

Chemical components of Lamiaceae *Teucrium polium* L. extract

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Abstract:

This review discusses the chemical components of *Teucrium polium* L. extract, a plant species belonging to the Lamiaceae family. The extract has been used medicinally for centuries because to its anti-inflammatory, analgesic, antispasmodic, and antioxidant characteristics. Many methods, including as GC-MS, HPLC, and NMR spectroscopy, have been used to determine the extract's chemical make-up. Terpenoids, flavonoids, and phenolic acids have been isolated as the primary chemical components. Monoterpenes, sesquiterpenes, and diterpenes, as well as flavonoids including apigenin, luteolin, and quercetin, have all been identified in the extract. Antioxidant, antiinflammatory, analgesic, antispasmodic, antibacterial, and anticancer characteristics are among the many pharmacological effects attributed to these substances. *Teucrium polium* L. extract has medicinal characteristics and prospective therapeutic uses that may be better understood if its chemical components were identified and characterized.

Keywords: *Teucrium polium* L., antioxidant, polyphenols, vitamins, minerals.

Introduction:

Teucrium polium L. is a member of the Lamiaceae family that may be found all throughout Europe, Asia, and even North Africa [1]. A perennial plant, it thrives in dry to semiarid climates. Anti-inflammatory, analgesic, antispasmodic, and antioxidant characteristics are only some of the reasons *Teucrium polium* L. has been used medicinally for centuries [2]. Current research has focused on pinpointing the chemical components of *Teucrium polium* L. extract that are responsible for its pharmacological actions. Many methods, including GC-MS, HPLC, and NMR spectroscopy, have been used to determine the chemical makeup of *Teucrium polium* L. extract. These methods make it possible to isolate the extract's chemical components and determine how much of each is present.

Terpenoids

There is a wide class of naturally occurring chemical substances called terpenoids, and they all branch off of isoprene, a compound with five carbon atoms. They contribute to the smell and taste of many plants and may be found in various species. Monoterpenes, sesquiterpenes, and diterpenes are only some terpenoids found in *Teucrium polium L.* extract [3].

Monoterpenes

A group of terpenoids known as monoterpenes, with a molecular weight of 136 Da, comprises two isoprene units. Volatile chemicals produce aromatics and flavors in plants. Major components of *Teucrium polium L.* extract include the monoterpenes pinene, pinene, and limonene. Evidence shows these chemicals have antibacterial, antioxidant, and anticancer effects [4].

Sesquiterpenes

Sesquiterpenes are a kind of terpenoids with a molecular weight of 204 Da and a composition of three isoprene units. As a result of these, many plants have their own distinct aroma and taste. Extracts of *Teucrium polium L.* have been found to contain sesquiterpenes such as α -caryophyllene and β -humulene. Evidence suggests that these chemicals have anti-inflammatory, analgesic, and antibacterial activities [5].

Diterpenes

Terpenoids with a molecular weight of 272 Da, such as the class called diterpenes, contain four isoprene units. They participate in a broad variety of biological processes and may be found in many plant species. *Teucrium polium L.* extract was used to isolate the diterpenes teucropolone A and teucropolone B. Evidence shows these chemicals may kill cells and inhibit fungal growth [6].

Flavonoids

The plant-based polyphenolic chemicals known as flavonoids are abundant. They serve several biological functions, including giving flowers and foods their distinctive hues. *Teucrium polium L.* extract is rich in flavonoids such as apigenin, luteolin, and quercetin. Antioxidant, anti-inflammatory, and cancer-fighting activities of these substances have been documented [7].

Flavones

The carbonyl group found at the C-4 position distinguishes flavones from other flavonoids. Antioxidant, anti-inflammatory, and cancer-fighting qualities are only a few of their many biological functions. *Teucrium polium L.* extract was shown to contain the flavone apigenin. Antioxidant and anti-inflammatory effects in this chemical have been identified [8].

Flavonols

There is a subset of flavonoids called flavonols, which are distinguished by the presence of a hydroxyl group at the C-3 position [9].

The anti-inflammatory, analgesic, antispasmodic, and antioxidant activities of *Teucrium polium L.* extract have long made it a staple in conventional medicine. Its possible therapeutic uses have

also been studied recently. Among *Teucrium polium L.*'s many medical uses are those listed below [10]. The potential of *Teucrium polium L.* extract to reduce blood glucose levels has been attributed to its antidiabetic effect. Researchers observed that using this extract on diabetic rats reduced blood glucose levels and increased insulin sensitivity [11]. *Teucrium polium L.* extract contains terpenoids, flavonoids, and phenolic acids, all of which contribute to the plant's shown anti-inflammatory effect. Several studies have shown that these chemicals may dampen the inflammatory response by preventing the generation of inflammatory cytokines and enzymes [12]. The capacity of *Teucrium polium L.* extract to cause apoptosis (programmed cell death) in cancer cells has been linked to its anticancer effect. Cancer cell growth was slowed and apoptosis was induced in a study of breast cancer cells treated with the extract [13]. The content of terpenoids and flavonoids in *Teucrium polium L.* extract has been linked to its antibacterial action. In vitro studies have shown that several of these chemicals have antibacterial action against a wide range of bacteria and fungi. The potential of *Teucrium polium L.* extract to shield the liver from oxidative stress and damage has led to claims of the extract's hepatoprotective properties. The extract was shown to restore liver function and lessen oxidative stress in a research involving rats with liver injury. In conclusion, the pharmacological features of *Teucrium polium L.* extract, such as its antidiabetic, anti-inflammatory, anti-cancer, antibacterial, and hepatoprotective actions, have many potential therapeutic uses. In order to completely comprehend the potential therapeutic uses of *Teucrium polium L.* extract and its active components, further study is required [14].

There is an enzyme called xanthine oxidase (XO) that is essential in the creation of uric acid. Uric acid is a byproduct of purine metabolism. Gout is an excruciating inflammatory disorder brought on by the buildup of urate crystals in the joints due to an excess of uric acid in the blood. Gout and other disorders related with hyperuricemia are often treated with XO inhibitors [15]. The therapeutic benefits of *Teucrium polium L.* may be due in part to the fact that this plant has been demonstrated to decrease XO activity. The XO inhibiting action of *Teucrium polium L.* extract and its bioactive components, particularly polyphenols and flavonoids, have been the subject of a number of research. The methanolic extract of *Teucrium polium L.* was reported to inhibit XO activity in a dose-dependent manner, with an IC₅₀ of 39.2 g/mL. Antioxidant activity was also detected in the extract, which may account for its XO-inhibiting properties. The study authors hypothesized that *Teucrium polium L.* extract might serve as a source of natural XO inhibitors for the treatment of gout and other hyperuricemic diseases [16].

Six flavonoids extracted from *Teucrium polium L.* were tested previously for their XO-inhibiting activities in a separate investigation. The IC₅₀ values for the flavonoids' inhibition of XO activity ranged from 1.2 to 17.6 M, suggesting a dose-dependent relationship. The capacity of flavonoids to scavenge free radicals and chelate metal ions, both of which are involved in the XO catalytic cycle, was hypothesized by the researchers to be responsible for their XO-inhibitory action [17]. *Teucrium polium L.* has been studied for its XO inhibitory action, but it also contains anti-inflammatory, antioxidant, and antibacterial properties. Perhaps useful in treating gout and other illnesses associated with hyperuricemia because to these qualities. To sum up, *Teucrium polium L.* has been demonstrated to decrease XO activity, which may contribute to its therapeutic benefits. The methods by which *Teucrium polium L.* inhibits XO activity and its potential

therapeutic implications in the treatment of gout and other hyperuricemia-related disorders need more study [18].

Recent scientific investigations have demonstrated that the herb *Teucrium polium L.* possesses hepatoprotective effects, meaning it may protect the liver from damage caused by numerous toxins and chemicals, supporting its long history of usage in traditional medicine for the treatment of liver ailments. *Teucrium polium L.* extract and its bioactive components, such as flavonoids, phenolic acids, and terpenoids, have been studied extensively for their potential hepatoprotective properties. *Teucrium polium L.* may have hepatoprotective benefits through the following mechanisms: *Teucrium polium L.* has powerful antioxidant properties, thanks to its abundance of flavonoids and phenolic acids, which neutralize free radicals and protect liver cells from oxidative stress. The antioxidant enzymes catalase, superoxide dismutase, and glutathione peroxidase were all shown to have considerably increased activity in rats with liver injury after being treated with a methanolic extract of *Teucrium polium L.* There are anti-inflammatory chemicals in *Teucrium polium L.*, such as flavonoids and terpenoids. Hepatitis, cirrhosis, and other liver illnesses are all linked to inflammation. One research demonstrated that *Teucrium polium L.* aqueous extract effectively reduced hepatic inflammation in rats with liver damage generated by carbon tetrachloride [11, 13].

Hepatic fibrosis is defined by the buildup of scar tissue in the liver and is a typical result of chronic liver disorders. Anti-fibrotic activities have been shown in *Teucrium polium L.*, suggesting it may be useful in halting the development of liver disorders. *Teucrium polium L.* methanol extract was shown to dramatically attenuate liver fibrosis in rats with carbon tetrachloride-induced liver injury. Hepatitis B and C viruses, significant causes of liver illness, have been shown to be susceptible to *Teucrium polium L.*'s antiviral action. Hepatitis B virus replication was inhibited in vitro by a methanolic extract of *Teucrium polium L.* As a result of its antioxidant, anti-inflammatory, anti-fibrotic, and anti-viral activity, *Teucrium polium L.* has been demonstrated to have hepatoprotective qualities. Due to its beneficial characteristics, it has great potential as a natural medicine for the treatment and prevention of liver disorders. *Teucrium polium L.* shows promise as a medicinal agent, but further research is required to fully understand its mechanisms of action. Although *Teucrium polium L.* has shown some promise in improving liver function, it shouldn't be utilized in place of medical advice from a specialist [11, 12, 19, 20].

In conclusion; The chemical makeup of *Teucrium polium L.* extract has been studied, and it has been shown to be a rich source of several bioactive chemicals. Several pharmacological effects, including antioxidant, anti-inflammatory, antibacterial, and hepatoprotective, have been observed in these substances.

Moreover, *Teucrium polium L.* has been examined extensively for its clinical uses, and the plant has been discovered to have potential therapeutic applications for a variety of disorders, including diabetes, cardiovascular disease, and liver disease. The extract has been studied for its ability to prevent and control diabetes and cardiovascular disease due to its hypoglycemic effects, improved lipid profile, and decreased oxidative stress. *Teucrium polium L.* has also been shown

to have hepatoprotective properties, meaning it may shield the liver from the toxicity of other substances.

The chemical makeup of *Teucrium polium* L. extract and its clinical uses have brought attention to the plant's possible health advantages, suggesting that it may be a useful natural cure for a number of different illnesses. To completely understand its mechanisms of action and to identify the appropriate dosage and duration of therapy for each application, however, further study is required. Herbal treatments should be used with caution, and before utilizing any natural substance for therapeutic reasons, it is best to speak with a healthcare practitioner.

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