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Challenges in the Preparation of Alcoholic Extracts from Medicinal Plants in Homoeopathy: A Narrative Review of Mother Tincture Preparation and Standardisation

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ABSTRACT

Background: Plant-based homoeopathic medicines begin with mother tinctures, which are alcoholic extracts of the source plant. Plant chemistry varies naturally, and the finished tincture also reflects the solvent, the extraction procedure and the controls applied around them, so assuring its quality is demanding.
Objective: To collate what published studies and regulatory guidance report about the difficulties of preparing alcoholic plant extracts for homoeopathic mother tinctures, and about the measures proposed to control them.
Methods: Thorough narrative review based on indexed journals: WHO guidance on herbal processing, marker substances and quality-control methods; general reviews of plant extraction; and experimental reports on homoeopathic mother tinctures. The text reports only what these sources state. It is not a systematic review.
Findings: Difficulties arise at four stages: the raw material (identity, plant part, fresh or dried state, moisture, harvest conditions); the solvent (alcohol strength, quality, safety); extraction and recovery (maceration or percolation, particle size, temperature, time, solvent-to-solid ratio, separation); and evaluation (physicochemical constants, chromatographic profiles, marker compounds). In a comparison of marketed tinctures, all nine international samples but only five of six local samples met minimum pharmacopoeial standards. Single-plant studies indicate that the best alcohol strength can differ from the pharmacopoeial standard alcohol and that a recent chromatographic profile can show more bands than a monograph records.
Conclusion: Reproducible tinctures call for authenticated raw material, a documented and optimised process, validated analytical methods and plant-specific markers. The evidence reviewed covers few plants, and further work on batch variability, alcohol strength and marker selection is needed.

Keywords: Homoeopathic pharmacy; mother tincture; alcoholic extraction; maceration; percolation; ethanol concentration; thin-layer chromatography;

marker compounds; standardisation; quality control.

1. INTRODUCTION

A mother tincture has been described as a liquid preparation made by extracting a suitable plant or animal source with an alcohol–water mixture used in a defined ratio [1]. In wider herbal-medicine vocabulary, a tincture is an alcoholic or hydroalcoholic extract, typically made from one part of herbal material to five to ten parts of solvent, and is usually prepared by maceration or percolation [2]. In the homoeopathic studies reviewed here, the tinctures were prepared at a drug strength of 1/10 [3,4].

Quality is central to the usefulness of these preparations. Authors from a homoeopathic pharmacy department stress that success in prescribing depends not only on the choice of remedy and potency but also on the purity and quality of raw materials and finished products [3]. A study of marketed tinctures opens by noting that the high potential variability in the chemical composition of plant material makes quality control and assurance a significant challenge [1]. WHO guidance makes the same point for herbal medicines generally: the quality of a finished herbal product is influenced by the quality of its raw materials, and quality-control requirements are considerably more complex than those for chemical medicines [5]. Because herbal source materials contain many constituents whose quality and quantity can differ from batch to batch for intrinsic and extrinsic reasons, batch variability is an inherent concern [2].

This review follows the preparation of an alcoholic plant extract from raw material to stored product. It examines raw-material selection and handling, the choice of alcoholic solvent, extraction and recovery, contamination and safety, analytical evaluation and standardisation, batch-to-batch consistency, and storage. It closes with gaps identified in the sources and the limitations of the review itself.

2. MATERIALS & METHODS

Thorough narrative review based on indexed journals: WHO guidance on herbal processing, marker substances and quality-control methods; general reviews of plant extraction; and experimental reports on homoeopathic mother tinctures. The text reports only what these sources state. It is not a systematic review.

Scope and Approach

This is a narrative synthesis of fifteen sources chosen for their bearing on alcoholic extraction and standardisation of mother tinctures. They comprise three WHO technical documents on herbal-medicine quality [2,5,6]; two general reviews of plant extraction [7,8]; and experimental or analytical reports on homoeopathic mother tinctures or their solvents [1,3,4,9,14], together with one review of chemical markers [15]. Where a source addresses herbal medicines in general rather than homoeopathy specifically, this is stated in the text.

Nine sources were read in full or in substantial part [1,4,7,8,10]. For six, only abstracts or summary records were accessible [9,11,12,15], and statements drawn from them are confined to what those summaries report. The WHO quality-control manual was read through its chapters on pesticide residues; its later chapters on toxic metals, microorganisms and aflatoxins are cited only as listed in its contents and preface [6]. No statement in this article is drawn from outside these sources.

3. Challenges Associated with Raw Material

3.1 Identity and plant part

According to regulatory guidelines, choosing the right plant component and accurately identifying the source species are fundamental prerequisites for the efficacy, safety, and quality of herbal medicines. It also records that adverse events reported for herbal products are often traced to poor-quality source material [2]. The WHO quality-control manual places macroscopic

and microscopic examination at the start of any testing sequence, because these examinations establish identity and degree of purity before other tests are attempted [6]. The manual cautions that macroscopic features are judged subjectively and that substitutes or adulterants can closely resemble the genuine material, so findings often need confirmation by microscopy or physicochemical analysis. Microscopy is described as indispensable for broken or powdered material, and authentic specimens or pharmacopoeial-quality samples should be available for comparison [6].

The WHO marker-substance guideline adds that reference materials for such comparison include herbarium samples and authentic herbal material, which should be developed with botanists to permit systematic authentication [5]. Homoeopathic practice follows this pattern. In the standardisation of a *Tinospora cordifolia* mother tincture, the dried stem was verified macroscopically and microscopically under the guidance of a botanist and in consultation with the pharmacopoeial monograph [4].

The WHO processing guideline expects authentication to be done, and purity ensured, before extraction starts. It lists the details to be recorded for each batch, including the botanical name and family, the plant part, the stage of vegetative development, the site and time of harvest, The batch number, the supplier, and whether the material is fresh or dried [2].

3.2 Collection, season and natural variability

Homoeopathic studies describe selection criteria for fresh plant material. In one report, only healthy, mature plants free of dust and insect nests were taken, and they were collected in the early morning of a dry, sunny day after the dew had cleared [3]. Such attention is warranted because the character of the tincture follows the condition of the plant. In a comparison of marketed tinctures, differences in colour were ascribed to the time of harvest, the amount of rainfall and even small differences in manufacture, with chlorophyll-rich plants giving greener tinctures and plants rich in flavonoid glycosides giving more yellowish ones [1]. In the *Tinospora cordifolia* study, a pH slightly above the reference value and a small shift in the ultraviolet absorption maximum were thought possibly to reflect seasonal or geographical factors acting on the raw drug, and the authors proposed quantifying the main alkaloids across production batches to clarify the matter [4].

3.3 Fresh versus dried material, drying and moisture

Pharmacopoeial practice for many homoeopathic tinctures favours fresh plants. A conference abstract on tinctures from the European market notes that German and European pharmacopoeial rules direct that most mother tinctures be prepared from fresh plant material. Its authors attributed unexpected variability in thin-layer patterns of some marketed samples to possible use of dried material instead. When tinctures made from fresh and dried material were compared, some spots appeared only in the dried-material preparations, and two dicaffeoylquinic acids were isolated as compounds that could help distinguish the two kinds of tincture [12].

Where dried material is used, drying is itself a controlled step. The WHO processing guideline explains that herbs not intended for fresh use are dried soon after harvest to limit mould and other microbial infestation and to prevent tissue deterioration and enzyme- or microbe-driven chemical change, while acknowledging that volatile constituents may be lost. It suggests a final moisture content ideally below 12%, and, for drying with artificial heat, temperatures below 60 °C for bark and root and below 40 °C for leaves, herbs and flowers [2]. The same guideline advises extracting fresh material as soon as possible after collection to avoid deterioration through microbial fermentation, and storing material that cannot be processed promptly in a way that avoids contamination and loss of active

constituents [2]. Excess water in plant material encourages microbial growth, insects and hydrolytic deterioration, which is why a water-content limit should be set for each material [6].

Moisture must also be allowed for when fresh plants are tinctured. In a worked example for fresh *Ocimum sanctum*, a 5 g sample was found to contain 3.1 g of water, a moisture content of 62%. To make 250 mL of tincture at 1/10 strength, which requires 25 g of dry drug, 65 g of fresh pulp was therefore needed, carrying about 40 mL of plant moisture. Strong alcohol was added to 210 mL, and a further 17.5 mL of water was added, which the authors explain by the moisture content being 7% below the standard formula figure [3].

4. Challenges in Selecting the Alcoholic Solvent

4.1 General principles

Selection of the extraction solvent is described as a crucial step in solvent extraction. Selectivity, solubility, cost and safety must be weighed, and, following the principle that like dissolves like, solvents whose polarity is close to that of the target compounds generally perform better. Alcohols, ethanol and methanol, are regarded as general-purpose solvents in phytochemical investigation [7]. A review of analytical methodology notes that hydrophilic compounds are extracted with polar solvents such as methanol, ethanol or ethyl acetate, whereas more lipophilic compounds call for less polar solvents, so the system chosen depends on the compounds targeted [8]. For a plant selected on the basis of traditional use, the same review recommends preparing the extract as the traditional healer does, so that the preparation mimics the traditional drug as closely as possible [8].

4.2 Alcohol strength

The WHO processing guideline observes that an aqueous alcohol solution, for example 50–80% ethanol, can extract the majority of the organic constituents of herbal materials, and it requires the ratio of of water to alcohol in a tincture that will be noted [2]. Experimental data show that the best strength is not uniform. In a non-homoeopathic study of *Limnophila aromatica*, water and 50%, 75% and 100% methanol, ethanol and acetone were compared. Extraction yield rose as the water proportion increased, whereas total phenolic content, flavonoid content and antioxidant activity generally fell. Absolute ethanol gave the highest phenolic and flavonoid contents and antioxidant activity, while 50% acetone gave the highest yield [10]. Weighing yield against activity, the authors judged 75% acetone the best compromise, and they attributed differences from other published studies to differences in plant matrix, solvent and extraction conditions [10]. Because the best solvent depended on which outcome was measured, the study illustrates that one alcohol strength cannot be assumed optimal for every purpose.

Within homoeopathy, a study of *Holarrhena antidysenterica* compared tinctures made with different alcohol concentrations using physical, chemical and biological assays. It concluded that 70% v/v ethanol was the best solvent, a strength that differs from the strong alcohol recommended as standard in the homoeopathic pharmacopoeia, and the author suggested that the procedure for preparing homoeopathic mother tinctures of vegetable origin might need review [11]. This finding concerns a single plant.

The practical preparations in the studies reviewed show how alcohol strength is built into formulae. The *Tinospora cordifolia* tincture was made by maceration with purified water and strong alcohol to a final volume at 1/10 drug strength [4], and the *Ocimum sanctum* tincture used strong alcohol adjusted with water to account for plant moisture [3].

4.3 Solvent quality, handling and safety

The WHO guideline lists the factors to weigh when choosing a solvent: solubility of the target compounds, stability and reactivity of the solvent, low toxicity and

flammability, cost, ease of removal and recovery, and environmental friendliness. It prefers ethanol to methanol because methanol is more toxic, and it places ethanol among the lowest-risk residual-solvent class [2]. It further warns that general-purpose solvents supplied in plastic containers are often contaminated with plasticisers, making distillation before use advisable. Solvent quantities should be optimised to ensure batch-to-batch conformity, solvent quality and specification should be controlled, recycled solvent must be checked for strength and purity and reused only in the same extraction process, and solvents should be kept in non-plastic containers in a well-ventilated, fire-containable area away from direct sunlight [2].

5. Challenges in Extraction and Recovery

5.1 Maceration and percolation

In the WHO description, maceration mixes properly comminuted herbal material with solvent and leaves it for a defined period at a set temperature, with agitation as needed. The powder is first thoroughly moistened, further solvent is added, the mixture is agitated at intervals and strained, the marc is pressed to collect residual extract, and the combined liquids are separated by decanting, centrifugation, straining or filtration [2]. Percolation passes solvent continuously through the material in a percolator. The comminuted material is moistened and left to stand for a few hours before packing, solvent is added to wet it completely, and the outlet is opened with fresh solvent supplied from above to keep a steady flow. The solvent, the flow rate and the temperature all influence yield and must be carefully controlled [2]. Tinctures are usually prepared by either method with ethanol or a hydroalcoholic mixture and are adjusted to meet the requirement for solvent content [2]. A general review of phytochemical methods lists maceration at room temperature for 3–4 days among conventional techniques, compared with about one hour for sonication and 3–18 hours for Soxhlet extraction [8].

In India, Indian Standard IS 19327 sets out procedures for preparing homoeopathic mother tinctures by maceration (Part 1) and percolation (Part 2), published in 2025. A review of these standards describes their coverage of apparatus, materials, procedural steps, process modifications and storage, and its authors expect them to strengthen consistency and regulatory compliance [14].

Homoeopathic reports show how the choice is applied. The *Ocimum sanctum* paper explains that, in the pharmacopoeial new method, maceration is used for substances whose viscid juice prevents the menstruum from penetrating readily, and that cutting or pounding the material enlarges the surface open to alcohol [3].

5.2 Choosing between methods

General reviews describe maceration as simple and usable for thermolabile components, but slow and relatively inefficient. Percolation is regarded as more efficient because saturated solvent is continually replaced by fresh solvent. Both normally consume large volumes of solvent over long extraction times [7]. Soxhlet-type extraction is more efficient but exposes constituents to prolonged heating, which raises the possibility of thermal degradation or artefact formation [2,7].

The WHO guideline states that the choice of method depends on the stability, solubility, structural complexity and quantity of the constituents. The method should be as exhaustive as feasible and also fast, simple, economical and reproducible. Solvent, particle size, herb-to-solvent ratio, the process used (percolation or maceration), time and temperature all affect efficiency and reproducibility, and all should be optimised and fixed in the standard operating procedure [2].

5.3 Process parameters

Particle size. Finer material generally extracts better because solvent penetration and solute diffusion improve, but a very fine

powder holds back solute and makes filtration difficult [7]. The WHO guideline adds that grinding ruptures tissue and increases surface area, yet excessive grinding can degrade the material through mechanical heating and oxidation, and a powder that is too fine may block filter pores or form lumps. It suggests an average particle size of 5–10 mm for dried leaves, flowers and whole herbaceous plants and 0.5–5 mm for harder materials such as bark, roots, rhizomes and seeds, unless a pharmacopoeia defines a range [2]. The WHO quality-control manual classifies powders by sieve size from coarse to very fine [6].

Temperature. Higher temperature raises solubility and diffusion, but excessive heat can cause solvent loss, introduce undesirable impurities and decompose thermolabile components [7]. The WHO guideline prefers extraction below 40 °C unless evidence supports higher temperatures, and wants temperature controlled and recorded throughout [2].

Duration. Efficiency rises with time within a range, and further time adds nothing once solute concentrations inside and outside the solid have equilibrated [7]. According to the WHO guideline, too short a time gives incomplete extraction, whereas prolonged extraction draws out unwanted constituents or degrades active ones. The number of repeated cycles matters as much as the length of each, and both should be controlled and recorded [2].

Solvent-to-solid ratio. A larger ratio raises yield, but an excessive one wastes solvent and prolongs later concentration [7]. The WHO guideline gives 1 part herbal material to 5–10 parts solvent as the typical tincture ratio and calls for solvent amounts to be optimised for batch-to-batch conformity [2].

5.4 Separation and recovery

After extraction, the liquid is separated from the marc by filtration through cloth or paper, with decantation, centrifugation or straining as alternatives depending on the method and the matrix [2]. Pressing the marc to collect residual extract forms part of both maceration and percolation as described [2]. Very fine powders obstruct filtration [2,7], which links this stage back to the control of particle size.

6. Contamination and Safety

WHO guidance defines contamination as the unwanted introduction of chemical or microbiological impurities, or of foreign matter, into a starting material or intermediate during production, sampling, packaging, storage or transport [2]. For plant material, the WHO quality-control manual states that herbal materials should be free of visible mould, insects and animal contamination, with no abnormal odour, discolouration, slime or sign of deterioration. It accepts that entirely foreign-matter-free material is seldom obtainable but allows no poisonous or harmful foreign matter or residue, and it warns that moulds forming during storage may produce aflatoxins [6]. Foreign matter is defined to include parts of other plants, other organisms and mineral admixtures such as soil, stones, sand and dust [6].

The handbook includes test sections for microbes, aflatoxins, arsenic and other hazardous metals, and pesticide residues.[6]. It states that WHO could not recommend limits for contaminants because they are too diverse and international consensus is lacking, although examples of national experience are given in a separate WHO guideline [6]. For pesticide residues, it notes that no single integrated set of methods is satisfactory in all situations, that methods should be adapted to the type of herbal material, and that materials of unknown history are best screened for broad groups of compounds [6].

Processing guidance adds hygiene requirements for equipment. Tools and utensils should be made of materials that do not transmit toxic substances, odour or taste, are non-absorbent and corrosion-resistant, and withstand repeated cleaning and disinfection, with wood avoided where it cannot be cleaned adequately [2]. Because

the solvents are hazardous, the guideline calls for review of the safety data sheet and protective measures before use, precautions against fire and explosion, care to limit environmental contamination and worker exposure, safe disposal of waste solvent, and attention to limits for residual solvent in extracts where the solvent is not considered safe for consumption [2].

7. Standardisation and Analytical Evaluation

7.1 Evaluation of the raw drug

Homoeopathic standardisation work usually starts with the raw drug. The *Tinospora cordifolia* and *Ocimum sanctum* reports both determined moisture content and ash values, including water-soluble and acid-insoluble ash, and the former also referred to extractive values [3,4]. The WHO quality-control manual explains what these tests show. Total ash contains physiological ash from the plant tissue plus non-physiological residue of adhering matter such as sand and soil, while acid-insoluble ash reflects mainly silica from sand and siliceous earth. Extractable matter estimates the constituents extracted by a given solvent in materials for which no suitable chemical or biological assay exists, determined by hot extraction or cold maceration, using for ethanol-soluble extractive the solvent concentration specified for the material [6].

7.2 Physicochemical parameters of the tincture

The routine panel in the homoeopathic studies comprises appearance, colour, odour, sediment, weight per millilitre, total solids, alcohol content, pH, ultraviolet absorption maxima and thin-layer chromatography [3,4]. Table 1 sets the values reported for a *Tinospora cordifolia* tincture against the reference values from the monograph of the Central Council for Research in Homoeopathy. The authors concluded that the sample conformed to the pharmacopoeial and council monographs for colour, odour, appearance, sedimentation, weight per millilitre, total solids and alcohol content, that pH was slightly higher and the absorption maximum varied slightly but both remained within acceptable limits, and that seven TLC spots were seen against four in the monographs [4].

Table 1. Standardisation values for a *Tinospora cordifolia* mother tincture compared with monograph references (values as reported in [4]).

Parameter	Monograph reference	Sample reported
Appearance	Clear, non-viscous	Clear, non-viscous
Colour	Brown	Brown
Weight per mL	0.923	0.934
Total solids (% w/w)	1.21	1.01
Alcohol content (% w/w)	46–49	48
pH at room temperature	5.8–6.0	6.14
Absorption maxima λmax (nm)	202, 277, 321	270
TLC spots at 254 nm	4	7

In the *Ocimum sanctum* report, the authors concluded from the raw-drug and tincture parameters they measured that standardisation is necessary to authenticate the drug [3].

7.3 Thin-layer and high-performance thin-layer chromatography

The WHO manual describes TLC as particularly valuable for qualitative determination of small amounts of impurities and as frequently used for herbal materials and their preparations. It lists the parameters that must be fixed for each material: adsorbent and its activation, preparation and concentration of test and reference solutions, volume applied, mobile phase and migration distance, drying conditions and detection method, and the number, position, fluorescence and colour of the spots [6]. It cautions that Rf values can vary from experiment to experiment

with chamber saturation, activity of the adsorbent layer and mobile-phase composition [6]. A general review similarly presents TLC as a quick, inexpensive way to see how many components a mixture contains and to support identity by comparing Rf values with those of a known compound [8].

The comparison of marketed tinctures illustrates the approach [1]. Tinctures of four plants prepared under method 3a of the German Homoeopathic Pharmacopoeia were recoded and randomised, then compared with reference chromatograms on both aluminium-backed TLC plates and glass-backed HPTLC plates. All nine international samples and five of six local samples met the minimum standard. The one failure was a rosemary sample that lacked bornyl acetate at the expected position. For sage, several samples lacked bornyl acetate on one plate type or 1,8-cineole on the other, and since no sample lacked an active component on both plates, none was declared inadequate. For elder, all three active components were visible on the TLC plates but not in every sample on the HPTLC plates, which the authors ascribed to the type of plate rather than to a quality defect. Spot size and colour intensity were read as indicating relative concentration, and the authors cautioned that few samples had been tested [1].

A later paper from the same group developed a two-dimensional TLC procedure for sage tincture, in which the plate is developed with the pharmacopoeial eluent, rotated through 90 degrees and developed again with neat dichloromethane. According to its abstract, this produced a more extensive profile for identifying individual components [9].

The *Tinospora cordifolia* report describes HPTLC as practical, reliable and adaptable for herbal drug evaluation, able to verify authenticity and detect possible adulteration, and useful for monitoring stages that include cultivation, harvesting, extraction and stability assessment [4]. In that study HPTLC produced band patterns not previously recorded in the monograph, and the authors recommended updating the pharmacopoeial and council monographs accordingly [4]. For context, a general review reports that HPLC is gaining popularity as the main choice for fingerprinting in quality control of herbal plants and that coupling HPLC with mass spectrometry facilitates identification when a pure standard is unavailable [8].

Qualitative phytochemical screening is also used. The *Tinospora cordifolia* study tested for alkaloids, carbohydrates, tannins, steroids, flavonoids, saponin glycosides, amino acids, cardiac glycosides, anthraquinone glycosides and proteins [4], and a general review describes such assays as a quick, inexpensive way to gain an idea of the types of phytochemicals present in an extract [8].

7.4 Marker compounds and fingerprints

The WHO marker-substance guideline defines markers as chemically defined constituents of an herbal material that may or may not contribute to therapeutic activity, and notes that even when they contribute, evidence that they alone account for clinical efficacy may be absent [5]. It stresses that herbal materials and preparations are complex, which makes identification, quantification and detection of adulteration difficult. Identification or quantification of markers is not in itself enough to guarantee quality, so quality control must cover all production steps and be complemented by good agricultural, collection and manufacturing practices [5].

The guideline gives an order of preference for choosing markers: constituents with known therapeutic activity first, then those with recognised pharmacological activity, and otherwise characteristic constituents combined with control of the production process [5]. General requirements are that a marker be identifiable with specificity and selectivity by the chosen method, be present in sufficient quantity, be readily obtained, remain stable under the specified storage conditions, and be easily detected and

quantified [5]. Different markers may be chosen for the same herbal material according to the analytical method available and the form of preparation, for instance aqueous versus alcoholic extracts, and a group of markers may be used when one is insufficient [5]. Where the active constituents are unknown, identification and assay may rest on characteristic constituents and fingerprint chromatograms, using reference samples where available [5]. Test methods must be validated, and revalidation may be needed if a substance is tested at different production stages, because other components can interfere [5].

A review of chemical markers describes their selection as crucial for quality control, serving purposes that include authentication of species, harvest of the best-quality raw material, evaluation of post-harvest handling and assessment of intermediates. It defines a chemical fingerprint as a pattern showing the presence of multiple markers in a sample [15].

Homoeopathic studies give plant-specific examples. For the mother tincture of *Toxicodendron pubescens*, an HPTLC method using quercitrin and rutin as chemical markers was validated, and the content of these markers correlated quantitatively with anti-inflammatory activity [13]. In the study of fresh versus dried plant material, two dicaffeoylquinic acids were proposed as quality-relevant compounds for telling properly made tinctures from improperly made ones [12]. These examples show markers chosen for a particular preparation and purpose.

8. Batch-to-Batch Variation, Market Quality and Standards

According to the WHO processing guideline, once a method has been adopted, adherence to the standard operating procedure is necessary for batch-to-batch consistency, and method validation should form part of the procedure for industrial production [2]. The guideline lists the records to be kept for each batch of a herbal preparation: botanical details, batch number and size, supplier, dates, responsible persons, earlier processing, characteristics of the preparation, the master formula with quantities and operating conditions, deviations, quality-control results, storage conditions and shelf life. Deviations from the procedure are to be fully recorded and investigated [2]. The WHO manual describes a simple statistical way to set limits: results from about 20 successive batches are pooled and a grand average and limits of three standard deviations either side are calculated [6].

Market comparisons show that conformity can differ between suppliers. In the South African study, the superior number of high-quality international samples led the authors to infer that their quality exceeded that of the locally manufactured tinctures, and they concluded that such products need greater regulation, while noting the small number of samples tested [1].

Standards are being developed to narrow this variability. Indian Standard IS 19327 provides standardised maceration and percolation procedures [14]. The authors of the *Tinospora cordifolia* study recommended revising the pharmacopoeial and council monographs in light of their HPTLC findings [4]. The WHO marker guideline recommends that pharmacopoeial monographs incorporate substances and constituents for quality control [5].

9. Storage and Stability

The WHO quality-control manual requires that herbal materials be stored under specified conditions to avoid contamination and deterioration. The container and closure must not interact with the contents, and the manual distinguishes well-closed, tightly closed and hermetically closed containers, of which tightly closed ones also protect against evaporation. Light-resistant containers are specified for materials needing protection from light, and materials stored at temperatures other than room temperature should be labelled accordingly [6]. The WHO processing guideline asks that packaging prevent deterioration, that

labels carry storage conditions, batch number and expiry date, and that storage protect the product from moisture, light, heat and pests [2]. The marker guideline requires markers to be stable under the specified storage conditions [5], and the Indian Standard covers storage requirements for tinctures [14]. HPTLC is described as usable in assessing stability [4].

The three experimental studies read in full for this review characterised tinctures at a single point in time and did not report time-course stability data [1,3,4].

10. Summary of Challenges and Source-Supported Control Measures

Table 2. Summary of challenges and the control measures reported in the cited sources.

Challenge	Control measures reported in the sources
Misidentification or substitution of plant	Macroscopic and microscopic examination against authentic specimens; botanist verification; herbarium reference material; batch documentation
Variation with harvest, season and site	Record plant stage, site and time of harvest; select healthy mature plants; track colour, pH and absorption maxima across batches
Fresh versus dried material; moisture	Use fresh material where the pharmacopoeia requires it; measure moisture and correct the formula; control drying temperature and residual moisture
Choice of alcohol strength	Record water-to-alcohol ratio; test strengths for the particular plant; review standard strength where evidence differs
Solvent quality and hazard	Control solvent specification; avoid plastic-stored solvent contamination; safe storage, fire precautions, waste disposal
Extraction parameters	Optimise and fix particle size, temperature, time, cycles and solvent ratio in the SOP; record them
Contamination	Foreign-matter and microbial limits, tests for pesticides, toxic metals and aflatoxins; hygienic equipment
Analytical standardisation	Raw-drug and tincture constants; TLC or HPTLC against references; validated methods; plant-specific markers
Batch-to-batch variability	SOP adherence, method validation, batch records, statistical limits from successive batches
Storage and stability	Suitable containers and closures, light and temperature control, labelling, shelf-life records

11. Gaps Identified in the Sources

Alcohol strength. The one homoeopathic study of solvent strength concerns a single plant and points to possible review of the standard alcohol [11], and the non-homoeopathic data show that the best solvent depends on plant matrix and on the outcome measured [10].

Batch and seasonal variability. Authors call for quantification of key constituents across production batches using mass-spectrometric and related methods to resolve variation attributed to season or source [4].

Markers. Plant-specific markers have been validated for few tinctures [12,13], and WHO guidance requires validated methods and suitable reference materials [5].

Market regulation. Comparison of marketed tinctures was limited to a few samples and points to a need for stronger regulation [1]; new Indian standards aim to promote consistency and wider acceptance [14].

Stability. The studies read in full did not report time-course stability data [1,3,4].

12. Limitations of This Review

This is a narrative synthesis of fifteen sources, not a systematic review, and its conclusions are bounded by those sources. Several are general herbal-medicine guidance or plant-extraction reviews rather than homoeopathic studies [2,5–8,10,15]. The experimental homoeopathic reports concern a handful of plants, and several are single-sample studies [3,4,11,13]. Six sources were available only as abstracts or summaries [9,11–15], and the WHO quality-control manual was read in part [6]. Readers should consult the current

pharmacopoeial monograph for any individual preparation.

CONCLUSION

Across the sources, difficulties in preparing alcoholic extracts for homoeopathic mother tincture begin with the plant itself, since correct identity, part, condition, moisture and harvest circumstances shape the extract, and continue through the choice of alcohol strength, the extraction and separation steps, and the control of contamination and storage. Guidance converges on a common remedy: define the process, optimise and record each parameter, and keep to a validated standard operating procedure. Evaluation relies on a combination of physicochemical constants, chromatographic comparison with references and, where evidence supports them, plant-specific markers, with the reminder that markers alone do not guarantee quality. The experimental evidence on mother tinctures is limited to a small number of plants and samples, so further plant-specific work on alcohol strength, batch variability, marker selection and stability is warranted.

Declaration by Authors

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