

German Chamomile (*Matricaria chamomilla*) Variety
'Him Kanti'
(CSIR-IHBT-MC19005)



German chamomile (*Matricaria chamomilla* L.) is a well-known medicinal and aromatic plant species from the Asteraceae family that has been recognised as "star herb". Years of traditional and scientific use of its flowers and blue essential oil have confirmed its multitherapeutic, aesthetic, and nutritional properties. Chamomile's global business is steadily expanding due to increased interest in pharmaceutical industries and its global demand is expected to be over USD 412 billion by 2025. German chamomile is adapted to many climatic and environmental conditions, however, its productivity may differ over variable agro-climatic conditions. There is a scanty of superior and stable genotypes of German chamomile, particularly for western Himalayan regions. Therefore, a total of nine superior selections developed by a half-sib progeny selection approach were evaluated at multi-locations in Himachal Pradesh to identify the variety 'Him Kanti'.



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'Him Kanti' (CSIR-IHBT-MC19005)

The variety 'Him Kanti' of German Chamomile has been developed by CSIR-Institute of Himalayan Bioresource Technology, Palampur through half-sib progeny selection approach. The variety was selected for higher capitulum yield and essential oil content. This selection "CSIR-IHBT-MC19005" is recorded significantly higher capitulum yield (2.55 kg/plot) and essential oil content (3.49 g/kg) than the overall mean (1.95 kg/ha and 2.53 g/plot, respectively) in Himachal Pradesh.

Morphological characters of 'Him Kanti' in mid hills of western Himalayan region

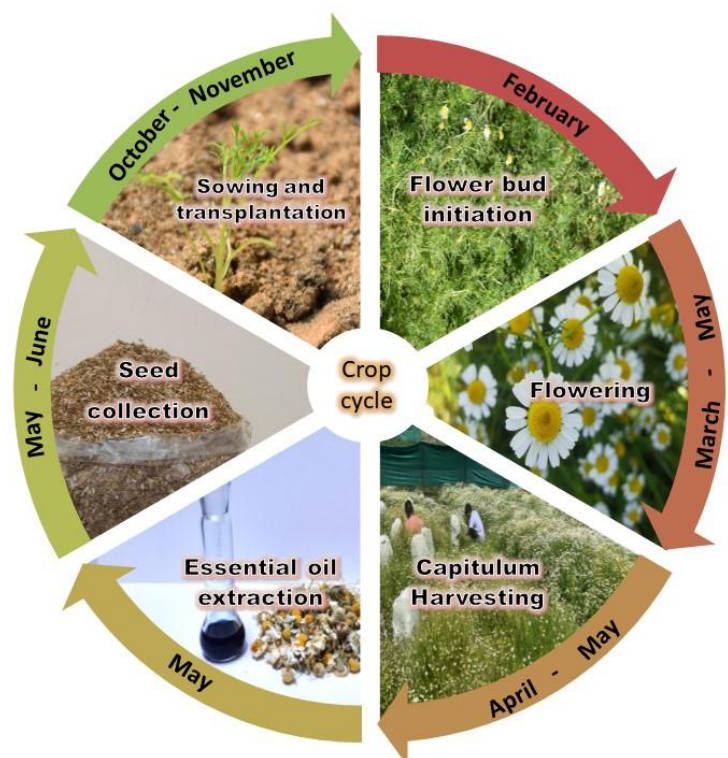
Characters	'Him Kanti'	Over all Mean
Days to 50% flowering	128.75	127.81
Plant height (cm)	89.03	88.08
Capitulum diameter (mm)	25.33	24.9
Capitulum disc diameter (mm)	13.75	12.51
Fresh capitulum yield (kg/plot)	2.55	1.95
Essential oil content (g/kg)	3.49	2.53

Statement of Distinction

The identified selection 'Him Kanti' (CSIR-IHBT-MC19005) has an advantage of 31% and 39% over population mean for capitulum and essential oil yield, respectively. The genotype CSIR-IHBT-MC19005 has a larger capitulum disc diameter of 13.75 mm, capitulum diameter of 25.33 mm and a plant height of 89.03 cm. It requires about 128 days for flowering in low- to mid-hill conditions of Western Himalayan. It has stable performance for capitulum yield and essential oil content over different locations in low- to mid-hill conditions of Himachal Pradesh.

Cultivation practices for 'Him Kanti'

German chamomile is commercially propagated through seeds by direct seeding and transplanting seedlings raised in a nursery. It is an undemanding winter crop (*rabi* season) that grows well across a wide range of soils and climate conditions. It is tolerant to soil alkalinity and can be grown on poor loamy and saline soils, and in water deficit conditions. However, it prefers long-warm days with cool nights and well-fertile soil with good topsoil. The seeds are very small in size; so, 2.0-2.5 kg seed should be mixed with sand (1:10 ratio) for easy sowing per hectare. The seed should be sown at a depth not more than 2 cm in the soil



Crop growth cycle of German chamomile in mid hills of western Himalayan region

Morphological performances in Himachal Pradesh

The CSIR-IHBT-MC19005 along with other eight superior selections of German chamomile populations were evaluated in a randomized block design (RBD). The experiments were laid out at four different locations. The experimental sites lay from 597 to 1410 m above mean sea level. All the studied location falls under the Low-hill sub-tropical to mid-hill temperate zones of Himachal Pradesh in the western Himalayas. The physiochemical properties of soil varied from slightly acidic alluvial to acidic silty-clay loam. Twenty-three days old seedlings of each selection were transplanted in a plot of size 3×2 meters by keeping 40 cm row-to-row and 20 cm plant-to-plant spacing at each location. The fresh capitulum yield (kg/plot) was observed on a plot basis by harvesting all capitula from the whole plot. The final fresh capitulum yield was the sum of three subsequent pickings from a plot. The fresh capitula were used for essential oil extraction to avoid any changes in essential oil composition. The essential oils were obtained by hydrodistillation using the Clevenger apparatus for 6 hours. The selection “CSIR-IHBT-MC19005” is recorded significantly higher capitulum yield and essential oil content at all four environments in Himachal Pradesh.

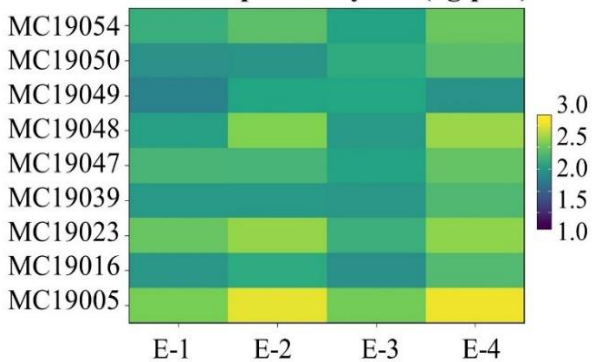


Field view of ‘Him Kanti’ during flowering

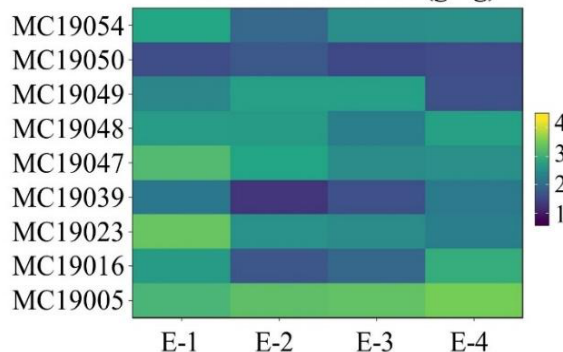


Fresh capitulum harvest and seeds of ‘Him Kanti’ (CSIR-IHBT-MC19005)

Fresh capitulum yield (kg/plot)



Essential oil content (g/kg)



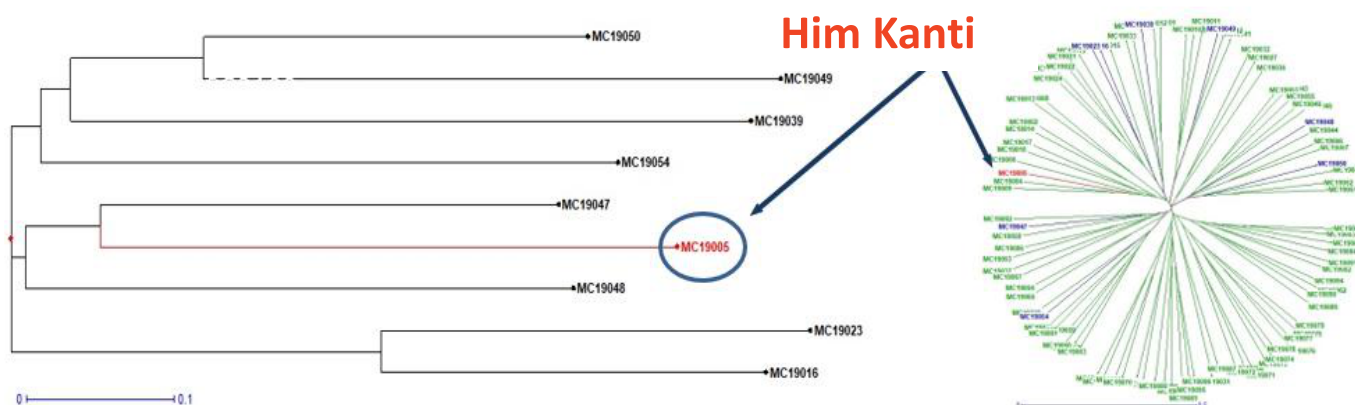
Comparative representation of fresh capitulum yield and essential oil content of ‘Him Kanti’ (MC19005) with other potential selections at multi-locations (E1 to E4)

Molecular characterization of Him Kanti

A total of 33 novel SSR markers were developed to characterize a base population of 118 genotypes of German chamomile. A total of 670 alleles with an average of 20.30 alleles per locus were amplified over all genotypes. The average most frequent, common and rare alleles were 0.24, 13.25 and 5.13, respectively over all the loci. Genetic distinctness of variety 'Him Kanti' (CSIR-IHBT-MC19005) was also studied separately with eight superior selections namely, MC19016, MC19023, MC19039, MC19047, MC19048, MC19049, MC19050 and MC19054. Based on the SSR data, consolidated DNA fingerprints were developed with rare or unique marker loci. The clustering based on simple matching dissimilarity index of 33 polymorphic SSRs allocated all the genotypes of the base population in to 5 clusters. Separately, the nine superior selections were grouped into three clusters, where, the selection MC19005 clustered with MC19047 and MC19048. The molecular data revealed high variability among the studied genotypes that may help the plant breeders to perform selections for trait specific breeding programs in chamomile.

DNA fingerprints of potential selections

SSR Markers	MC19005	MC19016	MC19023	MC19039	MC19047	MC19048	MC19049	MC19050	MC19054
SSR1489_250									
SSR1489_244									
SSR1489_247									
SSR1489_238									
SSR1489_241									
SSR730_283									
SSR730_289									
SSR730_277									
SSR730_259									
SSR730_265									
SSR1309_287									
SSR1309_293									
SSR1309_299									
SSR1859_262									
SSR1859_266									
SSR1859_250									
SSR1859_238									
SSR1859_242									
SSR1749_245									
SSR1749_257									
SSR1833_331									
SSR1833_337									
SSR1833_355									
SSR1833_361									
SSR1833_352									



Genetic relationship of Him Kanti with other potential selections and base population

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