

Aroma in *Origanum vulgare* L.: A Perceivable Criterion for Delimitation of Intraspecific Taxa

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Abstract The six varieties of *Origanum vulgare* L. of the tribe Menthae under family Lamiaceae possess remarkably different aroma in field which is easily decipherable without overlapping. This chemotaxonomic character, if retained permanently, at least to some extent, in the holotype specimens, can serve as a significant diagnostic feature in delineation of all variants of the species and can be useful in solving the existing Taxonomic complexity.

Keywords Aroma, Chemotypes, Lamiaceae, *Origanum vulgare*, Varieties

1. Introduction

1.1. Modern Taxonomy

In progression of Linnaeus' alpha taxonomy, the modern taxonomic approaches are directed to evolve a blend of parameters through 'palyno-', 'chemo-', and 'experimental-taxonomy' including gene mapping and DNA barcoding, heading towards 'Cyber Taxonomy' or 'e-Taxonomy' for resolving complexities in a more comprehensive way, with Linnaean taxonomic system at the foundation. During the course of taxonomic analysis, mainly the revisionary and monographic works, the array of infraspecific variations encountered are sometimes of vast gradation which create obstacle in unambiguous species characterization. Such species complexes warrant infraspecific categories and require assistance from the modern parameters, to ascertain their delimitation.

1.2. Chemodiversity in *Origanum vulgare* Complex

Origanum vulgare L. (monospecific genus in tribe Menthae, family Lamiaceae) is one such complex taxa, where Letswaart [1] recognized six subspecies, but other workers opined it to be a genus of great diversity with no infraspecific category [2, 3]. Chauhan et al., [4] studied the chemodiversity of the species from western Himalayan region and reported six chemotypes of the species. He stated that 'although similar in morphology, the chemotypes differed completely in the aroma they impart'

and further categorized the aroma as 'spicy' or 'pungent' and 'floral' or 'pleasant', adding that 'the characters do not overlap in field', 'even in intermingled populations'. But Chauhan et al. (*l.c.*) were not sure whether aroma in the *O. vulgare* complex can be considered as a criterion for taxa delimitation or not.

2. Discussion

Keeping in mind the Linnaean criterion for taxa delineation and combining it with modern trends of taxonomy, we are of the opinion that in the process of taxonomic delineation of any taxon, according to the Indian Code of Botanical Nomenclature the Botanical name and species description (protologue) rests on the 'Holotype' designated by the author. This holotype specimen is of recurrent usage and is referred repeatedly for the diagnostic character/characters of that taxon to which it is permanently attached. It is therefore implied that the diagnostic feature/s must be permanent and not disintegrate, diminish, or vanish over times. 'Aroma' therefore, may be used as a 'diagnostic trait' only in such case when it is retained permanently, at least to a decipherable degree in the holotype, so as to be in conformity with the protologue.

Furthermore, the species constitute 'populations of individuals with similar phenome and genome, which occur, survive and multiply in similar habitat and can share the gene pool comprised by them by homologous recombination and are reproductively isolated from other species'. The species definition does not exemplify the chemical nature of the individuals, but it is implicit to possess unaltered chemical constituents by virtue of having a uniform gene pool, mainly the primary metabolites, and the genetically determined traits. The factors that determine the chemical variability and yield of secondary metabolites for each species/infraspecific taxon include physiological variation, environmental conditions, geographic variations as well as genetic factors [5]. The presence, yield and composition of secondary metabolites in plants *viz.*, the volatile components and those occurring in essential oils, are mostly environmentally induced traits, and may vary with edaphic and environmental conditions, and can also be affected in a number of ways from their formation in plants to their isolation. Hence these cannot be considered stable/genetic characters, especially in instance where there is no morphological variations in support, as is the case in *Origanum vulgare* L. But at the same time, the difference in aroma, a noteworthy chemotaxonomic trait, cannot be ignored completely, at least at infraspecific level, paving way for possibility of occurrence of infraspecific taxa in *O. vulgare* L. In such complex situation, attention is also drawn towards the underutilized micro morphological tool, the pollen analysis of all variants, to substantiate and authenticate the chemotaxonomic data as the morphological features depicted by the pollen surface are genetically determined and constitute the most reliable characters of diagnostic value for establishing taxa relationships accurately, in situations where the macro-characters appear in-comprehensive.

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