

Thymus algeriensis Boiss. and Reut.

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Contributor: Radhia Aitfella Lahlou , Nsevolo Samba , Pedro Soeiro , Gilberto Alves , Ana Carolina Gonçalves , Luís R. Silva , Samuel Silvestre , Jesus Rodilla , Maria Isabel Ismael

The word Thymus comes from the Greek “*thyo*”, which means “*offering*” (to be burnt) and “*perfume*” because of the pleasant smell that the plant gives off naturally when burnt. *T. algeriensis* Boiss. and Reut. are classified in section *Hyphodromi* (A. Kerner) Halácsy and subsection *Subbracteati* (Klokov) Jalas. It belongs to the order Lamiales, subfamily Nepetoideae, and tribe Menthae.

Thymus algeriensis

distribution

botanical aspects

1. Thymus Genera: An Overview

The word Thymus comes from the Greek “*thyo*”, which means “*offering*” (to be burnt) and “*perfume*” because of the pleasant smell that the plant gives off naturally when burnt ^{[1][2]}. In ancient times, the Sumerians and Egyptians used it for embalming their dead (the mummification process). The Romans burned thyme to purify the air and keep pests away ^{[3][4]}. The name “*Thyme*” comes from the Greek word “*Thymos*” ^[5], meaning smell. In the Azores, Madeira and the western part of the Iberian Peninsula, Thyme has the Portuguese names “*tomentelo*” or “*tormentelo*”, “*tomelo do pais*”, “*tomentelo do pais*” or “*tomilho*” ^[2]. In the mountains of Ethiopia, it is known as “*rausi*”. Moreover, the African northwest has the following several Arabic vernacular names: “*Djertil*”, “*Hamzoucha*”, “*Mezouqach*”, and “*Khieta*”, and Berber names such as “*Azoukni*”, “*Tazuknite*”, “*Rebba*”, “*Djouchchen*”, and “*Touchna*” ^[6]. In Morocco, it is also called “*azukenni*” ^[2].

The genus *Thymus*, described by Carl Linnaeus in *Species Plantarum*, belongs to the monophyletic group of the subfamily *Nepetoideae* Kostel, the tribe *Menthae* Dumort and the subtribe *Menthinae* Endl ^{[7][8]}. The species can be sub-shrubs or shrubs, often herbaceous above, usually gynodioic and aromatic. They grow spontaneously on dry, rocky slopes and in scrubland. The stems of species are generally $\pm$ quadrangular, hairy all round, on two opposite sides, or only on the corners. The leaves are small, entire, and frequently revolute and form compact, highly branched clumps that rise to about 20 cm above the ground ^[9]. They have inflorescences of whorls forming a terminal, condensed, often spiciform or interrupted thyse ^[10]. These characteristics can have a high degree of polymorphism, demonstrating the complexity of the genus *Thymus* from a taxonomic and systematic point of view. Indeed, this hybridization has been observed between species belonging to different sections and between species with varying ploidy levels, resulting in different chemical compositions ^{[2][11]}. Eight sections can be distinguished in the genus from a taxonomic and geographical point of view, as follows: *Micantes*, *Mastichina*, *Piperella*, *Teucrioides*, *Pseudothymbra*, *Thymus*, *Hyphodromi*, and *Serpyllum*. Five of them (sections *Micantes*, *Mastichina*,

Piperella, *Pseudothymbra*, and *Teucrioides*) are endemic to the West Mediterranean area (Iberian Peninsula, Northwest Africa) [12].

2. *Thymus algeriensis* Boiss. and Reut.

2.1. Distribution

The medicinal properties of *Thymus* species have been investigated in numerous scientific studies, including in vitro et in vivo experiments. The results reveal that they have a unique combination of beneficial functions due to the Mediterranean climate [13][14][15]. In this geographical area, the western Mediterranean, under the influence of the Atlantic Ocean, the climatic conditions are favorable for thyme vegetation. Therefore, they are mainly found on the Mediterranean coast [16]. *Thymus* species are sun-loving, heliophilous plants, a fact that reflects the ecology of the genus. *Thymus* plants frequently live on rocks or stones, and the soil must be well-drained [8]. They need very different substrates. *T. algeriensis* usually lives on calcareous soils, characteristic of the Maghreb [17]. The Algerian species are found in the eastern Tell, in the bedrock areas, and on the high mountain plateaus up to the border of the pre-Sahara Tassili [18][19]. They are mainly present in subhumid and arid zones from the North-East of Algeria to the Tunisian border [9]; a few isolated individuals occur in Mascara province and from the Oran region to the Moroccan borders (Figure 1).



Figure 1. In Red *Thymus algeriensis* Boiss. and Reut. Maghreb distribution (Coordinates N26° 14.526120 E5° 9.313440) [18].

The Moroccan *T. algeriensis* is found in the Mediterranean part of the country, in the Tangier-Tetouan-Al Hoceïma and Fez-Meknes regions, and more particularly in the so-called Oriental area (Béni Snassen forest), in the northeast near the Algerian border [18][19][20]. A few specimens have been found in the Middle Atlas, in the so-called Béni Mellal-Khénifra region (Figure 1). In Tunisia, the species is found in almost all bioclimates. It occurs in the north-eastern Mediterranean in the sub-humid zones of the Boukournine Mountains at 200 m altitude, up to the upper semi-arid zones at the foot of the Reças Mountains (Lead Mountain) at 150 m altitude and the Zaghouane

Mountains at about 300 m altitude (**Figure 1**). Many populations of *T. Algerians* have been observed in the lower arid bioclimate. They formed a kind of vegetative belt from the city of Sfax to the Magel Bel Abbes near the Algerian border. In the southeastern part of the country, however, it occurs in the upper and lower Saharan bioclimate regions of Ksar Jedid and Remada [18][19]. In the Libyan zone, *T. algeriensis* only appears in the north-western part of the country (**Figure 1**), specifically in the Mediterranean coastal bioclimate and the coastal steppes climate in Qsar bin ghashir and Abu ar Rish. In the highlands, it has been detected in the Beni Walid, El Urban, Al Urqub, and Rahiba regions [18][19].

2.2. Systematic Classification and Botanical Aspects

According to Morales [2], *T. algeriensis* Boiss. and Reut. are classified in section *Hyphodromi* (A. Kerner) Halácsy and subsection *Subbracteati* (Klokov) Jalas [21][22]. It belongs to the order Lamiales, subfamily Nepetoideae, and tribe Menthae (**Figure 2**).



Figure 2. Systematic classification and botanical aspects of *Thymus algeriensis* Boiss. and Reut flowers and leaves. (a,b) from Tunisia, (c) from Algeria, (d) Systematic classification of *T. algeriensis* [23].

T. algeriensis is a subshrub that can reach a height of 50 cm. It is a short-lived diploid species ($2n = 2x = 30$), which is also aromatic, perennial, and gynodioic [21][24][25]. It is characterized by small, dark green, opposite, lanceolate, short petiole leaves. It reproduces by seed through vegetative means. *T. algeriensis* is hermaphroditic (male fertile) or female (male sterile) [24]. Pollination is usually via bees (allogamous species). Self-pollination can also occur in hermaphrodite plants [26]. The vegetative stage occurs in January and February, and its flowering occurs between April and June [27]. Its flowers are small (5–6 mm) with a glandular calyx, oval-shaped bracteoles, and a pinkish-purple corolla.

2.3. Uses in Folk Medecine

In traditional Algerian medicine, *T. algeriensis* has been used as an astringent, expectorant, and healing agent and a blood circulation stimulant and aphrodisiac [28][29]. Infusion, decoction, and powder of the aerial parts are used in Naâma, southwest Algeria for treating colds as an anti-inflammatory, to manage hypercholesterolemia and menstrual cycle problems, and recently against COVID-19 [30]. El Kantara's area (Algerian Sahara gate) is traditionally employed to flavor coffee, buttermilk, and tea. Infusing leaves and flowers are used against abdominal stomach pain, wound infections, and food poisoning. It is also antihypertensive and manages heart diseases [31]. In Morocco, *T. algeriensis* is a medicinal species indicated in the traditional treatment of diabetes [32]. It is a tonic

stimulant against cough, fever, and wound infections [33][34]. It also treats asthma, bad breath, chest pain, lung disorders, and rhinosinusitis. In addition, some of his by-products were used as antitussives [35] and anti-inflammatory agents by topical or oral administration [36][37][38]. Traditionally in Tunisia, *T. algeriensis* is used as a culinary herb, fresh or dried [39], or as condiments or flavoring mainly added to black tea [40]. It is widely used in popular Tunisian medicine as a protective treatment against digestive tract diseases and abortion [41].

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