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[J Ethnopharmacol.](#) 2015 Dec 4;175:528-48. doi: 10.1016/j.jep.2015.10.017. Epub 2015 Oct 8.

## A review of the relaxant effect of various medicinal plants on tracheal smooth muscle, their possible mechanism(s) and potency.

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### Abstract

**ETHNOPHARMACOLOGICAL RELEVANCE:** The therapeutic effects of the medicinal plants described in the current review on obstructive pulmonary diseases have found mention in ancient Iranian medical texts and in traditional folk medicine. These effects are attributed to their bronchodilatory activity, which relaxes the smooth muscles of the airway. Therefore, in the present review, the relaxant effects of various extracts, fractions and constituents of medicinal plants on tracheal smooth muscle are reviewed in light of their therapeutic effects on obstructive pulmonary diseases.

**MATERIALS AND METHODS:** The online literature was searched using Medline, PubMed, ScienceDirect, Scopus, Google Scholar, Web of Science and SID (for articles written in Persian). Moreover, local books on ethnopharmacology from 1918 to 2014 were searched with keywords such as tracheal smooth muscle, airway smooth muscle, relaxant effect, bronchodilatory effect and related mechanisms to identify studies on the relaxant effects of medicinal plants on tracheal smooth muscle and the possible mechanism(s) of these effects.

**RESULTS:** All studied plants showed significant relaxant effects on tracheal smooth muscle, which were similar or superior to the effect of theophylline at the used concentrations. According to the results, most of these plants also showed an inhibitory effect on muscarinic and histamine (H1) receptors, whereas some plants showed more pronounced stimulatory effects on the beta-adrenergic receptor. Some of the studied plants also showed inhibitory effects on calcium and potassium channels.

**CONCLUSION:** The present article reviewed the relaxant effects of several medicinal

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plants on tracheal smooth muscle, which were comparable or superior to the effect of theophylline at the studied concentration. The possible mechanisms of the relaxant effects of the studied medicinal plants and a comparison of these effects were also reviewed. This review presents the fractions and constituents of plants with potent relaxant effects on tracheal smooth muscle, which can be used to treat obstructive pulmonary disease.

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**KEYWORDS:** Carvacrol (PubChem CID: 10364); Medicinal plants; Possible mechanisms; Relaxant effects; Smooth muscle; Toxicological effects; Trachea; alpha-phellandrene (PubChem CID: 7460); alpha-pinene (PubChem CID: 6654); apigenin (PubChem CID: 5280443); crocetin (PubChem CID: 5281232); cuminaldehyde (PubChem CID: 326); dithymoquinone or nigellone (PubChem CID: 398941); p-cymene (PubChem CID: 7463); safranal (PubChem CID: 61041); saponins (PubChem CID: 11007422); thymol (PubChem CID: 6989g); thymoquinone (PubChem CID: 10281); trans-anethole (PubChem CID: 637563); umbelliprenin (PubChem CID: 1781413);  $\beta$ -pinene (PubChem CID: 14896)

PMID: 26456328 DOI: [10.1016/j.jep.2015.10.017](https://doi.org/10.1016/j.jep.2015.10.017)

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