Exploration and collection of different germplasm accessions of Oregano (*Origanum vulgare* L.) from the Kashmir Himalayas

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ABSTRACT

The collection of accessions of Origanum vulgare is an important resource for its conservation and utilization. To explore and collection of the different accessions of Origanum vulgare, an extensive survey was conducted across the Kashmir Himalaya. These exploration trips were concerted in North, Central and South zones of Kashmir Himalaya. The germplasm collections were conducted from late march to mid-May. This extensive survey yielded a total of nineteen accessions from different places; of which 17 accessions were from wild origins and two accessions were from cultivated sources. The germplasms were submitted to the National Bureau of Plant Genetic Resources (NBPGR) gene bank for their preservation and allotment of IC numbers. All the live plants of all the accessions were maintained in experimental plots at the Faculty of Forestry, SKUAST-K. These accessions can be used to maintain the species' genetic diversity, improvement of culinary, medicinal, and ornamental qualities, and to ensure its long-term survival.

***Keywords*:** Collection, germplasm accession, Kashmir**,** NBPGR, *Origanum vulgare*

INTRODUCTION

Organum is a large and diverse genus of plants belonging to the family Lamiaceae. This genus includes 49 taxa belonging to 10 sections (Ietswaart, 1980). Several species including *Origanum vulgare* L. are rich in essential oils and are commonly known as Oregano (Skoulaand Harborne, 2002). It is a perennial herb that grows to a height of 1.5 m and is distributed in the Mediterranean region, the Middle East, China and South Asia (Kokkini, 2002).The plant has been introduced to many other parts of the world and is now found in temperate and subtropical regions worldwide. The herb of oregano is widely consumed and traded as a culinary spice globally (Kaefer and Milner, 2008). It has been established that the herb contains a large diversity of secondary metabolites particularly thymol, carvacrol sometimes linalool (Lukas *et al*., 2008; Nurzynska-Wierdak *et al.,* 2012; Mastro *et al.,* 2017, Machado *et al.,* 2023) which are regarded as the signature class of compounds for recognizing the quality oregano. And due to these compounds, it is used for centuries as a traditional medicinal plant for curing myriad diseases across the globe. The same has been established through numerous clinical trials that a herb possesses a potential pharmacological activity especially, anti-microbial, anti-fungal, anti-oxidant and expectorant (Cleff *et al.,* 2010; Senderski, 2014; Brđanin *et al.,* 2015; Brondani *et al*., 2018; Campos *et al.,* 2022).

In India, *Origanum vulgare* subsp. vulgare (common oregano) is spread abundantly in the central, north and northeastern Himalayan region (Sarin, *et al.*, 1991) and is the only representative of *Origanum vulgare* in India (Chishti *et al.,* 2013). It is recognized with different names depending

upon regional dialect, in Kashmiri, it's famous as (van babber) in Persian (marzanjosh) in Arabic (*za'atar)* in Hindi (ban tulsi). The herb of *Origanum* is very famous among the tribal communities of Kashmir Himalaya (Atta, 2017). Exploration and collection of accessions/populations of *Origanum vulgare* is an important step in preserving the genetic diversity of the species. Leto and Salamone, (1997) collected 214 biotypes from 24 sites in the Mediterranean and were maintained for ex-situ conditions. The biotypes varied in morphology thus exhibiting great diversity. In a similar study, 70 accessions of *Origanum vulgare* were collected and results after their establishment showed variability in their agro-morphic traits (Mastro, 1997). Likewise, the exploration and collection of Origanum accessions from Europe (Raduöienë *et al.*, 2005; Azizi *et al.*, 2012; Sivicka *et al.*, 2013; Kosakowska and Czupa, 2018; Myagkikh *et al.*, 2020; Weglarz *et al*., 2020), and Iran (Morshedloo *et al.*, 2018) have been done for the appraisal of quality evaluation based on their morphological traits, production potential and essential oil characterization by isolating the elite lines from collected germplasm. Nevertheless, such research has been subject to only a few studies in India (Chauhan *et al.*, 2013, Raina and Negi, 2014; Manivel *et al*., 2019). And thus our present investigation is the first step towards identifying and collection of Oregano biotypes from different geographical locales of Kashmir Himalaya to make a base for the future improvement of this species for its commercial exploitations.

MATERIALS AND METHODS

The Collection assignment for germplasm accessions of oregano was meticulously planned to collect large populations from the wild as well as the cultivated origins in the whole Kashmir valley. For this purpose, an extensive preliminary survey was conducted across the Kashmir Himalaya during 2019-20 and during the survey, nineteen sites (Fig. 1.) were identified out of which 17-sites were from the wild origin and 2-sites were from cultivated sources. During the collection following sites were explored from the wild; Uri(chakra), Tral(buchoo), Mawar, Dachigam, Bamanhaar, Astanmarg, Zuthan, Sanzipora, Kiterdij, Urpash, Lar, Naranag, Yusmarg, Izmarg, Markoot, Khilanmarg, Tulail (safeed-aab) while the accessions from cultivated sources were procured from CSIR-IIIM Kashmir at their two sub-stations (Yarikha, Tangmarg and Bonera, Pulwama) (Table 1) The collected accessions were submitted to the NBPGR, New Delhi to store in the national gene bank and national idendity IC numbers were obtained. Also, while collection the soil samples were collected which were later analyzed for pH, EC and soil texture class with the aid of *Mridaparikshak* (mini soil testing kit developed by ICAR-Indian Institute of Soil Science, Bhopal)

RESULTS AND DISCUSSION

Biotypes/accessions are distinct varieties of a species that are adapted to specific environmental conditions. Exploration and collection can help us

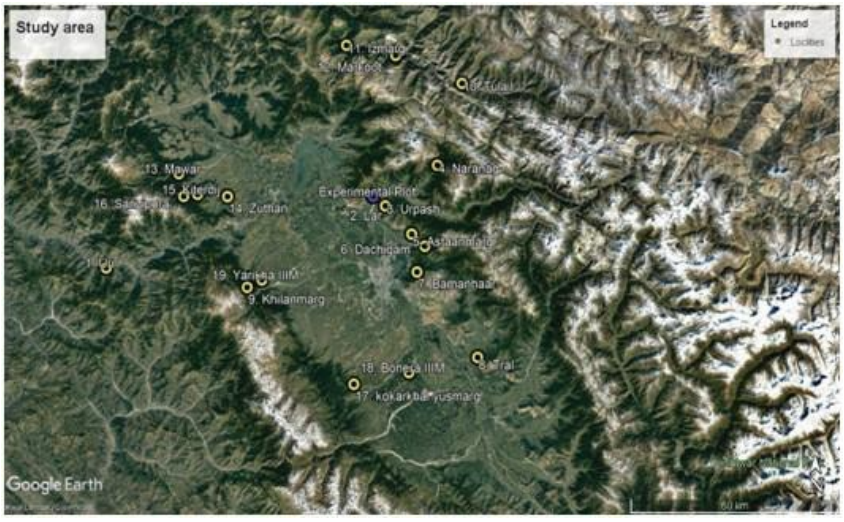

Fig.1: Map of collection sites of (wild & cultivated) accessions of *Origanum vulgare* L.

Table 1: Passport data sheet of *Origanum vulgare* accessions collected from different ecological niches of Kashmir Himalaya

S.No	Precinct	Collector No.	IC-No.	Type of material	Collecting site/ acquisition source	Frequency	Sampling method	Habitat
1.	Uri (Chakra)	UA/SAG/706	IC-0644413	Cuttings	Wild	Abundant	Random	Forest
2.	Tral (Buchoo)	UA/SAG/707	IC-0644414	Cuttings	Wild	Frequent	Random	Orchard
3.	Mawar	UA/SAG/717	IC-0644423	Cuttings	Wild	Frequent	Random	Forest
4.	Bamanhaar	UA/SAG/703	IC-0644410	Cuttings	Wild	Abundant	Random	Orchard
5.	Pulwama(Bonera-IIIM)	UA/SAG/710	IC-0644417	Cuttings	Cultivated	-	Random	Cultivated
6.	Dachigam	UA/SAG/709	IC-0644416	Cuttings	Wild	Frequent	Random	Forest
7.	Zuthan	UA/SAG/716	IC-0644422	Cuttings	Wild	Frequent	Random	Forest
8.	Sanzipora	UA/SAG/718	IC-0644424	Cuttings	Wild	Occasional	Bulk	Forest
9.	Kiterdij	UA/SAG/719	IC-0644425	Cuttings	Wild	Occasional	Bulk	Forest
10.	Urpash	UA/SAG/702	IC-0644409	Cuttings	Wild	Abundant	Random	Orchard
11.	Lar hills	UA/SAG/07	IC-063889	Cuttings	Wild	Frequent	Random	Forest
12.	Yusmarg (Kokarkhal)	UA/SAG/704	IC-0644411	Cuttings	Wild	Occasional	Bulk	Orchard
13.	Tangmarg(yarikha-IIIM)	UA/SAG/08	IC-063890	Cuttings	Cultivate	-	Bulk	Cultivated
14.	Naranag	UA/SAG/708	IC-0644415	Cuttings	Wild	Abundant	Random	Forest
15.	Astaanmarg	UA/SAG/705	IC-0644412	Cuttings	Wild	Occasional	Bulk	Roadside
16.	Izmarg	UA/SAG/711	IC-0644418	Cuttings	Wild	Abundant	Random	Meadow
17.	Markoot	UA/SAG/712	IC-0644419	Cuttings	Wild	Frequent	Random	Forest
18.	Khilanmarg	UA/SAG/715	IC-0644421	Cuttings	Wild	Frequent	Bulk	Meadow
19.	Tulail(safeed-aab)	UA/SAG/AS/713	IC-0644420	Cuttings	Wild	Abundant	Random	Forest

Table 2: The geographical localization & soil Physiochemical attributes of different sites of investigated populations

S.No	IC-No.	Geo-coordinates			Physiochemical analysis of soil		
		Latitude	Longitude	Altitude (m)	Soil pH	Soil E.C	Soil texture
1.	IC-0644413	$34^0$05′.94″	$73^0$57′.49″	1237(m)	7.03±0.04	1.64±0.03	Clay loamy
2.	IC-0644414	$33^0$54′.41″	$75^0$05′.67″	1609(m)	6.35±0.03	1.18±0.05	Loamy
3.	IC-0644423	$34^0$12′.10″	$74^0$07′.44″	1635(m)	6.36±0.13	0.79±0.02	Loamy
4.	IC-0644410	$34^0$06′.31″	$74^0$53′.80″	1655(m)	6.51±0.15	0.82±0.01	Loamy
5.	IC-0644417*	$34^0$50′.92″	$74^0$53′.17″	1701(m)	6.86±0.09	1.61±0.06	Loamy
6.	IC-0644416	$34^0$15′.36″	$74^0$92′.17″	1709(m)	6.24±0.96	1.92±0.04	Loamy
7.	IC-0644422	$34^0$18′.10″	$74^0$16′.10″	1724(m)	6.27±0.03	1.33±0.07	Loamy
8.	IC-0644424	$34^0$21′.70″	$74^0$11′.23″	1731(m)	6.37±0.06	0.94±0.09	Loamy
9.	IC-0644425	$34^0$17′.36″	$74^0$11′.37″	1784(m)	6.93±0.07	1.04±0.05	Loamy
10.	IC-0644409	$34^0$14′.98″	$74^0$48′.29″	1827(m)	6.91±0.05	0.85±0.11	Loamy
11.	IC-063889	$34^0$16′.72″	$75^0$46′.37″	1927(m)	6.94±0.11	0.08±0.17	Loamy
12.	IC-0644411	$33^0$50′.39″	$74^0$45′.57″	2087(m)	6.36±0.07	0.43±0.02	Loamy
13.	IC-063890*	$34^0$04′.51″	$74^0$25′.43″	2119(m)	6.67±0.05	0.91±0.05	Loamy
14.	IC-0644415	$34^0$21′.13″	$74^0$58′.53″	2281(m)	7.03±0.04	1.17±0.08	Loamy
15.	IC-0644412	$34^0$11′.21″	$74^0$45′.57″	2290(m)	6.73±0.01	0.07±0.01	Clay loamy
16.	IC-0644418	$34^0$39′.28″	$74^0$40′.54″	2358(m)	6.55±0.05	1.3±0.1	Loamy
17.	IC-0644419	$34^0$37′.45″	$74^0$50′.43″	2466(m)	6.79±0.09	1.41±0.11	Loamy
18.	IC-0644421	$34^0$04′.75″	$74^0$38′.53″	2532(m)	6.96±0.04	1.27±0.03	Clay loamy
19.	IC-0644420	$34^0$33′.40″	$75^0$01′.43″	3171(m)	7.01±0.02	0.14±0.03	Loamy

Note: *represent cultivated accessions

identify new sources of genes that can be used to breed new varieties of oregano with improved traits, such as increased resistance to pests or diseases, or improved flavor. The observations made from the data about the geo-coordinates and soil analysis collected from the different ecological niches in Kashmir Himalayas, (Table 2.) revealed that the *Origanum vulgare* L. (Oregano) finds its habitual zone in an elevation between 1237-3171m in the clay loamy- loamy soils having pH ranging from 5.9- 7.3 The plants of oregano usually occurs in the places which are; open, previously cleared forest patches, semi-dry meadows, forest edges, wastelands, elevated bunds of horticulture lands etc. Also, it was observed that oregano thrives well in the extreme competition of surrounding species. The places facing the southern or southeastern slope receiving more sunlight for a longer time duration were witnessed with abundant growth of *Origanum vulgare* than the north-facing slopes where growth was limited. Our results are in line with studies made earlier in the temperate Himalayas (Jan *et al*., 2018; Tewari *et al*., 2015) and also in the Mediterranean region (Skoula and Harborne, 2002; Meyers, 2005, Bonfanti *et al*., 2012) which suggests that *Origanum vulgare* L. can adapt itself to diverse environmental conditions.

CONCLUSION

Exploration and collection of biotypes of *Origanum vulgare* is an important step in preserving the genetic diversity of the species. By identifying and conserving the biotypes of the species, we can ensure that the species will continue to be available for future generations. Moreover, exploration and collection can be used to identify new sources of genes that can be used to breed improved varieties of oregano. In the present study, a substantial number of oregano germplasm accessions (19) were collected from the Kashmir Himalaya and conserved.

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