

# White dragonhead (*Dracocephalum heterophyllum*) variety

## Him Sugandh (CSIR-IHBT-DH-04)

### Introduction:

White dragonhead (*Dracocephalum heterophyllum*) is an aromatic herb of high altitude region in Himalayas which belongs to family Lamiaceae and has characteristic aroma in the aerial parts of the plant. The plant has been reported growing wild in the northern part of India, including Jammu, Ladakh, Himachal Pradesh, Uttarakhand and Sikkim Himalaya at an elevation of 3000–5200 m above mean sea level. Leaf extract of white dragonhead is reported to be used in treating eye ailments like redness of eyes, irritation and conjunctivitis by the native people of Spiti valley in Himachal Pradesh and in Ladakh region of trans-Himalaya.

### Uses

The essential oil of white dragonhead (*Dracocephalum heterophyllum*) is a source of citronellol and rose oxides for use by the perfumery industries. Earlier rose oxides were identified in rose and geranium oils. *D. heterophyllum* oil is identified as new source for rose oxides used in blending of high grade perfumery compounds. The oil has antiasthmatic, anticoughing and disinfectant properties.



### 'Him Sugandh' (CSIR-IHBT-DH-04)

The variety 'Him Sugandh' (CSIR-IHBT-DH-04) of white dragonhead (*Dracocephalum heterophyllum*) has been developed by CSIR-Institute of Himalayan Bioresource Technology, Palampur through half-sib progeny selection approach. The variety has biomass yield of 4.50 - 5.10 tonnes/ha and essential oil content 0.20 to 0.22% and was selected from advanced breeding lines developed from germplasm collections through half-sib progeny selection. The variety was evaluated in multi-location trials and found to be vigorous in growth with good adaptability.



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### Breeding methodology

White dragonhead (*Dracocephalum heterophyllum*) is an aromatic herb, used for its essential oil present in aerial parts of the plant. Based on floral biology studies, *Dracocephalum heterophyllum* has cross pollinated breeding behaviour. To improve aerial biomass and essential oil content selective breeding of *Dracocephalum heterophyllum* was done using half-sib progeny selection approach. One hundred eighty-two diverse accessions representing populations from different regions were screened for morphological traits viz., leaf lamina size, leaf number, number of branches and inflorescence length which were measured at the time of flowering. Multivariate clustering approach was used to identify six potential selections with significantly high values for all the parameters and shortlisted by retaining their seeds. Progeny plants of the six breeding lines were evaluated in multi-location trials along with 'Him surabh' variety of white dragonhead as the check in a Randomized Block Design (RBD) with three replications at four different locations in high altitude regions of Himachal Pradesh over two years. CSIR-IHBT-DH-04 has biomass yield of 4.50 - 5.10 tonnes/ha and essential oil content of 0.20 - 0.22%.

### Agrotechnology

The crop is most suitable for the production of essential oil in the high hills of Western Himalayas. The crop is perennial and flowers during July- August. Cultivation of white dragonhead (*Dracocephalum heterophyllum*) is done by direct sowing of seeds or transplanting. The essential oil is present in the aerial biomass but is high in the inflorescence, therefore, the crop is harvested at full bloom stage. The plants become dormant during the onset of winter season when temperature falls below 5 °C. However, the roots remain viable and re-sprout during spring season after melting of the snow.

### Propagation

*Dracocephalum heterophyllum* is a perennial crop and can be raised by direct seed sowing or through transplanting. Seeds of *Dracocephalum heterophyllum* are light and small in size, therefore, should be sown at soil surface and evenly distributed and covered with thin layer of soil mixture. Seed germination starts about 15-20 days after sowing. In case of transplantation, spacing of 30 x 45 cm is maintained for proper growth of the plants.



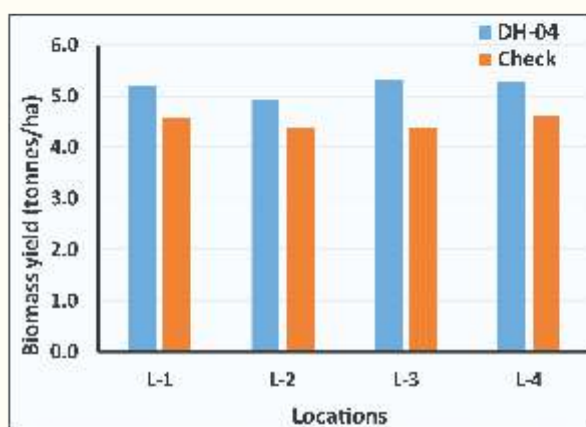
Field view of CSIR-IHBT-DH-04



Dracocephalum seedlings in the nursery ready for transplantation



Dracocephalum seedling in field



Field performance of DH-04 in comparison to check over different locations



Dracocephalum plant in first year of flowering

### Statement of distinction

Cultivar 'Him Sugandh' is about 25 cm in height with spreading plant stature and multiple branches which have erect and upright inflorescence. It has large number of leaves, dark green in colour. The flowers are white in colour.

### Harvesting, distillation and storage

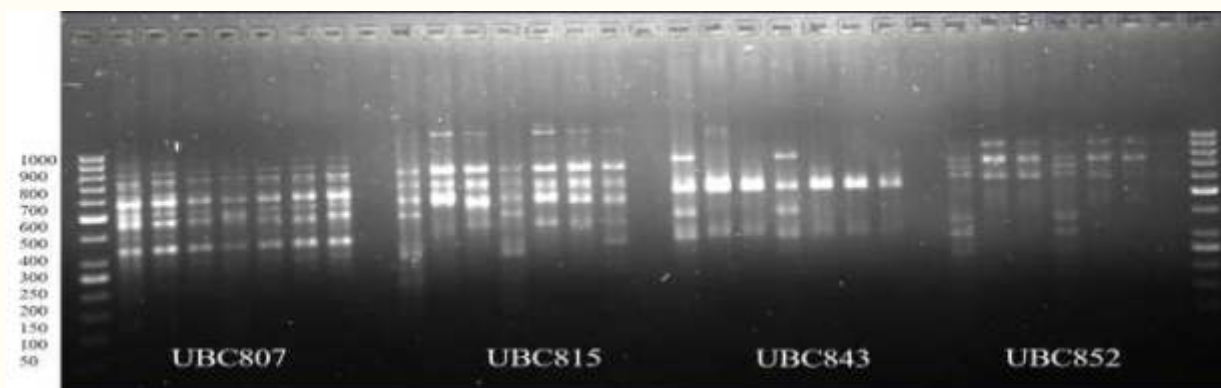
Essential oil is present in leaves and flowers of the crop but high in the inflorescence. Therefore, as a common practice, crop is harvested above the ground level at full bloom stage. The essential oil extraction from the crop is done through steam distillation. The produce should be distilled within 2-3 hours of harvesting. Aerial biomass or essential oil should not be exposed to sunlight, moisture and high temperature at any stage of distillation as these factors deteriorate the oil quality. *Dracocephalum heterophyllum* oil is pale yellow in colour and moisture should be removed immediately after distillation. The oil should be stored in stainless steel, amber colour glass container or aluminium containers filled up to the brim to avoid auto-oxidation and stored in cool and dark place.



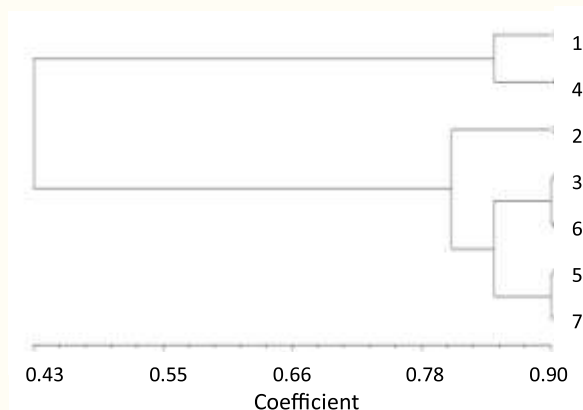
Dracocephalum plant in second year of flowering

## DNA Fingerprinting of improved cultivar 'Him Sugandh' using ISSR markers

Genetic distinctness of selection 'Him Sugandh' (CSIR-IHBT-DH-04) was established using 7 ISSR markers. Seven selections namely, DH-01 to DH-06 and DH-7 (check variety 'Himsurabh') of *Dracocephalum heterophyllum* were used for comparison purpose. In total, 39 alleles were detected ranging from 5 to 9 with an average of 5.5 alleles per ISSR locus. Seven ISSR markers evincing reproducible polymorphic loci among the CSIR-IHBT-DH-04 (Him Sugandh) and other selections were used for development of fingerprints. Based on the ISSR data, consolidated DNA fingerprints were developed with rare or unique marker loci. Cluster analysis of seven selections including check based on 39 polymorphic loci grouped in two major groups. Improved selection CSIR-IHBT-DH-04 captured significant diversity. Pair-wise genetic similarity (GS) of DH-04 varied from a minimum of 31% (DH-02) to maximum of 85% (DH-01). In conclusion, genetic similarity data based on 39 polymorphic loci suggested that improved selection DH-04 has captured high level of genetic diversity and can be potentially used as promising parental group for future genetic improvement programme of *Dracocephalum heterophyllum*.



Dendrogram of *Dracocephalum heterophyllum* selections representing genetic diversity (scale indicates Jaccard's similarity coefficient)



Representative SSR profile of *Dracocephalum heterophyllum* selections using ISSR primers

Table represents Jaccard's similarity matrix among the *Dracocephalum heterophyllum* selections

	1	2	3	4	5	6	7
1	1						
2	0.46	1					
3	0.46	0.74	1				
4	0.85	0.31	0.46	1			
5	0.46	0.79	0.85	0.36	1		
6	0.46	0.85	0.89	0.41	0.85	1	
7	0.51	0.85	0.85	0.41	0.89	0.85	1

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