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Standardization and Evaluation Parameters of Polyherbal Syrups: An Overview

Ubed M. Tamboli*[1] Nitin V. Kokare[2]

[1.] *Department of Pharmaceutical Quality Assurance, AppasahebBirnale college of Pharmacy Sangli,Maharashtra, India. 416416.*

[2.] *Department of Pharmaceutical Chemistry, AppasahebBirnale college of Pharmacy Sangli, Maharashtra, India. 416416.*

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ABSTRACT

Polyherbal syrups are widely used herbal liquid dosage forms due to their ease of administration, improved patient compliance, and traditional therapeutic relevance. However, the complex nature of herbal ingredients poses significant challenges in ensuring quality, safety, and batch-to-batch consistency. Standardization plays a crucial role in overcoming these limitations by establishing reproducible quality control parameters. The present review compiles and critically discusses various evaluation and standardization methods employed for polyherbal syrups, including organoleptic assessment, physicochemical parameters such as pH, viscosity, specific gravity, refractive index, and total solids, along with phytochemical screening, chromatographic fingerprinting using High Performance Thin Layer Chromatography (HPTLC), microbial load analysis, heavy metal testing, and stability studies. Emphasis is placed on World Health Organization (WHO) guidelines and previously reported research findings. This review highlights the importance of adopting systematic and standardized evaluation protocols to ensure the safety, quality, and regulatory acceptance of polyherbal syrup formulations intended for oral use.

Keywords: Polyherbal syrup, Standardization, Quality control, HPTLC, Herbal formulation, Stability studies.

I. INTRODUCTION

People who have difficulty swallowing tablets are usually given liquid medications since they are simpler to administer. A medicine must be dissolved in order for the body to absorb it. A medication is immediately available for absorption when administered as a liquid solution, and it is often absorbed more quickly and efficiently than when taken as a tablet or capsule.(Khandave, Mundhe and Gaikwad, 2025)

A decoction of herbs is combined and concentrated with honey, sugar, or occasionally alcohol to create herbal syrup. These syrups are made from a strong herbal decoction, which is thickened and preserved by combining it with sugar or honey. (B Pharm and Pharm, no date; Khandave, Mundhe and Gaikwad, 2025)

Herbal remedies continue to play an important role in contemporary pharmacological research and have been an essential component of traditional healthcare systems around the world. Compared to single-herb preparations, polyherbal formulations—which incorporate several medicinal plants—are thought to provide enhanced efficacy and synergistic therapeutic effects. Herbal syrups are notably favoured among different dosage forms because of their quick absorption, pleasant flavour, convenience of administration, and excellent patient compliance, particularly in younger and older patients. Despite being widely used, polyherbal syrups pose significant quality assurance issues. The content and effectiveness of herbal formulations can be greatly impacted by differences in raw materials, geographical origins, harvesting conditions, extraction techniques, and storage conditions. Herbal medications, in contrast to manufactured treatments, have several bioactive components, which complicates quality control and standardisation.(17,13)

Variability in raw materials, geographical source, harvesting conditions, processing techniques, and storage procedures all have a major impact on the quality, safety, and effectiveness of herbal and polyherbal products. Herbal medications, in contrast to synthetic treatments, are challenging to establish batch-to-batch consistency because they contain complex combinations of bioactive elements. This heterogeneity raises questions about product safety and reproducibility and could result in variations in therapeutic response. Standardisation is therefore necessary to set clear quality standards that guarantee the identification,

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consistency, and purity of herbal compositions. To reduce adulteration and contamination, the World Health Organisation (WHO) has stressed the significance of using systematic quality control procedures, such as physicochemical evaluation, phytochemical profiling, chromatographic fingerprinting, and safety assessment. (WHO, 2004; Sirisha et al., 2013; Sojitra et al., 2013;)

The liver is a vital organ that controls many bodily physiological functions. Liver disease is defined as any alteration in the liver's structure or function. The liver has a remarkable ability to produce beneficial principles and eliminate harmful ones. As a result, liver damage caused by hepatotoxic substances is extremely serious. Cirrhosis, jaundice, tumours, metabolic and degenerative lesions, liver cell necrosis, hepatitis, and other conditions are characteristics of a variety of liver diseases. In addition to viruses, xenobiotics, excessive medication use, environmental contamination, and alcohol intoxication can all cause liver diseases.(Sirisha *et al.*, 2013)

Hepatoprotective medications or chemicals are essential for preventing injury and shielding the liver from harm. The liver is a crucial organ that maintains the body's equilibrium by controlling numerous critical metabolic processes like detoxification, metabolism, and nutrition storage. Numerous conditions can cause liver damage, such as autoimmune illnesses like autoimmune hepatitis and infections like bacteria, viruses, and parasites.(Aladejana and Aladejana, 2023)

Types of herbal syrup:

1. **Flavouredsyrup:** Primarily for taste enhancement
2. **Medicated syrup:** Therapeutic and medicinal purpose
3. **Artificial syrup:** **S**ynthetic ingredients & herbal components are used.

Advantages of herbal syrup.

- Usually devoid of adverse effects
- Non-toxic and safe
- Easily reachable and accessible
- It is easy to modify dosage based on a weight of the child
- Doesn't need help with administration; Patients are able to take it on their own
- Common, local people can grow medicinal herbsregions
- High patient compliance, particularly in young patients because to its delightful flavour
- Serves as a natural preservative by preventing the development of bacteria. (Khandave, Mundhe and Gaikwad, 2025)

- **Disadvantages of herbal syrup.**
- Over time, solid particles may settle and change the product's look; Because Without unit dose packaging, accurate dosing is challenging.
- If preservatives are not applied appropriately, there is a risk of microbiological infection.
- The possibility of inappropriate self-dosing, however this is uncommon.
- In saturated syrups, variations in storage temperature may cause sucrose to crystallize.(Khandave, Mundhe and Gaikwad, 2025)

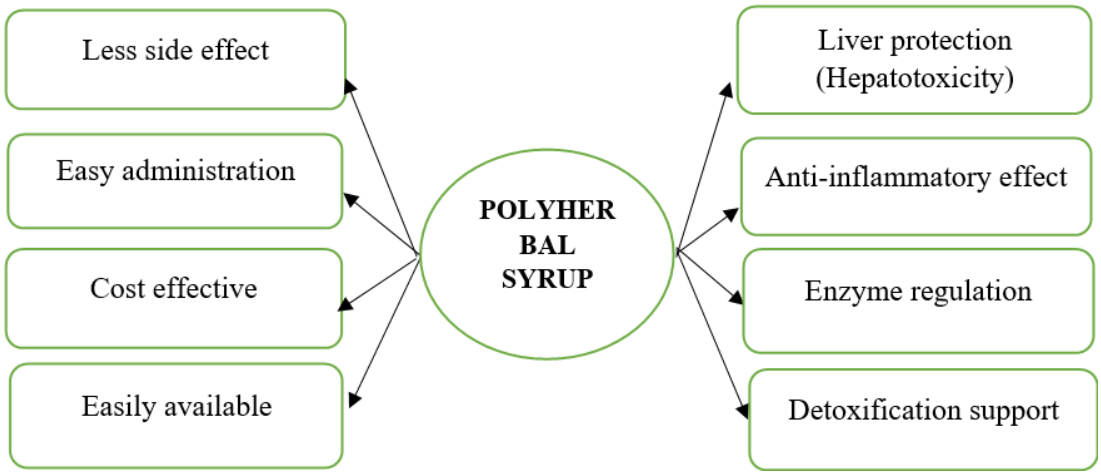

Fig. No. 01 Therapeutic effects of polyherbal syrup

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The current study involves accelerated stability investigations, standardization of the produced formulation, and standardization of raw ingredients for polyherbal syrup's identity, quality, and development. Following scaling up, the selected batch of polyherbal syrup was assessed for physical constants, phytochemical screening, heavy metal and microbial load analysis, and HPTLC fingerprinting. The physical characteristics of the polyherbal syrup (colour, odour and taste), pH, total solids, specific gravity, and viscosity were assessed.(Chandrasekar *et al.*, 2006)

There are hundreds of elements in plants, some of which are present in extremely small amounts. Despite the availability of contemporary chemical and analytical techniques, very few phytochemical studies can isolate and characterize every secondary metabolite found in the plant extract. Aside from this, the quality monitoring of phototherapeuticagents is hampered by the fact that plant elements differ significantly based on a few parameters. There are various procedures involved in the standardization and quality control of herbal medicines. However, ensuring the stability and quality of herbal remedies depends heavily on the source and calibre of raw ingredients.(Sirisha *et al.*, 2013; Sojitra*et al.*, 2013)

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II. Methodology of Literature review

Organoleptic parameters:

To verify consistency in the visual identity of raw materials and the final product, organoleptic parameters such as look, colour, and odour were employed.(Sirisha *et al.*, 2013; Sojitra*et al.*, 2013)

I. Colour test

Five millilitres of the resulting syrup were put in watch glasses and exposed to light so that the colour could be seen with the unaided eye.(De Silva et al., 2003)

II. Odor test

Two millilitres of the finished syrup were each smelled. To counteract the impact of the prior fragrance, the gap between the two smells was maintained at two minutes.(Girish and Pradhan, 2017)

III. Taste examination

A small amount of the finished syrup was obtained, and its flavour was assessed using the tongue's taste buds.(Kumar RSA, 2018)

IV. pH measurement:

A pH meter was used to measure the pH of the polyherbal syrup. Distilled water and buffer (at pH 4 and 9) were used to calibrate the pH meter until consistent results were obtained.(Maheshwara Reddy *et al.*, 2024)

V. Specific gravity measurement:

- At 25°C, the specific gravity was measured using a pycnometer. It was calculated by dividing the sample weight (measured in grams) by the water weight (measured in millilitres).(Sirisha *et al.*, 2013)
- Use the following formula to find specific gravity. (Khandave, Mundhe and Gaikwad, 2025)

Specific Gravity = Weight of syrup / Weight of equal volume of water---------Eq.No.I

VI. Viscosity measurement

The prepared polyherbal syrup's viscosity was measured using a Brookfield viscometer. The process was carried out in accordance with the laboratory's normal operating procedure.(Sheikh *et al.*, 2014; Maheshwara Reddy *et al.*, 2024)

VII. Polyherbal syrup fingerprinting using HPTLC

High Performance Thin Layer Chromatography, also known as High Pressure Thin Layer Chromatography, is known as HPTLC. This is a sophisticated development of TLC, or thin-layer chromatography. One of the most adaptable chromatographic techniques is HPTLC. Better resolution, quicker spot development, and simple detection and quantification of separated substances are just a few of its benefits. Most of the distinctive components of a sample standard can be demonstrated in a very short amount of time. The resulting fingerprint can be used to track the

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identification and purity of pharmaceuticals as well as to identify sample adulteration and substitution.(Rezghi*et al.*, 2019)

VIII. Refractive index

Refractometers are used to measure it. Set up the equipment in front of a suitable light source. Wash the device with a gentle cloth, then clean the prism with a gentle brush that has been dampened with alcohol, if needed, and Next, acetone. Adjust after adding a drop of distilled water. the equipment. Turn the index arm while focusing the telescope eyepiece on the instrument's cross-section. until a fringe or colourful border appears through the spectroscope.On the moveable arm, adjust the eyepiece to Look intently on the scale, then note the refractive index to the third and fourth decimal places, respectively Apply a reading lens. Each sample should have at least three readings, with the mean being utilized for computation. Turn the lock nut to open the prism, then clean the prism's face. Close the prism correctly after applying a few drop test solutions. Take three measurements for every liquid sample.(Sivakumar B, 2015)

IX. Stability Studies:

Stability studies are crucial to the quality assessment of polyherbal syrup formulations because they reveal details on the product's chemical, microbiological, and physical integrity while it is being stored. Because of their watery nature, sugars, and complex phytochemical makeup, herbal syrups are especially prone to instability. Over time, these factors may cause changes in colour, odour, taste, pH, viscosity, and microbial load. In order to forecast shelf life and evaluate formulation robustness, accelerated stability studies—which are usually carried out at high temperatures and humidity levels—are frequently used. When maintained under prescribed circumstances, correctly standardised polyherbal syrups retain acceptable physicochemical qualities and microbiological limitations, according to several published investigations.Stability evaluation helps regulatory approval and consumer trust in herbal liquid dosage forms in addition to guaranteeing product safety and quality throughout its shelf life.

Previously Reported Studies on Polyherbal Syrups:

Ketaki Gulab Khandave (2025) Worked on polyherbal syrup,study suggests that the polyherbal syrup formulated using Moringa and Curcumin demonstrates good physicochemical properties, acceptable taste, and stability under various storage conditions. The formulation is based on herbs known for anti-inflammatory and antioxidant properties, but pharmacological activity needs to be confirmed through future studies. The formulation demonstrated good physicochemical properties and appears suitable for oral use. However, pharmacological validation is necessary to confirm its anti-inflammatory potential before any therapeutic claims can be made.(Khandave et al., 2025)

Pavan Bisen (2024) worked on an herbal digestive syrup, study suggests that by utilizing the synergistic effects of its plant-based ingredients, the prepared herbal syrup exhibits remarkable promise as a natural cure for common digestive problems. It is a good substitute for chemical drugs because of its benefits, which include safety, simplicity in preparation, and effectiveness for ailments including bloating, acid reflux, and constipation. Its place as a common digestive aid might be strengthened by additional clinical trials.(Bisen, 2024)

Mule Geetanjli T (2023) worked on polyherbal cough syrup, study suggests that in this study, we created a polyherbal cough syrup that has been proved to be stable, safe, and effective. It might be used simply and effectively in place of any allopathic wet cough syrup to relieve wet cough. All the findings confirm the traditional claims made in Ayurveda and Siddha for the use of these formulations in the treatment of cough due to their antitussive activity. The polyherbal formulation offered experimental proof for protective agents by the formed polyherbal cough syrup.The presence of some phytoconstituents, such curcumin, may also be responsible for the herbal syrup's ability to suppress cough.(Geetanjli et al., 2023)

Ashish A Gawai (2022) worked on oral herbal liquid dosage form, study suggests that Approximately 75–80% of people worldwide still rely on polyherbal medications for primary healthcare, mostly in industrialized nations, due to their greater cultural acceptability, better compatibility with the human body, and less adverse effects. As stated in the literature review, we deduced from this study that poly-herbal formulations of herbal extracts, herbal forms, and products have hepatoprotective and antioxidant

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properties. This finding led to the conclusion that the prepared herbal syrup was clear, clean, and devoid of solid particles. Post-formulation research indicates that the herbal syrup has a sweet flavour, making it pleasant. The prepared syrup's colour and smell remained unchanged.(Gawai A. et al., 2023)

N.Thangarathinam (2013) worked on polyherbal syrup,study suggests that the seven herbs that have been traditionally used to treat urolithiasis and those with diuretic qualities were combined to create a polyherbal syrup, which was then assessed and standardized. The formulation is stable at 40°C ± 2°C and 75% RH ± 5% for three months, according to the accelerated stability analysis. The anti-urolithiatic potential of this polyherbal syrup needs to be further assessed in animals before moving on to humans.(N. Thangarathinam et al., 2013)

III. Conclusion

Standardization and quality evaluation are essential for ensuring the safety, consistency, and regulatory acceptability of polyherbal syrup formulations. Due to the complex and variable nature of herbal ingredients, the establishment of well-defined evaluation parameters is necessary to minimize batch-to-batch variability and potential safety concerns. This review highlights the importance of organoleptic assessment, physicochemical characterization, phytochemical screening, chromatographic fingerprinting using HPTLC, microbial load determination, heavy metal analysis, and stability studies as key components of a comprehensive quality control strategy. Adoption of standardized evaluation protocols in accordance with World Health Organization guidelines can significantly enhance the reliability, reproducibility, and scientific credibility of polyherbal syrups. Future research should focus on integrating validated pharmacological and clinical studies with standardized quality control approaches to further support the safe and effective use of polyherbal syrup formulations.

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