





14.27	Béta pinène	Monoterpène hydrocarboné	1.63
14.70	Alpha phellandrene	Monoterpène hydrocarboné	0.28
15.24	Alpha terpinène	Monoterpène hydrocarboné	3.25
15.61	p-cymène	Monoterpène hydrocarboné	15.59
17.07	Gamma terpinène	Monoterpène hydrocarboné	22.25
17.30	p-menth-2-en-1-ol	Monoterpène oxygéné	0.65
18.10	Terpinolène	Monoterpène hydrocarboné	0.16
18.63	Linalool	Monoterpène oxygéné	1.79
20.16	Camphre	Monoterpène oxygéné	0.24
21.04	Bornéol	Monoterpène oxygéné	0.65
21.48	4-terpinéol	Monoterpène oxygéné	1.15
23.54	Thymol methyl ether	Autre (oxygéné)	1.18
23.86	2-isopropyl-4-methylanisole	Autre (oxygéné)	0.88
25.80	Thymol	Monoterpène oxygéné	41.39
26.00	Carvacrol	Monoterpène oxygéné	2.06
27.60	Isothymol	Monoterpène oxygéné	0.27
29.81	Caryophyllène	Sesquiterpène hydrocarboné	1.30
31.71	Germacrène D	Sesquiterpène hydrocarboné	0.40

From these results, the major constituents of thyme EO are Thymol (41.39 %), the Gamma terpinene (22.25 %) and p-cymene (15.59 %).

The comparison of our results with the literature shows considerable qualitative and quantitative differences in the chemical composition. Indeed, our results differ from those obtained by Özcan and Chalchat (2004) who studied the thyme of EO composition of a sample of the same species in which thymol (46.2%), alpha terpinene (14.1%), p-cymene (9.9%), the alpha-pinene (3.0%) and carvacrol (2.06 %) were found to be the majority.

This can be explained by the existence of different chemical families or chemotypes. Det. vulgaris: thymol, carvacrol, linalool, thuyanol, alpha terpineol, geraniol, and paracymene.

**Table 2:** chemical composition of the EO of *M.pulegium*:

Temps de Réention (min)	Composé	Famille chimique	Valeur Indicative %
8.30	α-Pinène	Monoterpène hydrocarboné	0.17
9.74	Sabinene	Monoterpène hydrocarboné	0.11
11.65	Limonene	Monoterpène hydrocarboné	1.63
16.50	p-Menthone	Monoterpène hydrocarboné	5.24
17.35	Neomenthyl acetate	Autre (oxygéné)	0.53
19.45	Pulegone	Monoterpène oxygéné	78.98
21.47	3-p-Menthene	Monoterpène hydrocarboné	1.75
21.47	Carene	Monoterpène hydrocarboné	1.75
26.08	α-Caryophyllene	Sesquiterpène hydrocarboné	2.33
26.91	Germacrene-D	Sesquiterpène hydrocarboné	0.42

These results show that pulegone (78.98 %) is the major constituent of EO *M. pulegium*, which justifies the name mint pulegone.

The chemical composition obtained from the EO *M.pulegium*, approximates the results obtained by Lorenzo et al. (2002), who reported a chemical composition dominated by pulegone (73.4 %). Similarly, the majority of work already done in Morocco by Ouraini et al. (2007) and Chebli et al. (2003) showed that pulegone is the major component of *M. pulegium*, with respective concentrations of 44.27 % and 61.11 %.

### 3.2 Antifungal Activity of Essential Oils:

The table 3 showed the result of antifungal activity of essential oils *M.pulegium* and *T.vulgaris*. When we test the two oils, we notice that the greater the volume of EO increases, the greater the diameters of the zones of inhibition increases. This is due to the presence of more active compounds with the increased volume of EO.

One study examined the antifungal effects of thyme EO (Rasooli et al., 2006), especially on the consequences of this oil on the ultra structure of the fungus *Aspergillus's Niger*. It has everything to first identify by electron microscopy, when *A. Niger* was exposed to EO, it caused irreversible damage to the cell membrane as well as on the organelles of the fungus (Barrel et al., 2007). So they inhibit spore germination, elongation mycelium, sporulation and toxin production in molds. This antifungal activity may be due to its major constituents: thymol, Gamma terpinene and p-cymene.

Belghazi et al. (2002) agree that the oil of *M.pulegium* whose majority compound is pulegone, has a strong antifungal potency against *Penicillium* and *Mucor*.

Indeed, both oils are rich in monoterpenes, which are well known for their antimicrobial activities. According Derwich et al. (2010), the antimicrobial activity of monoterpenes is

explained by the presence of phenolic hydroxyl groups able of the targeted cell.  
to form hydrogen bonds with the active sites of the enzymes

**Table 3:** Halos inhibition (diameter in mm) caused by the two essential oils:

		Control	10 $\mu$ l	20 $\mu$ l	30 $\mu$ l	50 $\mu$ l	60 $\mu$ l	80 $\mu$ l
<i>P. digitatum</i>	<i>M. pulegium</i>	0	17 (+)	19 (+)	30,1 (+++)	40 (+++)	72 (+++)	100 (+++)
	<i>T. vulgaris</i>	0	16,8 (+)	21 (+)	29,7 (+)	39 (+++)	44 (+++)	88 (+++)
<i>P. italicum</i>	<i>M. pulegium</i>	0	16,3 (+)	21(+)	31 (+++)	44 (+++)	69 (+++)	100 (+++)
	<i>T. vulgaris</i>	0	19,8 (+)	24(+)	32(+++)	37(+++)	45(+++)	73,1(+++)

(+): sensitive  
(+++): Exemely sensitive

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