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A Review Article : Formulation and Evaluation of Herbal Throat Spray

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Abstract: *Almost everyone has had a sore throat, and in most people it clears up by itself within a few days, since the usual cause is a virus. Still, the scratchy, painful feeling is bothersome enough that people want something that works quickly, and many would rather reach for a natural product than a synthetic one. A herbal throat spray fits that wish well. It places the active material right on the irritated tissue, it does not have to be swallowed, and it is easy to carry and use. In this review I have gathered what has been published about herbal throat sprays: why the spray form makes sense, what is known about popular plant ingredients such as Triphala and liquorice (Glycyrrhiza glabra), how these sprays are prepared, which tests are used to judge their quality, and what is known about their clinical benefit and safety. The review also points out where the evidence is still thin, especially standardisation, stability and properly controlled human trials.*

Keywords: herbal throat spray, pharyngitis, Triphala, liquorice, formulation, evaluation, oral spray.

I. INTRODUCTION

A sore throat, or pharyngitis, is simply inflammation of the pharynx. It shows up as pain, a scratchy feeling and discomfort while swallowing. Most cases are viral. Only a smaller share are caused by bacteria, mainly group A streptococci, and these are the ones that really need a proper diagnosis and antibiotic treatment [1]. Because the majority of patients recover without antibiotics, what they usually want is relief from symptoms, which is why topical throat products are so common in pharmacies.

Many traditional systems of medicine have used plants for throat complaints for centuries. In recent years researchers have been trying to turn this traditional knowledge into modern dosage forms that are easier to dose, store and sell. Reviews on herbal oral sprays point to their convenience, their fast local action and the fact that patients accept them readily, and they list the plants and excipients that have been tried so far [2,3]. This article summarises that work and looks at it from a pharmaceutical angle, that is, how a herbal throat spray is designed, made and evaluated.

II. WHY A SPRAY?

A spray breaks a measured amount of liquid into fine droplets that settle over the back of the mouth and throat. Compared with other forms, the literature gives a few recurring reasons to prefer it [2,3]. The active material reaches the inflamed area directly, so relief can be fast. It is helpful for children and older people who find tablets and lozenges hard to swallow. It covers the mucosa more evenly than a gargle, which stays in the throat only for a short moment. The pump also gives some control over how much is delivered, and because the bottle stays closed, the remaining liquid is less likely to get contaminated between uses.

There are drawbacks as well. The pump and bottle need to be chosen carefully, particles from the herbal material can block the nozzle, and many plant extracts taste bitter or astringent, which patients dislike. Researchers working on Triphala and liquorice sprays have handled these problems by filtering the extract well, choosing suitable solvents and adding sweeteners and flavours [4,5].

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III. HERBAL INGREDIENTS USED IN THROAT SPRAYS

3.1 Triphala

Triphala is a well-known Ayurvedic preparation made from three fruits: Terminalia chebula, Terminalia bellirica and Phyllanthus emblica. One review of its therapeutic uses covers a wide range of traditional and experimental applications and attributes much of its action to tannins, gallic acid and related polyphenols [6]. Another review examines how well the traditional claims for Triphala hold up experimentally, discussing antioxidant, anti-inflammatory and antimicrobial effects [7].

Its antioxidant behaviour has been tested in several laboratory models. These studies found that Triphala, as well as the fruits it contains, can mop up free radicals, and the polyphenol content is thought to be the main reason [8,9]. This matters for a throat product because inflamed tissue is under oxidative stress. A Triphala-based throat spray has also been developed and tested for its physical and chemical properties, stability and biological potency, which shows that the extract can realistically be used in a spray [5].

3.2 Liquorice (Glycyrrhiza glabra)

Liquorice root is one of the most thoroughly studied plant drugs for soothing and anti-inflammatory use. Detailed reviews describe its main constituents, namely glycyrrhizin (also called glycyrrhizic acid, a triterpenoid saponin), flavonoids such as liquiritin and isoliquiritigenin, and several polysaccharides [10–12]. The reported activities include anti-inflammatory, antimicrobial, antiviral, antioxidant, antiulcer and expectorant effects, and the soothing, slightly mucilaginous nature of the root is the reason it has been used for so long in cough and throat remedies [11,13,14]. More recent reviews bring the phytochemical and pharmacological data up to date and stress that extracts need to be standardised [15,16].

On the antibacterial side, one in vitro study compared aqueous and alcoholic liquorice root extracts with chlorhexidine against Streptococcus mutans and Lactobacillus acidophilus. Both extracts showed activity, and under the conditions of that study the alcoholic extract did better than the aqueous one [17]. This is a useful hint when choosing a solvent, but one should be careful: these are mouth bacteria, not the usual throat pathogens, so the result cannot simply be carried over to sore throat.

3.3 Other Plants Tested as Throat Sprays

Triphala and liquorice are not the only options. A randomised controlled trial looked at a spray made from Andrographis paniculata in patients with acute pharyngitis [18]. Earlier, a randomised, double-blind, placebo-controlled study tested a sage (Salvia officinalis) spray in the same condition, using an adaptive design with an interim analysis to judge efficacy and tolerability [19]. Both studies are useful because they show that herbal sprays can be put through the same kind of rigorous trial as conventional drugs, and they give a template for future work on Triphala and liquorice products.

IV. FORMULATION CONSIDERATIONS

4.1 What Goes Into the Spray

In general, a herbal throat spray is a water-based or water-alcohol solution. Besides the extract itself, the formulation literature describes a handful of supporting ingredients, summarised in the table below [2–5].

Component	Purpose	Examples
Herbal extract(s)	Active ingredient	Triphala, liquorice, other plant extracts
Solvent / vehicle	Dissolves or disperses extract	Purified water, ethanol, glycerin, propylene glycol
Viscosity / mucoadhesive agent	Prolongs contact time	Natural gums, cellulose derivatives
Preservative	Prevents microbial growth	Parabens, benzoates, sorbates
Sweetener / flavour	Taste masking	Sucrose, sorbitol, mint or other flavours
pH adjuster / buffer	Maintains comfortable and	Citric acid, sodium citrate

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	stable pH	

Which of these are chosen in practice depends on how well the extract dissolves, how thick the final liquid should be and whether the ingredients are compatible with one another.

4.2 Extraction and Preparation

The process generally begins with the raw plant material, which is identified, cleaned, dried and ground to a powder. The active constituents are then drawn out with water, alcohol or a mixture of the two, by maceration, decoction or percolation. The extract is filtered and concentrated, and its yield and phytochemical profile are usually recorded. After that, the extract is dissolved or dispersed in the chosen vehicle along with the other excipients, the volume is made up, and the liquid is filtered once more so it does not clog the nozzle. Finally it is filled into bottles fitted with a spray pump [3–5].

4.3 The Importance of pH

pH affects both how comfortable the spray feels and how long it stays stable. Saliva is normally close to neutral, although its pH shifts with flow rate, diet and the health of the mouth, and it has even been proposed as a diagnostic marker [20]. A spray that is far from this range could irritate the tissue, and phenolic compounds in the extract may also degrade. For these reasons formulators usually bring the pH to a slightly acidic to neutral value and keep checking it during stability studies.

V. EVALUATION OF HERBAL THROAT SPRAYS

Once a batch has been prepared, it is checked in several ways: how it looks and tastes, its physical and chemical properties, how the spray behaves, how stable it is on storage, and whether it has the expected biological activity. The tests most often reported for Triphala, liquorice and other herbal sprays are listed below [2–5].

Parameter	What is assessed	Importance
Leakage and container compatibility	Integrity of pump and bottle	Product quality
Stability	Storage under ICH-type conditions, checking pH, colour, viscosity and assay	Shelf-life
Antimicrobial activity	Zone of inhibition or MIC against selected organisms	Pharmacological support
Antioxidant activity	Radical scavenging assays such as DPPH	Pharmacological support

The Triphala spray study is a good example of how these tests come together, since it reports physical and chemical properties, stability and biological potency in one piece of work [5]. A combined Triphala and liquorice spray was likewise prepared and evaluated using routine physical tests [4]. For the biological side, liquorice extracts are usually compared against a standard such as chlorhexidine [17], while the antioxidant claims for Triphala rest on laboratory scavenging models [8,9].

5.1 Standardisation

One problem keeps coming back in herbal work: the chemistry of a plant extract is not constant. It changes with the species, where the plant was grown, when it was harvested and how it was extracted. The liquorice reviews therefore insist that marker compounds such as glycyrrhizin should be measured, so that one batch can be compared with another [12,15,16]. In the case of Triphala, gallic acid and other polyphenols are the usual candidates. Chromatographic or spectrophotometric assays of such markers should be a regular part of quality control for any herbal spray.

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VI. WHAT DOES THE CLINICAL EVIDENCE SAY?

Honestly, the clinical evidence is still limited, although it is growing. The Andrographis paniculata and sage trials show that placebo-controlled testing of herbal sprays in acute pharyngitis is possible [18,19]. For Triphala and liquorice sprays, however, most of the data come from formulation and laboratory work [4,5]. Properly designed clinical trials are still needed to show that these products actually relieve symptoms in patients. Since most sore throats are viral and get better on their own [1], future trials should use validated symptom scores and clear inclusion criteria, otherwise natural recovery could be mistaken for a drug effect.

VII. SAFETY CONSIDERATIONS

A product being herbal does not make it automatically safe. Reviews of liquorice toxicity warn that long-term or heavy intake of glycyrrhizin can lower blood potassium, cause sodium and water retention and raise blood pressure, so the glycyrrhizin content of a product and how long it is used should be kept in mind [14,21]. A throat spray exposes the body to much less than eating liquorice regularly would, but people with high blood pressure, heart or kidney disease, and pregnant women should still be told to get professional advice. Other concerns include allergy, local irritation, microbial contamination and heavy-metal or pesticide residues in the raw material, which is why good quality control and clear labeling are needed.

VIII. CHALLENGES AND FUTURE PROSPECTS

Several challenges stand in the way of better herbal sprays. Variation in extract composition makes batches hard to reproduce [12,15,16]. Polyphenols can oxidise during storage, changing colour and possibly potency[5]. Bitter, astringent extracts need taste masking that does not upset stability[3,4].

Controlled clinical trials of Triphala and sprays are scare[4,5,18,19],and herbal products still need clearer standards for quality, safety and labeling.

Looking ahead it would worth exploring mucoadhesive system that keep the active material in contact with the throat for longer, nanotechnology- based carriers, sensible combination of complementary plants standardized extracts with validated marker assays.

IX. CONCLUSION

Herbal throat sprays offer a convenient, patient-friendly way to put plant-based remedies where they are needed. Triphala and liquorice are attractive choices because of their antioxidant, anti-inflammatory and antimicrobial properties, and the existing formulation studies show that stable sprays can be made and assessed with routine physical, chemical and biological tests. Even so, better standardisation, long-term stability data and randomised clinical trials are needed before these products can be recommended with real confidence.

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