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REVIEW ARTICLE

RECORDS OF PHARMACEUTICAL AND BIOMEDICAL SCIENCES

Review on Chemical Constituents of Genus *Marrubium*

Salma A. Ibrahim[a], Asmaa I. Ali[a], Reda F. A. Abdelhameed[b], Jihan M. Badr[b*]

[a] *Department of Pharmacognosy, Faculty of Pharmacy and Pharmaceutical Industries, Misr International University, Cairo, Egypt.*
[b] *Department of Pharmacognosy, Faculty of Pharmacy, Suez Canal University, Ismailia, 41522, Egypt*

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*Correspondence Author:

Tel: +01091332451

E-mail address:

jihanbadr2010@hotmail.com

Abstract

Herbal medicine is considered a natural source of a variety of beneficial active constituents. Since ancient times, herbal medicines have been used to cure different types of diseases. The World Health Organization (WHO) reports that the usage of herbal medicines has surpassed that of conventional pharmaceuticals by a factor of two to three worldwide due to it showed a remarkable safety profile when compared to conventional medicine. The use of herbal plants for primary healthcare is expanding tremendously. This isn't just because they are less expensive, but also because they are more widely accepted culturally, work better with the human body, and have less adverse effects. The process of extracting medicinal plants involves separating active plant extracts or secondary metabolites using the proper solvent and various extraction techniques. The Labiatae (Lamiaceae) family is one of the largest and most distinctive families of flowering plants, with about 220 genera and nearly 4000 species worldwide. Genius *Marrubium* consists of 97 flowering plants belonging to the Labiatae family that are native to the temperate regions of Europe, North Africa and Asia. Some other species grow in North and South America. This genus also contains a wide range of compounds including terpenes, oils, iridoids, sterols, glycosides, saponins, phenolic compounds and flavonoids. The species of this genus are characterized through having potential therapeutic activities as antispasmodic, hypolipidemic, hypotensive, hypoglycemic, anti-inflammatory and analgesic properties. This chemical review shows genus *Marrubium* plants extract contains different classes of bioactive chemical classes as terpenes, flavonoids, essential oil and sterols.

Keywords: Herbal medicine, Labiatae, *Marrubium*, Flavonoids, Terpenes.

1. Introduction:

Herbal medicinal plants are considered one of the main and valuable remedy sources of many bioactive ingredients which play an important role in the treatment of various human diseases throughout human history **(Abubakar and Haque, 2020)**.

About 80% of the people living in developed countries depend on herbal medicine over the synthetic ones due to the majority of the therapies use plants extracts and bioactive ingredients deprived from a plant source **(Zhang et al., 2015).**

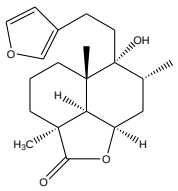
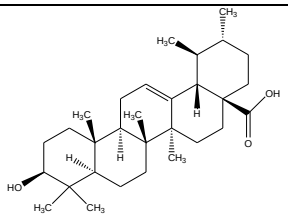
Moreover, herbal medicinal products are widely considered to be of lower risk side effects and higher efficacy when compared with synthetic drugs **(Posadzki et al., 2015)**.

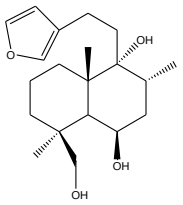
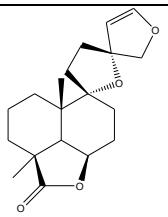
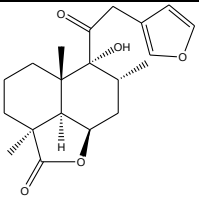
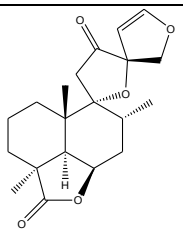
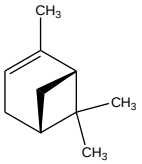
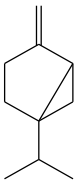
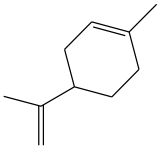
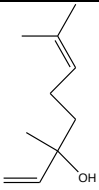
According to previous studies, medicinal plants contribute to the manufacturing of new drugs these days **(Veeresham et al., 2012).**

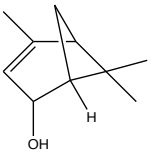
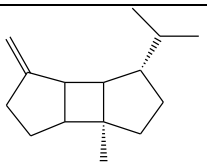
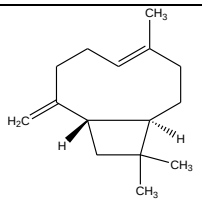
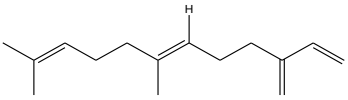
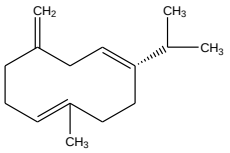
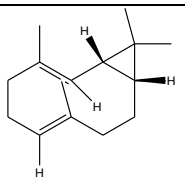
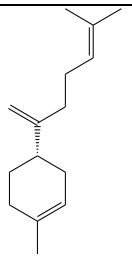
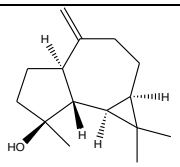
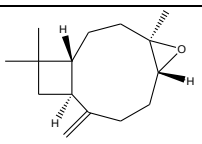
The Labiatae (Lamiaceae) family is one of the largest and most distinctive families of flowering plants, with about 220 genera and nearly 4000 species worldwide **(Raja, 2012)**. Genius *Marrubium* consists of 97 flowering plants belonging to the Labiatae family that are native to the temperate regions of Europe, North Africa and Asia. Some other species grow in North and South America. This genus also contains a wide range of compounds including terpenes, oils, iridoids, sterols, glycosides, saponins, phenolic compounds and flavonoids **(Uritu et al., 2018)**. The species of this genus are characterized through having potential therapeutic activities as antispasmodic, hypolipidemic, hypotensive, hypoglycemic, anti-inflammatory and analgesic properties. This genus acts as an effective antioxidant remedy which could be crucial in the treatment of diabetes mellitus, cancer and liver diseases **(Aćimović et al., 2020)**. As stated by previous numerous studies, this chemical review objective is to show the genus *Marrubium* plants extract chemical constituents.

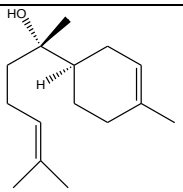
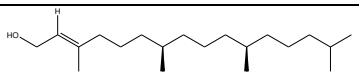
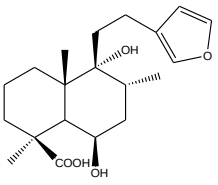
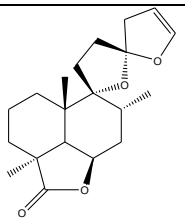
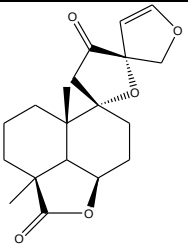
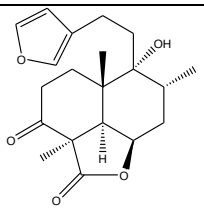
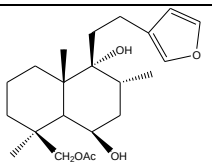
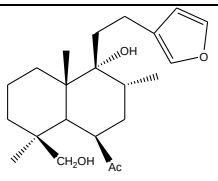
2. Chemical constituents reported from species of genus *Marrubium*

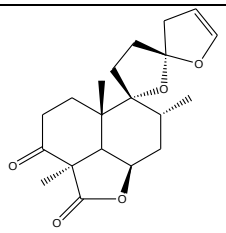
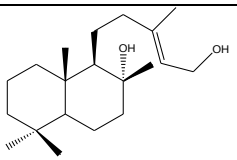
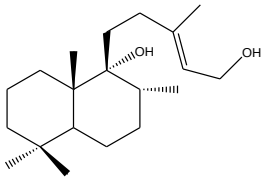
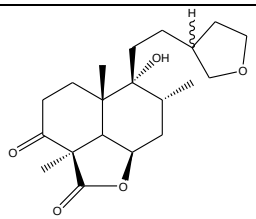
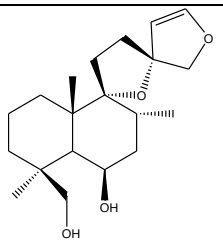
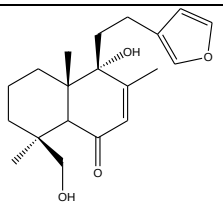
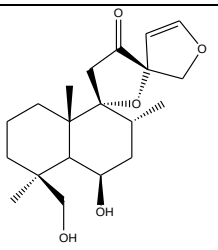
Table 1: Terpenes reported in genus *Marrubium*:

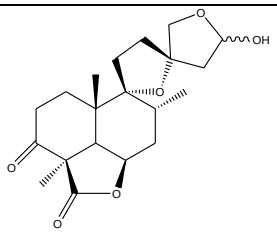
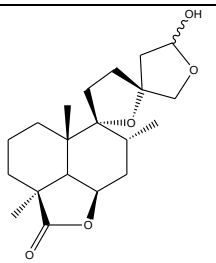
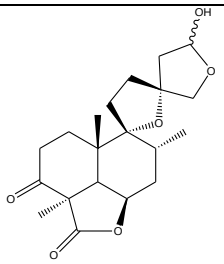
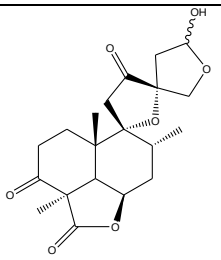
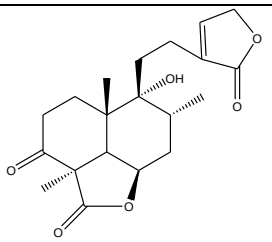
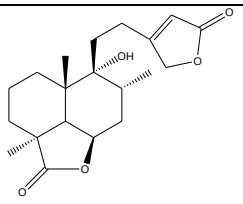
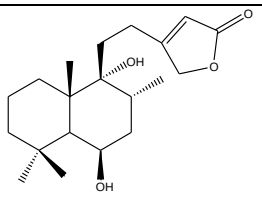
Species	Compound Name	Compound Structure	Reference
M. alysson *M. vulgare* *M. anisodon,* *M. cylleneum,* *M. globosum,* *M. heterocladum,* *M. incanum,* *M. sericeum,* *M. supinum,* *M. trachyticum,*	Marrubiin		(Calis *et al*.,1992) (Popoola *et al*., 2013) (Abd El-Mohsen *etal.*, 2014) (Shaheen *etal.*, 2014) (Piozzi *etal.*, 2006) (Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)
M. alysson	Ursolic Acid		(Calis *et al*.,1992)

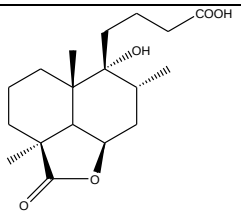
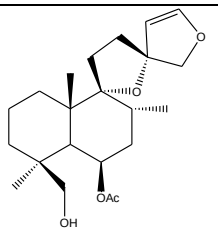
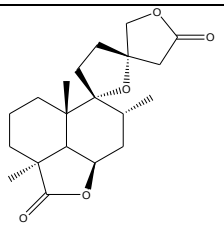
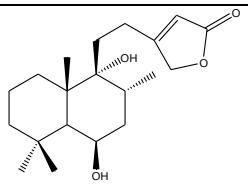
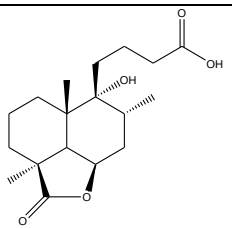
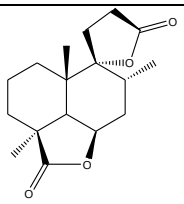
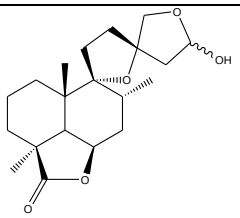
M. alysson *M. sericeum* *M. vulgare* *M. supinum*	Marrubinol		(Popoola *et al*., 2013) (Abd El-Mohsen *etal.*, 2014) (Piozzi *etal.*, 2006) (Savona *etal.*, 1979) (Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)
M. alysson *M. ayardii*, *M. vulgare.*	Premarrubin (13S-Premarrubin)		(Abd El-Mohsen *etal.*, 2014) (Piozzi *etal.*, 2006) (Lodhi *etal.*, 2017) (Aćimović *etal.* 2020)
M. vulgare	11-Oxomarrubiin		(Aćimović *etal.*, 2020)
M. vulgare *M. globosum*, *M. astracanicum*, *M. polyodon*, *M. velutinum*	Polyodonine		(Shaheen *etal.*, 2014) (Piozzi *etal.*, 2006) (Aćimović *etal.* 2020)
M. propinquum *M. parviflorum* *M. vulgare* *M. persicum*	α-Pinene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. vulgare* *M. persicum*	Sabinene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. vulgare*	Limonene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. persicum* *M. vulgare*	Linalool		(Hamedeyazdan *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)

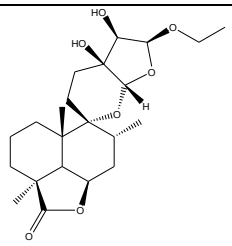
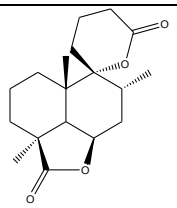
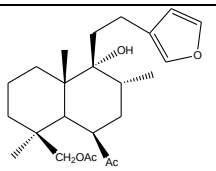
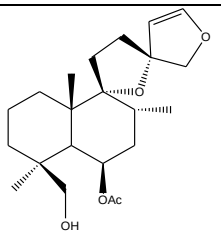
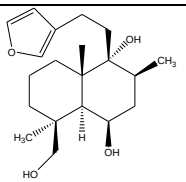
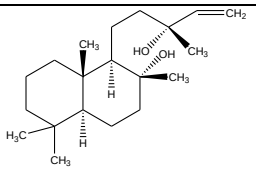
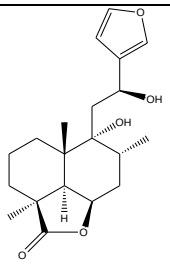
M. propinquum *M. parviflorum*	Verbenol		(Hamedeyazdan *etal.*, 2017)
M. propinquum *M. parviflorum* *M. vulgare*	β-Bourbenene		(Hamedeyazdan *etal.*, 2017) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. vulgare* *M. persicum*	β-Caryophyllene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. persicum* *M. vulgare*	β-Farnesene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. vulgare* *M. persicum*	Germacrene D		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. persicum* *M. vulgare*	Bicyclogermacrene		(Hamedeyazdan *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. vulgare* *M. persicum*	Beta-bisabolene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. persicum* *M. vulgare*	Spathulenol		(Hamedeyazdan *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum* *M. persicum* *M. vulgare*	Caryophyllene oxide		(Hamedeyazdan *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)

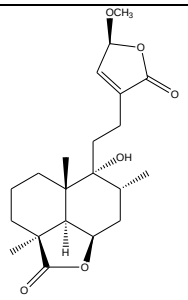
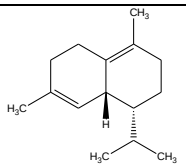
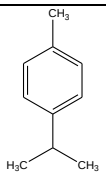
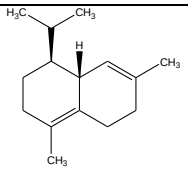
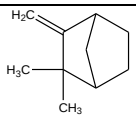
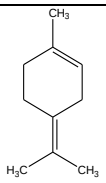
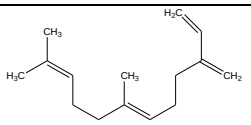
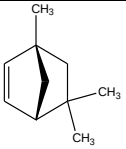
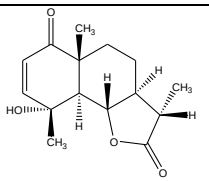
M. propinquum *M. parviflorum* *M. persicum* *M. vulgare*	α- Bisabolol		(Hamedeyazdan *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum*	Phytol		(Hamedeyazdan *etal.*, 2017)
M. anisodon, *M. cylleneum,* *M. globosum,* *M. heterocladum,* *M. incanum,* *M. sericeum,* *M. supinum,* *M. trachyticum,* *M. vulgare*	Marrubic acid		(Piozzi *etal.*, 2006) (Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)
M. ayardii, *M. vulgare.*	13R-premarrubiin		(Piozzi *etal.*, 2006)
M. astracanicum.	Marrubinone A		(Piozzi *etal.*, 2006)
M. friwalskianum, *M. incanum,* *M. peregrinum,* *M. velutinum* *M. vulgare.*	Peregrinine		(Piozzi *etal.*, 2006) (Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)
M. alysson, *M. sericeum.* *M. supinum*	19-acetyl-marrubenol		(Piozzi *etal.*, 2006) (Savona *etal.*, 1979)
M. alysson, *M. sericeum.* *M. supinum*	6-acetyl-marrubenol		(Piozzi *etal.*, 2006) (Savona *etal.*, 1979)

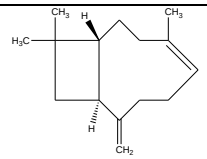
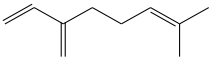
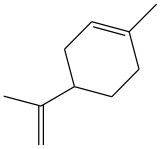
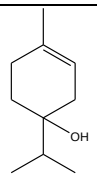
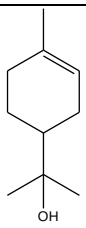
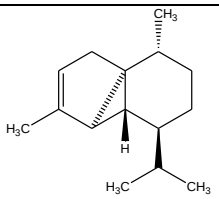
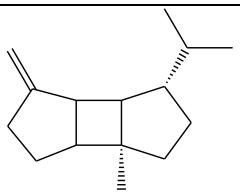
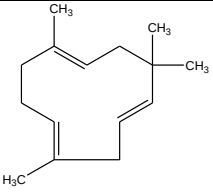
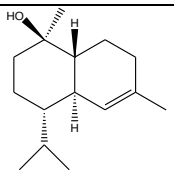
M. friwalskian.	Preperegrinine		(Piozzi *etal.*, 2006)
M. anisodon, *M. vulgare.*	Vulgarol		Piozzi *etal.*, 2006) (Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)
M. catariifolium, *M. leunuroides,* *M. peregrinum,* *M. praecox,* *M. propinquum,* *M. vulgare*	Peregrinol		(Piozzi *etal.*, 2006) (Aćimović *etal.*, 2020)
M. peregrinum.	Tetrahydroperegrinine		(Piozzi *etal.*, 2006)
M. alysson, *M. supinum.* *M. sericeum.*	Premarrubenol		(Piozzi *etal.*, 2006) (Savona *etal.*, 1979)
M. parviflorum	Anatolione		(Piozzi *etal.*, 2006)
M. globosum ssp. globosum.	Marrubiglobosin		(Piozzi *etal.*, 2006)

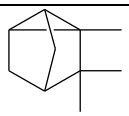
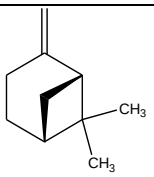
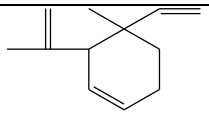
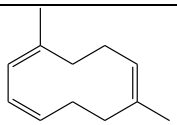
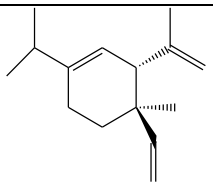
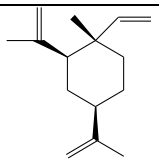
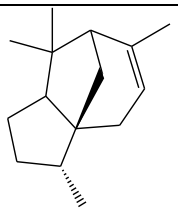
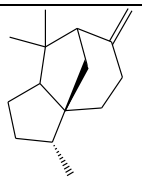
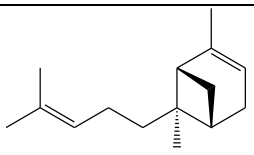
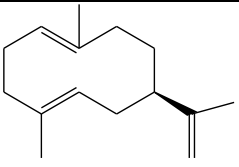
M. velutinum.	Velutine A		(Piozzi *etal.*, 2006)
M. vulgare, *M. globosum ssp. libanoticum*, *M. cylleneum.*	Cyllenine A		(Piozzi *etal.*, 2006) (Marrelli *etal.*, 2013) (Aćimović *etal.*, 2020)
M. velutinum.	9α,13R-15,16-bisepoxy-15 α-hydroxy-3-oxo-labdan-6 β,19-olide		(Piozzi *etal.*, 2006)
M. velutinum.	Velutine B		(Piozzi *etal.*, 2006)
M. velutinum.	Velutine C		(Piozzi *etal.*, 2006)
M. globosum ssp. libanoticum	Marrulibanoside		(Piozzi *etal.*, 2006) (Marrelli *etal.*, 2013)
M. globosum ssp. libanoticum	13,14-γ-lactone		(Piozzi *etal.*, 2006)

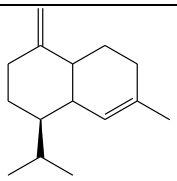
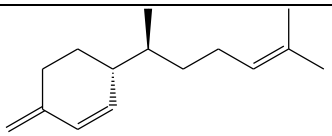
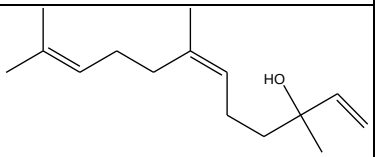
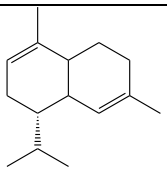
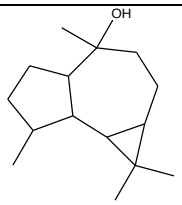
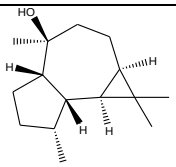
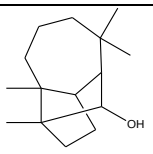
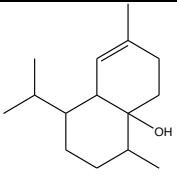
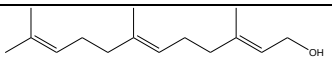
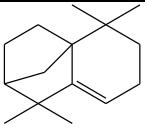
M. globosum ssp. libanoticum	Bisnor-labdane marrulanic acid		(Piozzi *etal.*, 2006)
M. supinum.	6-acetyl premarrubenol.		(Piozzi *etal.*, 2006)
M. globosum	(13S)-9α,13α-epoxylabda-6b(19),16(15)-diol dilactone		(Marrelli *etal.*, 2013)
M. globosum *M. vulgare*	Deacetylvitexilactone		(Marrelli *etal.*, 2013) (Aćimović *etal.*, 2020)
M. globosum	Marrulanic acid		(Marrelli *etal.*, 2013)
M. globosum	Cyllenine C		(Marrelli *etal.*, 2013)
M. globosum	13-epicyllenin A		(Marrelli *etal.*, 2013)

M. globosum	Marrulibacetal		(Marrelli *etal.*, 2013)
M. globosum	Marrulactone		(Marrelli *etal.*, 2013)
M. alysson, *M. sericeum.* *M. supinum*	6,19 diacetyl-marrubenol		(Savona *etal.*, 1979)
M. alysson, *M. sericeum.* *M. supinum*	6-acetyl premarrubenol derivative.		(Savona *etal.*, 1979)
M. vulgare	Marrubiol		(Lodhi *etal.*, 2017)
M. vulgare	Sclareol		(Lodhi *etal.*, 2017)
M. vulgare	12(S)-hydroxymarrubiin		(Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)

M. vulgare	3-deoxo-15-methoxyvelutine C		(Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)
M. vulgare	δ-amorphene		(Lodhi *etal.*, 2017)
M. vulgare	P-cymol		(Lodhi *etal.*, 2017)
M. vulgare *M. persicum* *M. parviflorum*	δ-cadinene		(Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. vulgare	Camphene		(Lodhi *etal.*, 2017)
M. vulgare	α-terpinolene		(Lodhi *etal.*, 2017)
M. vulgare	E-β-farnesene		(Lodhi *etal.*, 2017)
M. vulgare	p-fenchene		(Lodhi *etal.*, 2017)
M. vulgare	Vulgarin		(Lodhi *etal.*, 2017) (Aćimović *etal.*, 2020)

M. vulgare	Isocaryophyllene		(Lodhi *etal.*, 2017)
M. persicum *M. vulgare*	Myrcene		(Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. persicum *M. vulgare*	Limonene		(Hamedeyazdan *etal.*, 2017) (Lodhi *etal.*, 2017) (Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. persicum	Terpinen-4-ol		(Hamedeyazdan *etal.*, 2013)
M. persicum	α-Terpineol		(Hamedeyazdan *etal.*, 2013)
M. persicum *M. parviflorum* *M. vulgare*	α-Cubebene		(Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. persicum	β-Bourbonene		(Hamedeyazdan *etal.*, 2013)
M. persicum *M. parviflorum* *M. vulgare*	α-Humulene		(Hamedeyazdan *etal.*, 2013) (Khanavi *etal.*, 2005)
M. persicum	α-Cadinol		(Hamedeyazdan *etal.*, 2013)

M. parviflorum *M. vulgare*	Tricyclene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	β-Pinene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Geijerene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Pregeijerene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	δ-Elemene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	β-Elemene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	α-Cedrene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	β-Cedrene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Trans-α-Bergamoten		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Germacrene A		(Khanavi *etal.*, 2005)

M. parviflorum *M. vulgare*	γ-Cadinene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	β-Sesquiphellandrene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	cis-Nerolidol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	α-Cadinene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Globulol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Viridiflorol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Longiborneol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	1-epi-Cubenol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Farnesol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	iso-Langifolol		(Khanavi *etal.*, 2005)

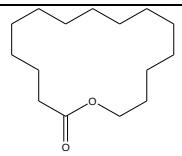
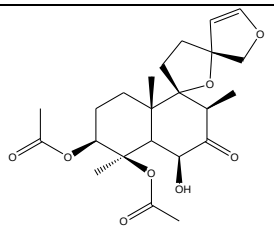
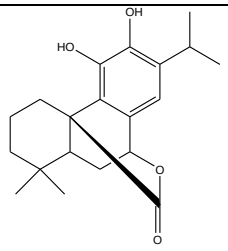
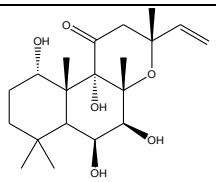
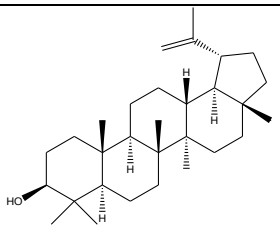
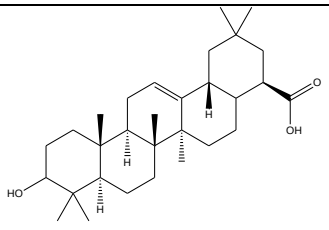
M. parviflorum *M. vulgare*	Cyclopentadecanolide		(Khanavi *etal.,* 2005)
M. vulgare	Preleosibirin		(Aćimović *etal.,* 2020)
M. vulgare	Carnosol		(Aćimović *etal.,* 2020)
M. vulgare	Deacetylforskolin		(Aćimović *etal.,* 2020)
M. vulgare	Lupeol		(Aćimović *etal.,* 2020)
M. vulgare	Oleanolic acid		(Aćimović *etal.,* 2020)

Table 2: Sterols reported in genus *Marrubium*:

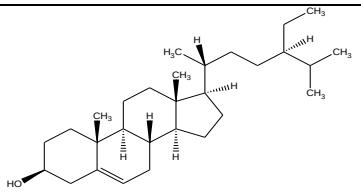
Species	Compound Name	Compound Structure	Reference
M. alysson *M. vulgare*	Beta-Sitosterol		(Calis *et al*.,1992) (Aćimović *etal.,* 2020)

Table 3: Phenyl propene reported in genus *Marrubium*:

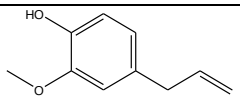
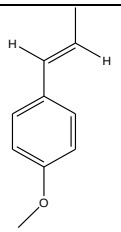
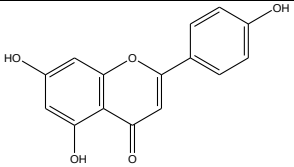
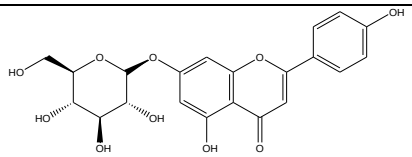
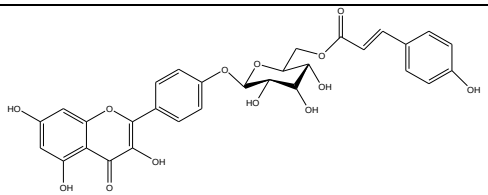
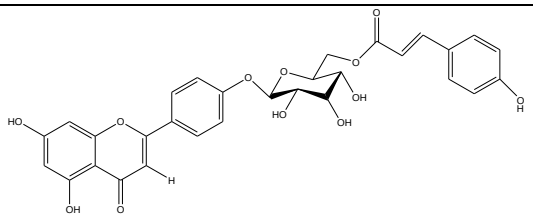
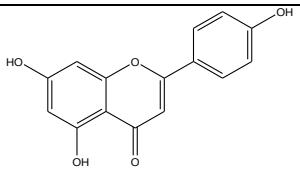
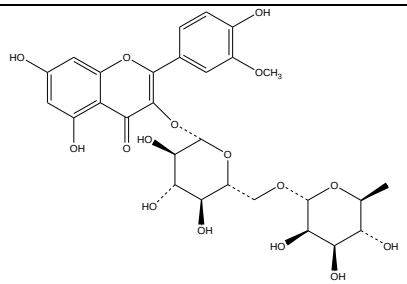
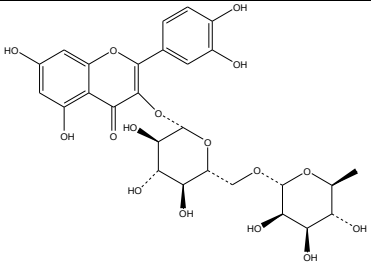
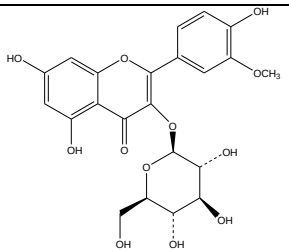
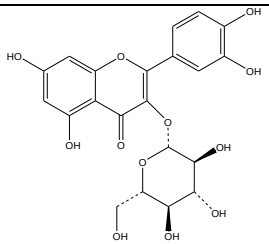
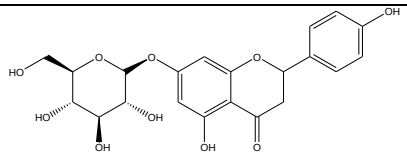
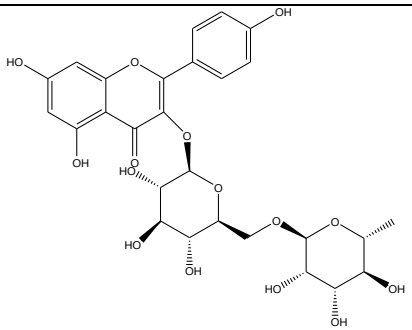
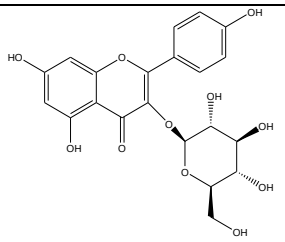
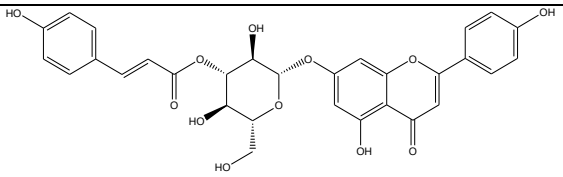
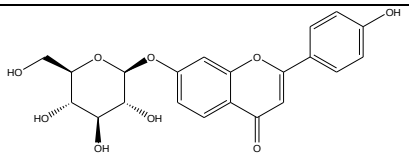
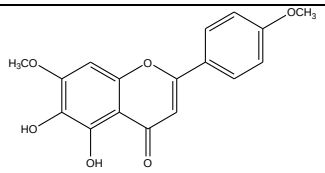
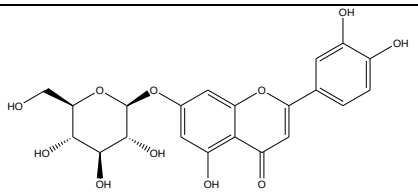
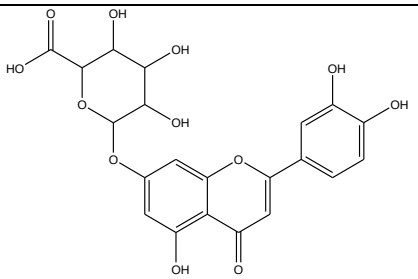
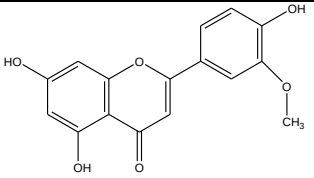
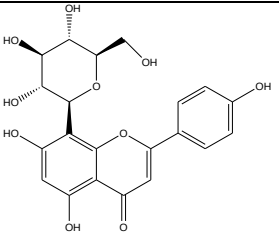
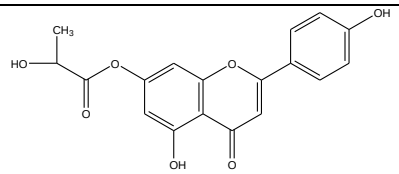
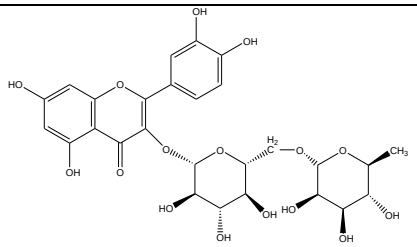
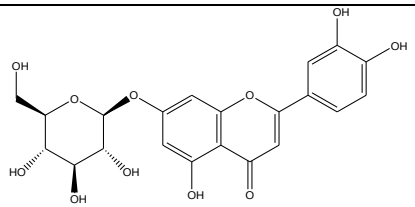
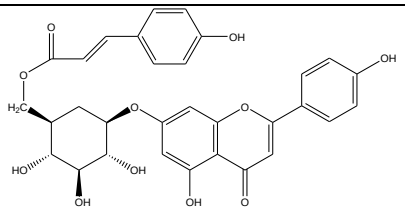
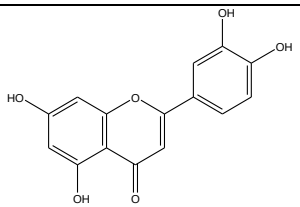
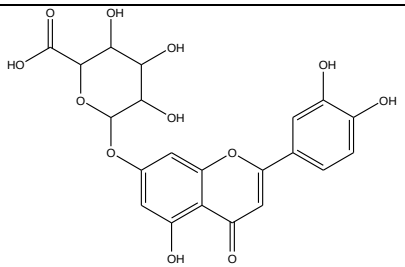
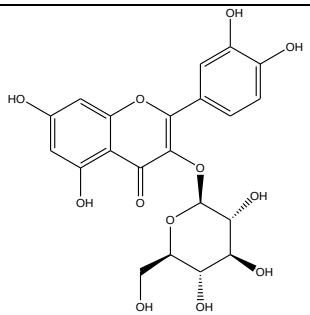
Species	Compound Name	Compound Structure	Reference
M. parviflorum *M. vulgare*	Eugenol		(Khanavi *etal.*, 2005)
M. propinquum *M. parviflorum*	Anethole		(Hamedeyazdan *etal.*, 2017)

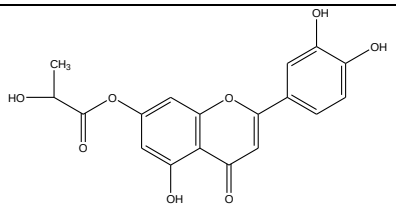
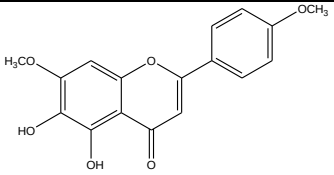
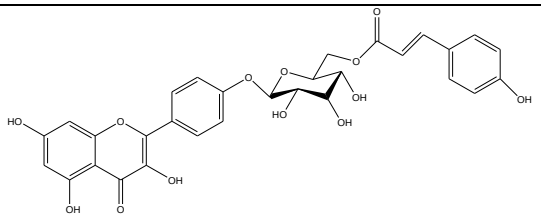
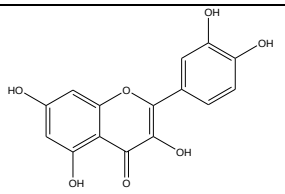
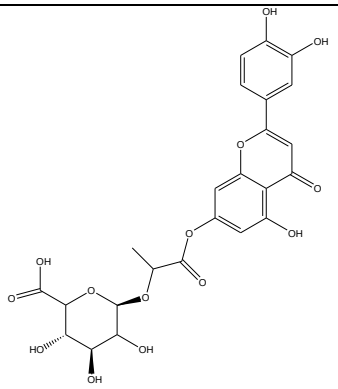
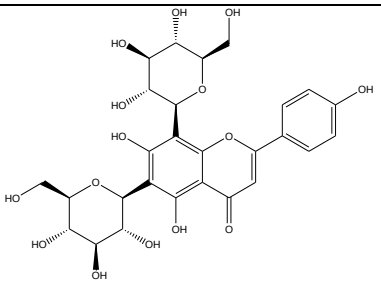
Table 4: Flavonoids reported in genus *Marrubium*:

Species	Compound Name	Compound Structure	Reference
M. alysson *M. vulgare*	Apigenin		(Calis *et al*., 1992) (Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. alysson	Apigenin-7-glycoside		(Calis *et al*., 1992) (Lodhi *etal.*, 2017)
M. vulgare	3-Hydroxyapigenin-4′-O-(6′′-O-p-coumaroyl)-β-Dglucopyranoside		(Shaheen *etal.*, 2014) (Lodhi *etal.*, 2017)
M. vulgare	Apigenin-4′-O-(6′′-O-p-coumaroyl)- β-D-Glucopyranoside		(Shaheen *etal.*, 2014)
M. vulgare	4’,5,7-Trihydroxyflavone		(Shaheen *etal.*, 2014)

M. globosum	Narcissin Isorhamnetin 3-O-β-D-rutinoside		(Marrelli *etal.*, 2013)
M. globosum	Quercetin 3-O-β-D-rutinoside		(Marrelli *etal.*, 2013)
M. globosum	Isorhamnetin 3-O-β-D-glucoside		(Marrelli *etal.*, 2013)
M. globosum *M. vulgare*	Quercetin 3-O-β-D glucoside		(Marrelli *etal.*, 2013) (Nawwar *et al*., 1989)
M. globosum	Naringenin 7-O-β-D-glucoside		(Marrelli *etal.*, 2013)
M. globosum	Kaempferol 3-O-β-D-rutinoside		(Marrelli *etal.*, 2013)

M. globosum	Kaempferol 3-O-β-D-glucoside		(Marrelli *etal.*, 2013)
M. globosum	Apigenin 7-O-(3″-p-coumaryl)-glucoside		(Marrelli *etal.*, 2013)
M. globosum *M. vulgare*	Apigenin 7-O-β-D-glucoside		(Marrelli *etal.*, 2013)
M. vulgare	5,6-dihydroxy-7,40-dimethoxyflavone		(Pukalskas *etal.*, 2012) (Lodhi *etal.*, 2017)
M. vulgare	7-O-b-glucopyranosyl luteolin		(Pukalskas *etal.*, 2012)
M. vulgare	7-O-β-glucuronyl luteolin		(Pukalskas *etal.*, 2012) (Lodhi *etal.*, 2017)
M. vulgare	Chrysoeriol		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. vulgare	Vitexin		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)

M. vulgare	Apigenin-7-lactate		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. vulgare	Quercetin 3-O-a-1-ramnosyl-glucoside		(Lodhi *etal.*, 2017)
M. vulgare	Luteolin 7-O-β-d-glucoside		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. vulgare	Apigenin 7-(6’’-p-coumaroyl)- glucoside		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. vulgare	Luteolin		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. vulgare	7-O-β-glucuronyl luteolin		(Pukalskas *etal.*, 2012) (Lodhi *etal.*, 2017)
M. vulgare	Isoquercitrin		(Lodhi *etal.*, 2017)

M. vulgare	Luteolin 7-lactate		(Lodhi *etal.*, 2017) (Nawwar *et al*., 1989)
M. vulgare	5,6-dihydroxy-7,40-dimethoxyflavone (ladanein)		(Lodhi *etal.*, 2017)
M. vulgare	3-Hydroxyapigenin-4′-O-(6′′-O-p-coumaroyl)-β-Dglucopyranoside		(Shaheen *etal.*, 2014) (Lodhi *etal.*, 2017)
M. vulgare	Quercetin		(Nawwar *et al*., 1989)
M. vulgare	Luteolin 7-[2-glucosyllactate		(Nawwar *et al*., 1989)
M. vulgare	Vicenin II		(Nawwar *et al.*, 1989)

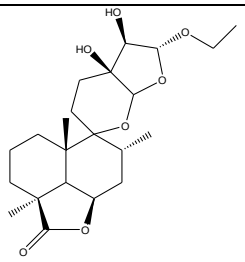
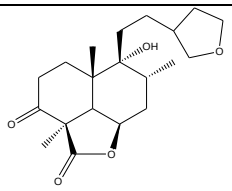
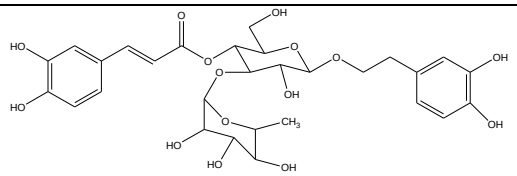
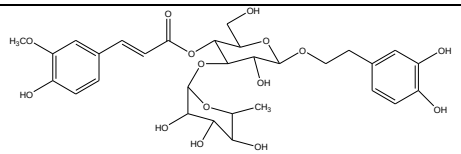
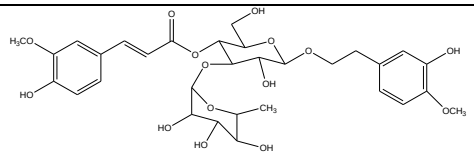
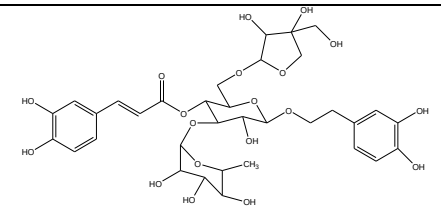
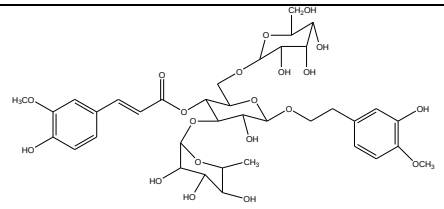
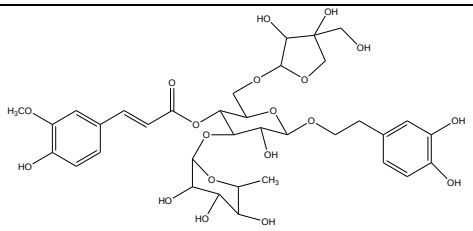
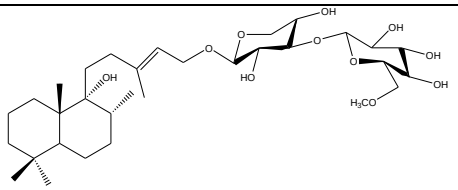
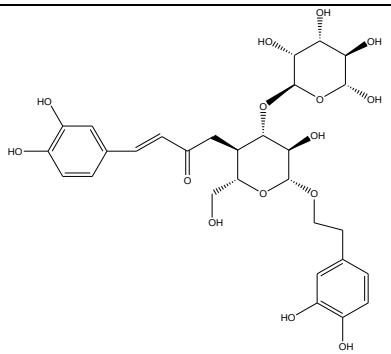
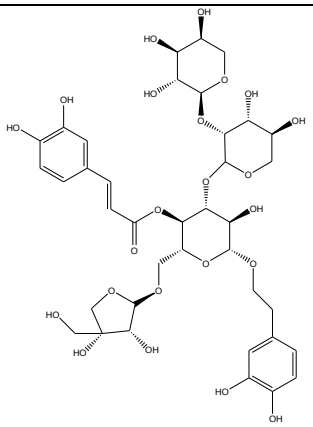
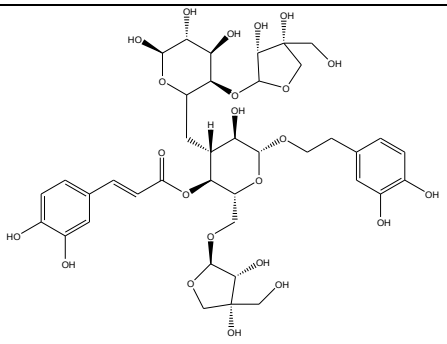
M. vulgare	Marruliba-acetal		(Aćimović *etal.*, 2020)
M. vulgare	Dihydroperegrinin		(Aćimović *etal.*, 2020)

Table 5: Glycosides reported in genus *Marrubium*:

Species	Compound Name	Compound Structure	Reference
M. alysson *M. globosum* *M. vulgare*	Verbascoside		(Calis *et al*., 1992) (Marrelli *etal.*, 2013) (Pukalskas *etal.*, 2012) (Lodhi *etal.*, 2017)
M. alysson	Leucosceptoside A		(Calis *et al*., 1992)
M. alysson	Martynoside		(Calis *et al*., 1992)
M. alysson *M. vulgare*	Forsythoside		(Calis *et al*., 1992) (Pukalskas *etal.*, 2012) (Lodhi *etal.*, 2017)
M. alysson	Leucosceptoside B		(Calis *et al*., 1992)

M. alysson	Alyssonoside		(Calis *et al*., 1992)
M. vulgare	Vulgarcoside A		(Shaheen *etal*., 2014) (Lodhi *etal*., 2017) (Aćimović *etal*., 2020)
M. vulgare	Acteoside		(Lodhi *etal*., 2017)
M. vulgare	Ballotetroside		(Lodhi *etal*., 2017)
M. vulgare	Marruboside		(Lodhi *etal*., 2017)

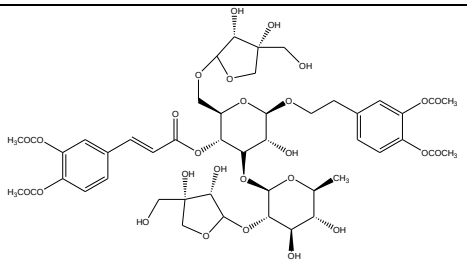
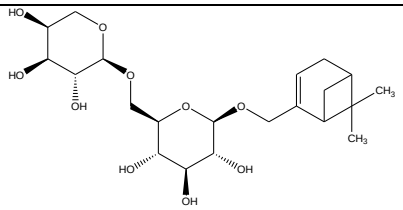
M. vulgare	Acethyl marruboside		(Lodhi *etal.*, 2017)
M. vulgare	Sacranoside A		(Aćimović *etal.*, 2020)

Table 6: Coumarins compounds reported in genus *Marrubium*:

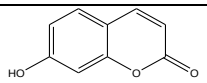
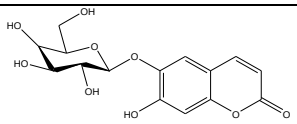
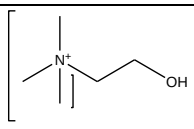
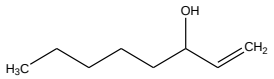
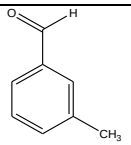
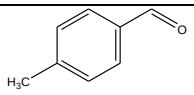
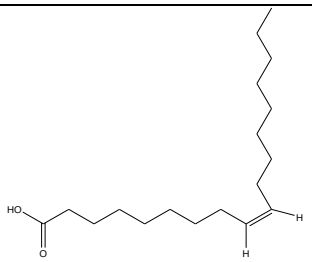
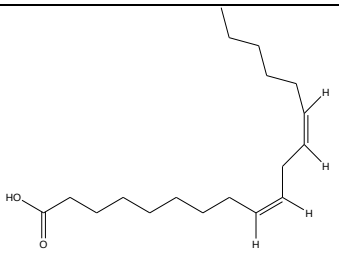
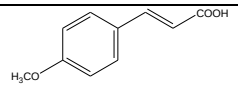
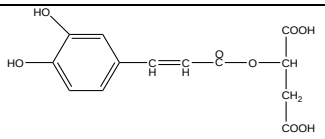
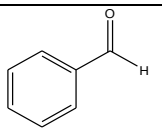
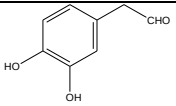
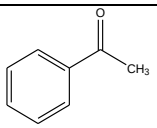
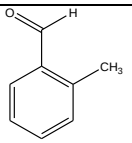
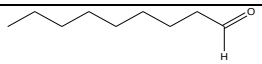
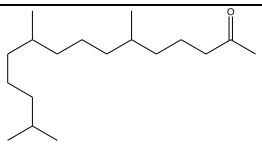
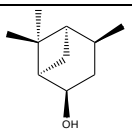
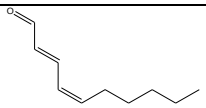
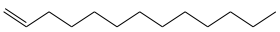
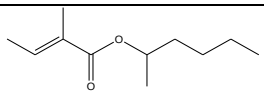
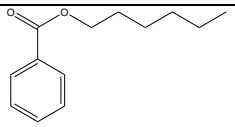
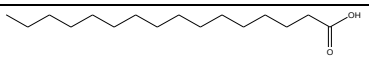
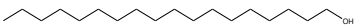
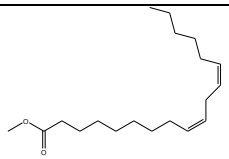
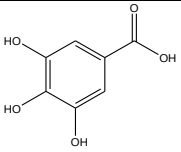
Species	Compound Name	Compound Structure	Reference
M. vulgare	Umbelliferone (Coumarins)		(Aćimović *etal.*, 2020)
M. vulgare	Aesculin		(Aćimović *etal.*, 2020)

Table 7: Miscellaneous compounds reported in genus *Marrubium*:

Species	Compound Name	Compound Structure	Reference
M. alysson	Choline		(Calis *et al*., 1992)
M. propinquum *M. parviflorum* *M. persicum*	1-Octen-3-ol		(Hamedeyazdan *etal*., 2017) (Hamedeyazdan *etal*., 2013)
M. propinquum *M. parviflorum* *M. persicum*	m-Tolualdehyde		(Hamedeyazdan *etal*., 2017) (Hamedeyazdan *etal*., 2013)
M. propinquum *M. parviflorum*	p-Tolualdehyde		(Hamedeyazdan *etal*., 2017)
M. propinquum *M. parviflorum* *M. vulgare*	Eicosane		(Hamedeyazdan *etal*., 2017) (Khanavi *etal*., 2005)

M. propinquum *M. parviflorum*	Oleic acid		(Hamedeyazdan *etal.*, 2017)
M. propinquum *M. parviflorum*	Linoleic acid		(Hamedeyazdan *etal.*, 2017)
M. propinquum *M. parviflorum* *M. vulgare*	Heneicosane		(Hamedeyazdan *etal.*, 2017) (Khanavi *etal.* 2005)
M. propinquum *M. parviflorum* *M. vulgare*	Tricosane		(Hamedeyazdan *etal.*, 2017) (Khanavi *etal.* 2005)
M. propinquum *M. parviflorum* *M. vulgare*	Tetracosane		(Hamedeyazdan *etal.*, 2017) (Khanavi *etal.* 2005)
M. globosum	P-methoxy-cinnamic acid		(Marrelli *etal.*, 2013)
M. vulgare	(E)-caffeoyl-L-malic acid		(Lodhi *etal.*, 2017)
M. persicum	n-Nonane		(Hamedeyazdan *etal.*, 2013)
M. persicum	Benzaldehyde		(Hamedeyazdan *etal.*, 2013)
M. persicum	Decane		(Hamedeyazdan *etal.*, 2013)
M. persicum	α-Tolualdehyde		(Hamedeyazdan *etal.*, 2013)
M. persicum	Acetophenone		(Hamedeyazdan *etal.*, 2013)
M. persicum	o-Tolualdehyde		(Hamedeyazdan *etal.*, 2013)

M. persicum	Nonanal		(Hamedeyazdan *etal.*, 2013)
M. persicum	Hexahydrofarnesyl acetone		(Hamedeyazdan *etal.*, 2013)
M. persicum	Hexacosane		(Hamedeyazdan *etal.*, 2013)
M. persicum	Octacosane		(Hamedeyazdan *etal.*, 2013)
M. persicum	Nonacosane		(Hamedeyazdan *etal.*, 2013)
M. parviflorum *M. vulgare*	Iso-verbanol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	(E,Z)-2,4-Decadienal		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	α-Tridecene		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Hexyl tiglatec		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	n-Hexyl benzoate		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Heptadecane		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Octadecane		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Hexadecanol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Nonadecane		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Hexadecanoic acid		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Octadecanol		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Methyl linoleate		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Docosane		(Khanavi *etal.*, 2005)
M. parviflorum *M. vulgare*	Pentacosane		(Khanavi *etal.*, 2005)
M. vulgare	Gallic acid		(Aćimović *etal.*, 2020)

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