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Article Review

Bibliometric Analysis of Polyherbal Formulations as Aphrodisiacs: A Review of Current Research Trends

Analisis Bibliometrik Formulasi Poliherbal sebagai Afrodisiak: Tinjauan Tren Penelitian Terkini

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Kata Kunci: afrodisiak, formulasi poliherbal, kesehatan seksual, kombinasi herbal, potensi terapeutik.

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Abstract

In recent years, the therapeutic potential of polyherbal formulations as aphrodisiacs, particularly as natural alternatives to synthetic treatments for sexual health disorders, has garnered significant attention. Polyherbal formulations are believed to enhance efficacy through synergistic effects, making them a preferred option in both traditional and modern therapeutic practices. This review aims to provide a comprehensive analysis of research trends relating to the use of polyherbal formulations for aphrodisiac purposes. A bibliometric analysis was conducted using the Scopus database, extracting relevant articles with the keywords 'Aphrodisiac AND Polyherbal OR Combination.' From an initial pool of 88 articles, 16 were selected for in-depth analysis. VOSviewer software was used to visualize collaboration networks, co-authorship patterns, and keyword trends, highlighting the increasing research interest in polyherbal formulations for enhancing sexual health. The narrative review supplements these findings by exploring study methodologies, sources of herbal ingredients, formulation compositions, and commonly used herbs. Results indicate that while polyherbal aphrodisiac formulations show promising therapeutic potential, research in this field remains fragmented, with limited clinical trials evaluating safety and efficacy. The most frequently studied herbs include *Tribulus terrestris*, *Mucuna pruriens*, and *Withania somnifera*, known for their effects on testosterone levels, vascular function, and libido enhancement. Aphrodisiac polyherbal formulations comprising 2 to 41 plant species operate through inter-plant synergistic mechanisms that enhance sexual function and support reproductive health comprehensively. These findings provide valuable insights for researchers and industries developing polyherbal-based nutraceutical and pharmaceutical products.

Abstrak

Dalam beberapa tahun terakhir, potensi terapeutik formulasi poliherbal sebagai afrodisiak, khususnya sebagai alternatif alami pengganti terapi sintetis untuk gangguan kesehatan seksual, telah menarik perhatian yang signifikan. Formulasi poliherbal diyakini meningkatkan efektivitas melalui efek sinergis, sehingga menjadi pilihan yang disukai baik dalam praktik pengobatan tradisional maupun modern. Tinjauan ini bertujuan memberikan analisis komprehensif mengenai tren penelitian terkait penggunaan formulasi poliherbal untuk tujuan afrodisiak. Analisis bibliometrik dilakukan menggunakan basis data Scopus dengan mengekstraksi artikel relevan menggunakan kata kunci "Aphrodisiac AND Polyherbal OR Combination". Dari 88 artikel awal, 16 artikel dipilih untuk analisis mendalam. Perangkat lunak VOSviewer digunakan untuk memvisualisasikan jaringan kolaborasi, pola kepenulisan bersama, dan tren kata kunci, yang menunjukkan meningkatnya minat penelitian terhadap formulasi poliherbal untuk meningkatkan kesehatan seksual. Tinjauan naratif melengkapi temuan ini dengan mengeksplorasi metodologi penelitian, sumber bahan herbal, komposisi formulasi, dan tanaman yang paling sering digunakan. Hasil menunjukkan bahwa meskipun formulasi afrodisiak poliherbal memiliki potensi terapeutik yang menjanjikan, penelitian di bidang ini masih terfragmentasi dengan uji klinis yang terbatas terkait keamanan dan efektivitas. Tanaman yang paling sering diteliti meliputi *Tribulus terrestris*, *Mucuna pruriens*, dan *Withania somnifera*, yang dikenal berpengaruh terhadap kadar testosteron, fungsi vaskular, dan peningkatan libido. Formulasi afrodisiak poliherbal yang terdiri dari 2 hingga 41 spesies tanaman

bekerja melalui mekanisme sinergis antar tanaman yang meningkatkan fungsi seksual dan mendukung kesehatan reproduksi secara komprehensif. Temuan ini memberikan wawasan penting bagi peneliti dan industri dalam pengembangan produk nutraseutikal dan farmaseutikal berbasis poliherbal.

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INTRODUCTION

The global prevalence of sexual dysfunction has led to increasing interest in alternative and complementary therapies. Conventional pharmacological treatments, such as phosphodiesterase-5 inhibitors, are widely used but often come with side effects and contraindications,[1] leading many individuals to seek herbal-based solutions. Herbal medicines have been widely used in traditional healing systems, such as Ayurveda and Traditional Chinese Medicine (TCM), for managing sexual health disorders. With the growing demand for natural alternatives, scientific research has increasingly focused on validating the efficacy and safety of these herbal-based therapies.[2]

Among various herbal therapies, polyherbal formulations have gained significant attention due to their potential synergistic effects. These formulations combine multiple medicinal plants to enhance therapeutic efficacy while minimizing toxicity. Rather than using just one compound, polyherbal formulations offer a more targeted pharmacological approach making treatment more effective and safer.[3–6] *Eurycoma longifolia* and *Tribulus terrestris* are two important herbs that have been shown to increase sex hormone levels and enhance the function of vascular endothelial cells. This is one reason why these herbs are aphrodisiacs.[7,8] New meta-analyses show that polyherbal formulations are safe and effective for sexual health therapy in clinical settings.[9] A multi-herb formulation containing *Asparagus racemosus*, *Mucuna pruriens*, *Chlorophytum borivilianum*, *Asteracantha longifolia*, *Anacyclus pyrethrum*, and *Tribulus terrestris* significantly enhanced mating behavior, serum hormone levels, sperm count, and the testes-to-body weight ratio in a dose-dependent manner. The 600 mg/kg dose yielded effects similar to those observed with the standard treatment.[8]

Despite increasing interest in polyherbal aphrodisiacs, significant research gaps remain. Clinical trials evaluating their efficacy and safety are still limited, and the synergistic mechanisms between multiple herbal components are not well understood. Additionally, bibliometric studies on polyherbal aphrodisiac research are scarce, making it difficult to assess global research trends and collaborations. Addressing these gaps is crucial for advancing evidence-based applications of polyherbal formulations in sexual health therapy. To bridge this gap, this study aims to analyze bibliometric trends and provide a narrative review of polyherbal formulations as aphrodisiacs, focusing on their compositions, pharmacological mechanisms, and clinical potential.

METHODS

Data Source

The bibliometric analysis of the use of polyherbal formulations as aphrodisiacs is the main focus of this review article. To obtain relevant articles, we utilized the Scopus database as the primary source of bibliographic data, which provides a wide coverage of scientific research in various disciplines, including pharmacology and health sciences. Falagas et al. (2008) assert that Scopus offers extensive interdisciplinary coverage and stringent indexing, establishing it as a dependable source for high-quality, peer-reviewed literature.[10] The search strategy combined Boolean operators as follows: ("Aphrodisiac" AND "Polyherbal") OR ("Aphrodisiac" AND "Combination"). The Publish or Perish (PoP) version 8 application served as a supplementary tool for refining search queries and identifying relevant articles from the Scopus database, emphasizing search string optimization and duplicate screening to ensure data accuracy. To refine the results, we applied the following filters: (a) English language, (b) article-type documents (excluding conference proceedings and book chapters), and (c) studies available in full text. This study analyzed articles published from the earliest available record in 1974 to the most recent publications in 2024, without applying any restrictions on publication years. All

retrieved articles matching the specified keywords were included in the analysis. While Scopus provides extensive bibliographic data across disciplines, its limitation lies in the exclusion of certain regional or non-indexed journals. As a result, some relevant studies available in other databases, such as PubMed or Web of Science, may not be represented in our analysis.

Article Selection Procedure

An initial search identified 88 articles, which were screened based on predefined inclusion and exclusion criteria. Eligible studies included those published in any year that investigated aphrodisiac activity of polyherbal formulations through in vitro, in vivo, or clinical experiments, were written in English to ensure accessibility and consistency in data extraction, and provided clear information on pharmacological mechanisms or clinical outcomes related to aphrodisiac activity.

Articles were excluded if they did not meet these criteria. Specifically, review articles, meta-analyses, and opinion pieces were removed as they lack primary experimental data. Studies focusing exclusively on single herbal compounds rather than polyherbal formulations were also excluded to maintain the scope of analysis. Additionally, articles without detailed experimental methodologies, which hindered validity assessment, were excluded. Full-text availability was required; therefore, articles behind paywalls or inaccessible through institutional subscriptions were omitted. After applying these criteria, 16 articles were selected for final analysis.

Bibliometric Analysis

To analyze research trends in the use of polyherbal formulations as aphrodisiacs, we used VOSViewer software version 1.6.20 (Leiden University, The Netherlands). The software was used to create visual of networks of co-authors, keywords that appear together, and partnerships between institutions. The analysis applied a minimum threshold of two occurrences per keyword, grouping them into thematic clusters based on the strength of similarity. A network visualization was used to illustrate author collaborations, while a density visualization highlighted frequently occurring research topics. Cluster analysis further categorised keywords into distinct research themes, providing insights into dominant topics within the field.

Narrative Review

Along with the bibliometric analysis, we conducted a narrative review that examined at the study model, material sources, composition, and plant species used in polyherbal formulations. We extracted information from the 16 chosen articles about the types of experiments that were used (in vitro, in vivo, or clinical studies), where the herbal materials came from, and how they were categorized, what went into polyherbal formulations, and how often different plant species were used. The study identified patterns in the choice of herbal ingredients and how they were put together in previous research. This helped us understand the variety of polyherbal aphrodisiac preparations and how they might be used.

Data Analysis and Visualization

Bibliometric data obtained from Scopus were analyzed using VOSviewer to visualize co-authorship networks and keyword co-occurrence. Data analysis included year of publication, co-authorship based on country, author, and organization; co-occurrence based on keyword; analysis of citation based on document; and document number published by the publisher. We analyzed the narrative research data from selected articles employing descriptive statistics, which encompassed the identification of modes and percentage values. Graphs and tables were generated using Microsoft Excel and VOSviewer to systematically present bibliometric patterns and research trends.

Ethical Considerations

This study is based on publicly available bibliometric data and a narrative review of published literature. No human or animal subjects were involved, and therefore, ethical approval was not required. All sources used in this study have been properly cited to maintain academic integrity. Additionally, the authors declare no conflicts of interest in conducting or presenting this research.

RESULTS AND DISCUSSION

This study aimed to analyze bibliometric trends and provide a narrative review of polyherbal formulations as aphrodisiacs, focusing on their composition, pharmacological mechanisms, and clinical potential. Bibliometric analysis in natural product research has been applied to identify research trends, scientific collaborations, key topics across various fields, global scientific research output, as well as to analyze and predict hotspots for natural product research.[11–14]

In this study, bibliometric analysis identified key trends in publication growth, co-authorship networks, and keyword co-occurrence, reflecting research interests and collaboration patterns in this field. Meanwhile, the narrative review highlighted the most commonly used herbs, their synergistic effects, and potential therapeutic applications. These findings directly address the study objectives by mapping the research landscape and identifying gaps, such as the need for more clinical trials and standardization efforts, which are crucial for advancing polyherbal aphrodisiac formulations toward clinical use.

The use of polyherbal formulations, which involve a combination of various medicinal plants, is attractive in sexual health therapy because the synergistic effect is believed to be stronger than a single compound.[3–6] This effect prompts extensive research on polyherbal formulations as an alternative therapy for natural sexual dysfunction, with the expectation of minimal side effects.

Publications on polyherbal formulations of aphrodisiacs date back to 1974. The number of publications has shown an increasing trend since 2013, reflecting a growing interest in polyherbal research within the field of sexual health. The fluctuations observed in publication output may be influenced by research trends, funding availability, and policy changes in various countries. However, the limited number of publications since 1974 suggests a lack of widespread exploration of the potential of polyherbal aphrodisiacs.

Bibliometric analysis data show that eight countries have conducted research on polyherbal formulations. India has the highest number of publications in this field (10 articles). Other countries also contributed, albeit to a lesser extent. The United States contributed to two articles, while other countries such as Malaysia, Turkey, Indonesia, Italy, Morocco, and Taiwan only contributed one article each.

Traditional medicine, such as Ayurveda in India, has a rich history of applying various plants for sexual therapy, contributing to this dominance.[15,16] India has the highest number of publications on polyherbal formulations, a trend that aligns with the popularity of traditional Ayurveda medicine, particularly its *Vajikarana* branch of therapy, which aims to enhance vitality and sexual function.[17] The close collaboration between these countries indicates the existence of a strong research network and it serves as evidence that countries with rich local flora are trying to explore the aphrodisiac potential of their natural resources.

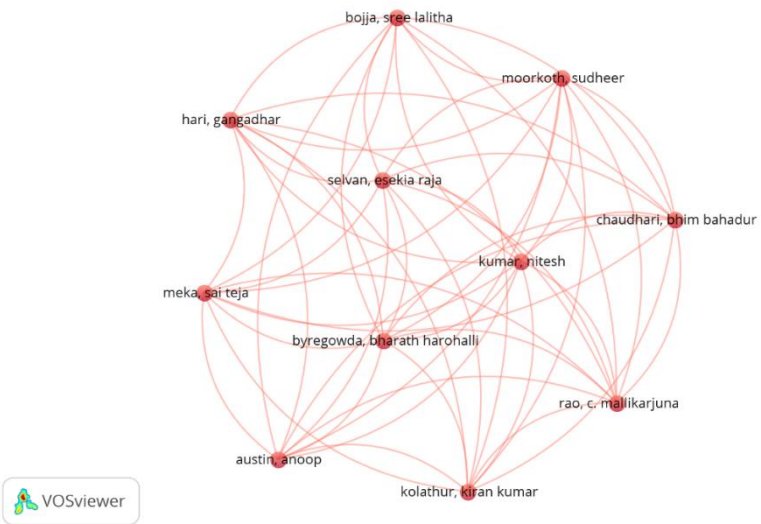

Figure 1. Co-Authorship Network Among Researchers. This figure visualizes the co-authorship network based on bibliometric analysis using VOSviewer software.

International collaboration plays an important role in advancing this research. Eighty-one authors contributed to the publication of 16 selected articles. No dominant author was identified in this research domain, but a network of collaboration among researchers is evident (**Figure 1**). Each author contributed only one article. This suggests that studies on polyherbal aphrodisiacs involve multiple research groups, though with relatively limited cross-group collaborations.

Most studies have been conducted by universities, pharmaceutical research institutions, and hospitals, with contributions from researchers in fields such as pharmacy, biomedical sciences, urology, nutrition, reproduction, pharmacology, biology, andrology, zoology, and natural product chemistry. Strengthening inter-institutional collaborations could enhance the quality and scope of future research. Based on the data, 47 organizations contributed to the publication of 16 selected articles. **Figure 2** presents the relationships between organizations.

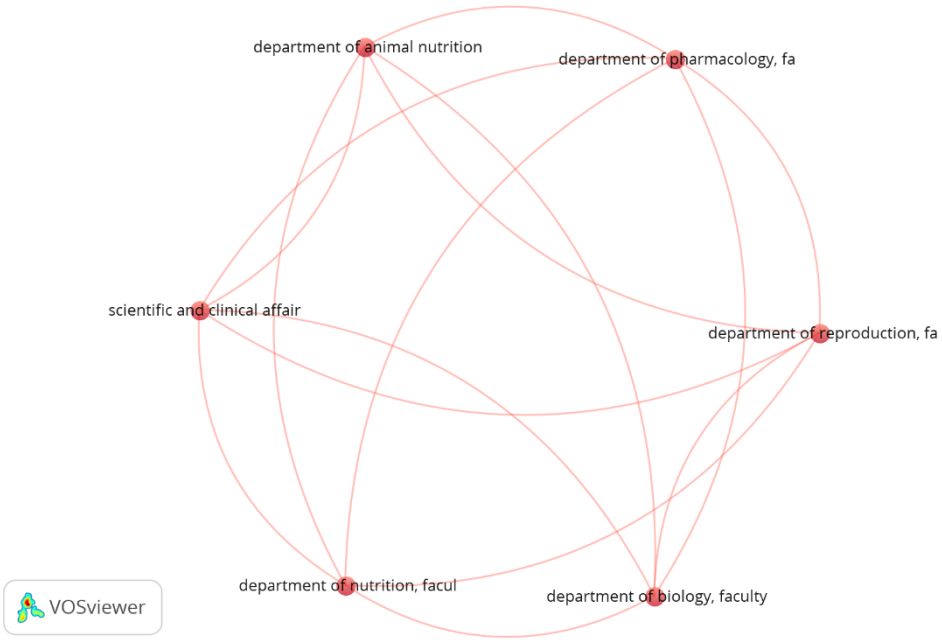

Figure 2. Institutional Collaboration in Polyherbal Aphrodisiac Research. This figure depicts the network of institutional collaborations in research on polyherbal aphrodisiacs.

Based on the co-authorship analysis (**Fig. 1** and **Fig. 2**), a network of collaborations exists among researchers. This indicates that research on polyherbal formulations as an aphrodisiac has the potential to become a multidisciplinary field that involves not only pharmacologists but also scientists in the fields of biomedicine, phytochemistry, urology, and andrology.

Table 1.* Keyword Clusters in Polyherbal Aphrodisiac Research

Cluster	Keywords	Focus correlation
1	Male infertility, *musalyadi churna*, nicotine, rats, sperm count, testicular degeneration	This cluster discusses the effects of nicotine and traditional medicine on male rats' fertility.
2	Aphrodisiacs, *Apium graveolens*, *Coriandrum sativum*, *Petroselinum crispum,* sildenafil	This cluster discusses the effects of natural ingredients as aphrodisiacs compared to standard drugs.
3	Ayurveda, ayurvedic *ghrita*, indian cow ghee, sexual performance, *vajikarana rasayana*	This cluster discusses polyherbal ingredients for sexual performance based on Indian culture.
4	Aphrodisiac activity, ejaculation latency, intromission latency, lordosis, mount latency	This cluster discusses the test parameters in measuring aphrodisiac activity.
5	Automated runway apparatus, copulatory arena, l-name induced female sexual dysfunction, polyherbal formulation	This cluster discusses various test models for polyherbal formulations as aphrodisiacs.
6	AndroCare, mice	This cluster discusses AndroCare and aphrodisiac test animals.

*This table categorizes the primary keywords used in studies on polyherbal aphrodisiacs into six clusters based on thematic relationships.

Based on the author keywords filter, we found a total of 68 keywords related to this aphrodisiac polyherbal publication. The most frequently occurring keywords include polyherbal formulation and aphrodisiac activity, show that a lot of research is being done on certain herbal ingredients and how they work in the body (**Figure 3**).

Figure 3 illustrates the keyword co-occurrence network, highlighting thematic clustering within research focus areas. This directly correlates with the six primary domains of study outlined in **Table 1**, based on similarity and frequency of occurrence, offering a visual confirmation of bibliometric patterns. The six main areas of study that make up polyherbal aphrodisiacs: (1) bioactive compounds and their pharmacological effects; (2) mechanisms of action related to hormone regulation; (3) experimental models used in aphrodisiac studies; (4) clinical applications of polyherbal formulations; (5) safety and toxicity issues; and (6) incorporating traditional herbal knowledge.

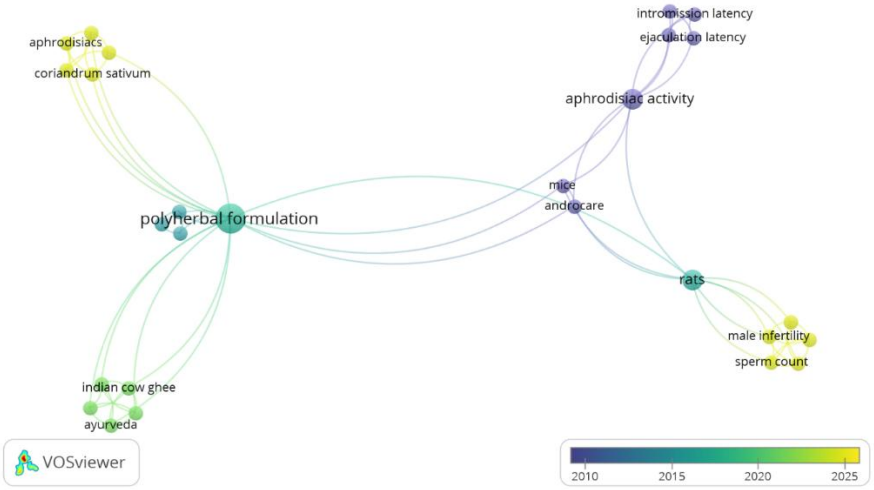

Figure 3. Keyword Co-Occurrence Analysis in Polyherbal Aphrodisiac Research. This figure presents a keyword co-occurrence network, clustering keywords into six thematic groups based on bibliometric analysis.

Keyword analysis reveals a focus on using animal models to test aphrodisiac effects, such as the Automated Runway Apparatus and Copulatory Arena, which serve to evaluate mating behavior. While these models can yield preliminary data, the application of animal results to humans is not always straightforward. Therefore, we need further research to test the safety and effectiveness of these plants in a broader human population, especially considering the differences in metabolism between humans and animals.

Analysis of citation based on document reveals that Arletti et al.'s 1999 article,[18] "Stimulating property of *Turnera diffusa* and *Pfaffia paniculata* extracts on the sexual behavior of male rats," received the most citations out of the 16 selected articles in this study, with 88 citations. Udani et al.'s 2014 article,[19] "Effects of a proprietary freeze-dried water extract of *Eurycoma longifolia* (Physta) and *Polygonum minus* on sexual performance and well-being in men: A randomized, double-blind, placebo-controlled study," garnered 36 citations, making it the second most cited article. Mahajan et al.'s (2012) article,[20] "Efficacy of aphrodisiac plants towards improvement in semen quality and motility in infertile males," received 21 citations, making it another article with a significant number of citations.

In total, 14 journals have accepted this polyherbal aphrodisiac research article for publication. The two journals with the most documents, namely two articles each, are Pharmacology online and Evidence-based Complementary and Alternative Medicine.

Based on the research model, studies on experimental animals still dominate the test models used in polyherbal research (13 studies), but there have also been tests on humans (2 studies). Polyherbal formulations that have been tested on humans include a combination of *Eurycoma longifolia* (Physta) and *Polygonum minus*; a combination of *Mucuna pruriens* Linn, *Chlorophytum borivillianum* (Sant and Fernand), and *Eulophia*

campestris Wall; and a TCM formula consisting of *Astragalus membranaceus*, *Lepidium meyenii* Walp. (maca), *Ophiocordyceps sinensis*, *Panax quiquefolium* (American ginseng), *Piper nigrum* (black pepper), *Rhodiola rosea*, and *Serpentes cnidium monnieri*.[19,21]

Variations in interspecies metabolism and human genetic diversity hinder the conversion of preclinical results into therapeutic applications. Supplementary methods, such as in vitro models, can improve predicted precision.[22] The focus of the aphrodisiac mechanism under study determines the diversity of the induction model in these experimental animals.[23] All studied polyherbal formulations use oral preparations as their administration method. However, researchers have developed topical formulations as aphrodisiacs, specifically in the form of nanohydrogels.[24]

The study analysis also considers the number of different types of herbal ingredients in a formula. This combination is expected to produce a positive synergistic effect both pharmacokinetically and pharmacodynamically. Polyherbal formulations used and studied as aphrodisiacs consist of a varying number of herbal items, from two to a maximum of 41 types of herbs (**Figure 4**). A polyherbal formulation with a mixture of 2–7 types of plants dominate the formula. There are two polyherbal formulations that contain only two plants: one made up of *Eurycoma longifolia* and *Polygonum minus,*[19] and another made up of *Turnera diffusa* and *Pfaffia paniculata*.[18] There are five polyherbal formulations comprising three plants. They comprise a formulation containing *Mucuna pruriens* (Linn), *Chlorophytum borivillianum* (Sant and Fernand), and *Eulophia campestris* (Wall);[20] a formulation with *Mucuna pruriens*, *Tribulus terrestris*, and *Withania somnifera;*[16] a formulation with *Tribulus terrestris*, *Eurycoma longifolia*, and *Pimpinela alpina;*[7] a formulation with *Chlorophytum borivilianum*, *Tribulus terrestris*, and *Withania somnifera;*[25] and a formulation with *Petroselinum crispum*, *Coriandrum sativum*, and *Apium graveolens*.[26] Two polyherbal formulations comprise six plants. They comprise a formulation containing *Mucuna pruriens*, *Withania somnifera*, *Pueraria tuberosa*, *Tribulus terrestris*, *Myristica fragrans*, and *Curculigo orchioides;*[27] and another formulation containing *Bacopa monnieri*, *Asparagus adscendens*, *Asteracantha longifolia*, *Asparagus racemosus*, *Mucuna pruriens*, and *Withania somnifera*.[28] There are three polyherbal formulations, each comprising seven plants. They comprise a formulation including *Tribulus terrestris*, *Curculigo orchioides*, *Allium tuberosum*, *Cucurbita pepo*, Elephant creeper, *Mucuna pruriens*, and *Terminalia catappa;*[8] as well as a formulation with *Chlorophytum borivilianum* Sant.F., *Pueraria tuberosa* DC, and Tinospora cordifolia (Willd) Miers. *Mucuna prurita* Hook, *Tribulus terrestris* Linn., *Bombax ceiba* DC, and *Phyllanthus emblica* Linn;[29] together with a formulation containing *Astragalus membranaceus*, *Lepidium meyenii* Walp., *Ophiocordyceps sinensis*, *Panax quinquefolius*, *Piper nigrum*, *Rhodiola rosea*, and *Cnidium monnieri*.[21]

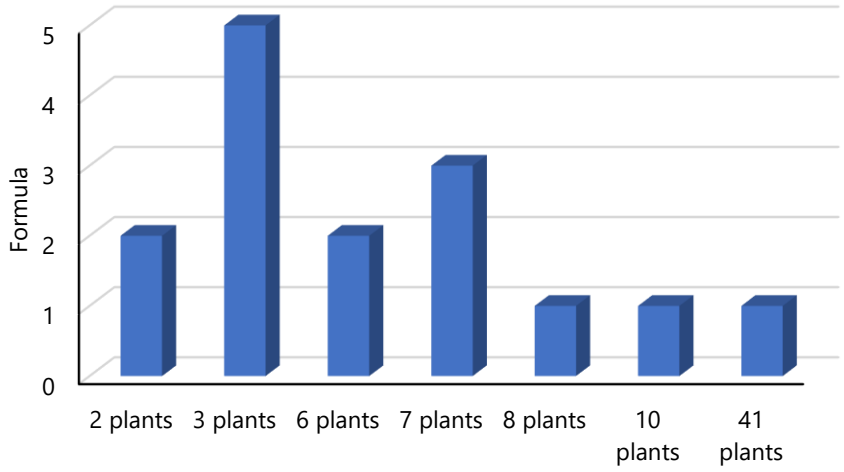

Figure 4. Type of Polyherbal Formulations Used. This figure categorizes polyherbal formulations studied for aphrodisiac effects based on the number of plant ingredients they contain. The formulations range from two-component combinations to complex mixtures of up to 41 herbs.

Various types of plants dominate the polyherbal formulations study (97%). However, there is also the use of animal and herbomineral materials. Cow Ghee[30] serves as the animal material in question, while Shilajit[31,32] serves as the hermomineral material.

While **Figure 4** illustrates the variation in the number of herbal components per formulation, **Table 2** provides complementary data on the most frequently included plant species, indicating clear trends in herbal selection across studies. Aphrodiac polyherbal formulations use seventy-three plant species. However, certain plant species are used more frequently. **Table 2** displays the list of plants utilized in multiple formulas. The *Tribulus terrestris* plant is the most frequently used and appears in nine formulas. This indicates that people consider this plant species to have the highest potential as an aphrodisiac. Meta-analysis research has proven the potential of this plant. *T. terrestris* has been shown to possess profertility and aphrodisiac activities.[33]

Table 2.* Most Frequently Used Plants in Polyherbal Aphrodisiac Formulations

No	Plant Name	Used in Formula (times)	References
1	*Tribulus terrestris*	9	7,8,16,25,27,29,31,32,34
2	*Mucuna pruriens*	7	8,16,20,27,28,31,34
3	*Withania somnifera*	7	16,25,27,28,31,32,34
4	*Myristica fragrans*	4	27,31,32,34
5	*Asparagus adscendenns*	3	28,31,34
6	*Asparagus racemosus*	3	28,31,32
7	*Chlorophytum borivilianum*	3	20,25,29
8	*Pueraria tuberosa*	3	27,29,31
9	*Curculigo orchioides*	3	8,27,32
10	*Astercantha longifolia*	2	28,31
11	*Eulophia campestris*	2	20,31
12	*Eurycoma longifolia*	2	7,19
13	*Syzygium aromaticum*	2	31,34
14	*Tinospora cordifolia*	2	29,31

*This table lists the plant species most frequently utilized in polyherbal formulations for aphrodisiac purposes, as identified from the 16 analyzed articles.

The most often utilized substances in ranks 2 to 5 are *Mucuna pruriens*, *Withania somnifera*, *Myristica fragrans*, and *Asparagus adscendens*, respectively. All of these herbs have demonstrated pharmacological effects as aphrodisiacs. *M. pruriens* has demonstrated aphrodisiac effects by enhancing male sexual function through mechanisms involving the Nrf2/HO-1 pathway, NF-κB inhibition, and androgenic activity, alongside potential benefits for diabetes-related sexual dysfunction.[35,36] Recent studies confirm that *W. somnifera* enhances male sexual function by improving sexual well-being, increasing serum testosterone levels, enhancing semen quality, and reducing male infertility.[37,38] *M. fragrans* (nutmeg) exhibits aphrodisiac properties by enhancing sexual behavior, increasing mounting frequency, and improving mating performance in male animal models without notable adverse effects.[39,40] The study by Bansode et al. (2015) demonstrated that *A. adscendens* root extract enhances anabolic, reproductive, and sexual behavioral activities in a dose-dependent manner, supporting its traditional use as an aphrodisiac.[41]

The main focus of polyherbal formulations' aphrodisiac research was found to be on how to increase testosterone levels, enhance vascular endothelial function, and find ways for medicinal plants to work together to make them more effective. This trend highlights the scientific effort to explore the potential of formulations that not only support sexual function but also impact overall reproductive health.

A review of the articles included in the study revealed that several polyherbal formulations had a synergistic impact. Synergistic effects in polyherbal formulations occur when the combined action of numerous herbs has a therapeutic impact greater than the sum of their individual effects, hence increasing efficacy

through complementary interactions. This is in contrast to additive effects, in which the herbs work separately to produce a total impact equal to the sum of their individual contributions, with no enhancement.[42]

A polyherbal formulation that demonstrates a synergistic effect consists of a hydroalcoholic extract of *Chlorophytum borivilianum*, an ethanolic extract of *Tribulus terrestris*, and a hydroalcoholic extract of *Withania somnifera*, all in a 1:1:1 ratio. The combination of these herbs exhibits a synergistic effect, allowing for potential dose reduction.[25] The combination of Apiaceae plant extracts (*Petroselinum crispum*, *Coriandrum sativum*, and *Apium graveolens*) also had a stronger aphrodisiac effect than their separate use, considerably increasing metrics such as mounting frequency, reduced latency times, and testosterone levels in male rats. This synergistic effect outperformed the results of individual extracts, demonstrating the combined formulation's higher efficacy in stimulating sexual activity and hormonal balance while minimizing side effects.[26] An additional interaction was identified between herbal therapy and a surgical technique. The synergistic interaction between an oral herbal formula and penile venous stripping (PVS) surgery in the treatment of erectile dysfunction results in substantially improved erectile function scores when the two therapies are combined. This combination offers patients complementary advantages, surpassing the efficacy of PVS or herbal treatment alone.[21]

Interactions between polyherbal formulations and conventional medications require scrutiny. Sildenafil, a Phosphodiesterase-5 (PDE-5) inhibitor commonly used as a conventional aphrodisiac, is recognized for its interactions with numerous herbal medications.[43] One of the herbal ingredients discussed in this study that interacts with sildenafil is pomegranate (*Punica granatum).* Recent studies suggest that pomegranate juice may be associated with low-flow priapism when ingested alongside sildenafil, as it potentially increases nitric oxide bioavailability and inhibits CYP3A4, the enzyme responsible for metabolising sildenafil, thereby raising its plasma levels[43,44] Clinical guidelines recommend against the simultaneous consumption of sildenafil and pomegranate juice to avert serious adverse effects such as priapism, and healthcare providers should educate patients about this interaction during treatment.

This study's findings suggest that developing polyherbal formulations as natural aphrodisiac products holds significant potential. In this regard, it is important to create formulations that are not only effective but also safe for long-term use. The pharmaceutical and nutraceutical industries can benefit from the results of this study by developing polyherbal-based products that meet clinical standards, especially for populations seeking natural alternatives to enhance sexual performance. When developing products, it is crucial to take into account the quality of raw materials and the sustainability of natural resources, particularly because some of the plants used in the formulation are rare and valuable.

The variability in plant composition caused by environmental conditions, harvest time, and processing processes can greatly affect the consistency of polyherbal formulations, which is essential for clinical applications. Standardizing raw materials by analyzing physical and chemical factors, including moisture content and active component concentrations, is crucial for ensuring quality and efficacy. Advanced methodologies such as high-performance liquid chromatography (HPLC) are frequently used for this objective.[45] Additional study is advised to establish more rigorous standardization techniques that account for heterogeneity among various plant species.

The increasing number of publications in recent years suggests growing scientific interest in polyherbal aphrodisiac formulations, aligning with the rising global demand for natural sexual health therapies. However, co-authorship analysis indicates that research remains fragmented with limited international collaboration, which may hinder the standardization and clinical translation of findings.

The narrative review provides further insight into how these bibliometric trends translate into research focus. The use of specific keywords, such as "aphrodisiac activity" and "polyherbal formulation" shows that a lot of work has gone into testing the effectiveness of combining several plants. The discovered synergistic effects of polyherbal formulations, which were discussed above, show how important it is to use multiple components in therapies to make them more effective and less harmful. These findings address the gaps

highlighted in the Introduction, emphasizing the need for further clinical validation and regulatory standardization of polyherbal formulations.

Further research is necessary to support the clinical translation of polyherbal formulations as aphrodisiac therapies. Well-designed randomized controlled trials (RCTs) are essential to validate their efficacy and safety in humans, determine optimal dosages, and assess long-term effects. Also, pharmacokinetic and pharmacodynamic studies are needed to learn about how the drug is broken down, how much of it is available in the body, and how it might interact with other drugs, such as phosphodiesterase-5 (PDE-5) inhibitors.

Standardization remains a major challenge in the clinical application of polyherbal formulations.[46,47] Variability in plant composition due to environmental factors, harvest timing, and processing techniques can affect consistency and therapeutic outcomes. Implementing Good Manufacturing Practices (GMP), quality control measures, and chemical fingerprinting techniques (e.g., HPLC) can help ensure product reliability and regulatory compliance. Greater collaboration between researchers, clinicians, and policymakers is necessary to harmonize regulations and facilitate product commercialization.

Furthermore, polyherbal formulations have the potential to be used as complementary therapies alongside synthetic drugs. Some studies show that some combinations of herbs may enhance the effects of PDE-5 inhibitors. In contrast, others show that there may be dangerous interactions between herbs and drugs that need to be carefully considered. Investigating these interactions through clinical trials and mechanistic studies is crucial to maximizing therapeutic benefits while minimizing risks. Addressing these aspects will contribute to the safe and effective integration of polyherbal formulations into modern clinical practice.

This study has several limitations. First, the reliance on bibliometric analysis means that while publication trends, co-authorship patterns, and keyword distributions were analyzed, the study does not assess the quality or methodological rigor of individual articles. Second, the small number of articles included in the narrative review (16 articles) may not fully represent the diversity of research on polyherbal aphrodisiacs, potentially introducing selection bias. Additionally, this study only utilized the Scopus database, which, while comprehensive, may not cover all relevant publications indexed in other databases such as PubMed or Web of Science. Moreover, only English-language articles were included, meaning that important studies published in other languages may have been excluded. These limitations should be considered when interpreting the findings, and future research should aim to incorporate multiple databases and broader language inclusion criteria to achieve a more comprehensive analysis.

CONCLUSION

This review offers an overview of recent research trends regarding polyherbal formulations with aphrodisiac potential, emphasizing the rise in publication output, common herbal combinations, and developing pharmacological themes. Polyherbal formulations are believed to exhibit greater synergistic effects than single-compound therapies, driving significant research interest in alternative treatments for sexual dysfunction. India is at the forefront of global research on polyherbal formulations, particularly in the area of aphrodisiacs. Bibliometric analysis reveals an increase in the number of publications, with research clusters focusing on bioactive compounds, pharmacological mechanisms, and clinical applications. Narrative analysis shows that *Tribulus terrestris*, *Withania somnifera*, and *Mucuna pruriens* are the herbs that have been studied the most, and they are all known for their aphrodisiac properties. Studies predominantly use animal models, emphasizing mechanisms such as testosterone regulation and vascular endothelial function to assess efficacy. Despite growing interest, challenges persist in standardization, clinical validation, and regulatory approval, with variability in herb compositions and a limited number of clinical trials hindering widespread adoption. Future research should focus on clinical validation, herb-drug interactions, and formulation standardization to facilitate the integration of polyherbal therapies into evidence-based sexual health treatments.

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CONFLICT OF INTEREST

There is no conflict of interest.

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