried for a week and stored at 9-15°C for dormancy breaking.

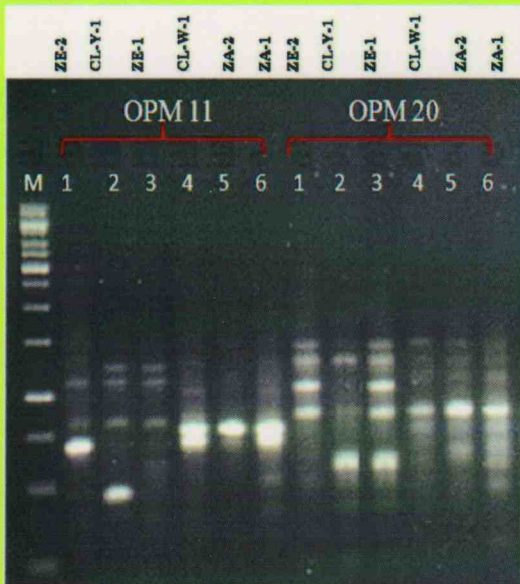




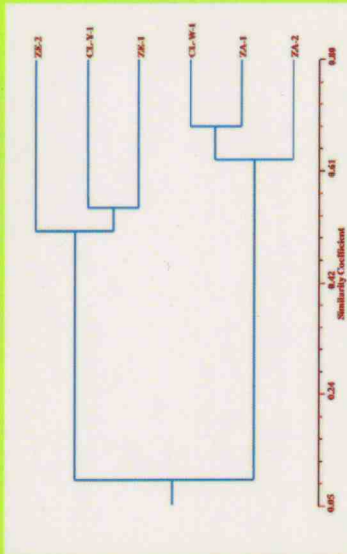
## DNA finger printing of cultivars for establishing genetic distinctness

The genetic distinction of cultivars Him Sumukh and Him Shweta along with the parents were established using 35 RAPD markers. Fourteen RAPD markers were finally selected for molecular characterization of all the genotypes. A total of 87 polymorphic bands were detected. Number of bands varies from 3 (OPS-19) to 9 (OPS5, OPT12, OPA2). Of these, 39 DNA regions

derived from 14 RAPD markers were selected for development of fingerprints. Cluster analysis based on 87 polymorphic bands grouped all the genotypes into two different groups. Overall genetic diversity ranged 0.26 to 0.92 with an average 0.47. Genetic diversity revealed that Calla Lily genotypes tested at molecular level captured moderate to very high level of genetic diversity.



Representative RAPD profile of calla lily parental genotypes and their hybrid progenies using primer OPM-11 and OPM-20



Dendrogram of calla lily genotypes representing genetic diversity among the parents and cultivars (Scale indicates Jaccard's similarity coefficient)

Markers	ZE-2	CL-Y-1	ZE-1	CL-W-1	ZA-2	ZA-1
OPM-11-480						
OPM-11-1.2 KB						
OPM-20-600						
OPM-20-1.2 KB						
OPS-05-250						
OPS-05-650						
OPS-05-1.2 KB						
OPS-13-400						
OPS-13-600						
OPS-13-760						
OPT-12-400						
OPT-12-500						
OPC-10-400						
OPC-10-1.2 KB						
OPT-13-700						
OPT-13-740						
OPA-01-400						
OPA-01-800						

Diagrammatic representation of DNA fingerprints of calla lily cultivars and parents revealed by RAPD markers amplicons



Field view of Him Sumukh (CSIR-IHBT-CL-Y-1)



Field view of Him Shweta (CSIR-IHBT-CL-W-1)

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