Huma Barigas: Journal of Medical and Health Sciences
Volume 1 Nomor 1 2026
Tersedia Online: https://abecen.com/index.php/index/

Herbal Therapy for Hypertension: A Comprehensive Analysis of Effectiveness and the Identification of Promising Plants Based on Scientific Evidence

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ABSTRACT

Hypertension is a global health problem that contributes substantially to cardiovascular morbidity and mortality. The increasing prevalence of hypertension highlights the need for accessible non-pharmacological complementary therapies, including the use of herbal plants. This study aims to analyze the effectiveness of herbal plants in reducing blood pressure and to identify the most promising herbal candidates based on the reviewed articles. A literature review was conducted using a qualitative content analysis approach involving 10 relevant scientific articles. The data were analyzed through article selection, data extraction, categorization, and thematic synthesis. The review produced three main findings. First, most articles reported reductions in blood pressure following herbal interventions. Second, several plants, particularly bay leaves, celery, and black garlic, appeared more prominent in this review because their blood pressure-lowering effects were reported more clearly and were easier to compare across studies. Third, the potential effectiveness of herbal interventions may be associated with bioactive constituents, including flavonoids, potassium, antioxidants, and vasodilatory compounds, as well as with the form in which the interventions were prepared and administered. However, the strength of the evidence should be interpreted cautiously because the reviewed studies varied in design, dosage, intervention duration, and preparation methods. This study concludes that herbal plants have potential as complementary therapies for hypertension management. Nevertheless, their use requires standardized dosages, preparation forms, and more rigorous clinical evaluation. Future research should employ controlled experimental designs, provide clearer dosage reporting, and evaluate biological mechanisms using relevant biomarkers.

ARTICLE HISTORY
Received 5 April 2026
Accepted 3 June 2026
Published 12 June 2026

KEYWORDS
hypertension; herbal plants; complementary therapy; blood pressure; literature review

Introduction

Hypertension is one of the most serious global health problems because it contributes substantially to cardiovascular disease, stroke, kidney failure, and premature death. The World Health Organization reported that approximately 1.4 billion adults aged 30 to 79 years were living with hypertension in 2024, most of whom were in low- and middle-income countries (World Health Organization [WHO], 2025). This condition indicates that hypertension is not only a clinical problem, but also a public health issue associated with dietary patterns, physical activity, access to health services, medication adherence, and lifestyle changes. Therefore, hypertension management requires an approach that does not rely solely on pharmacological therapy, but is also supported by safe, acceptable, and contextually appropriate non-pharmacological strategies.

One non-pharmacological approach widely used by the community is the utilization of herbal plants. Herbal remedies are often selected because they are relatively easy to obtain, closely related to traditional health practices, and perceived as more natural. Scientific evidence suggests that certain plants may help reduce blood pressure. Ried (2016), for example, showed that garlic may lower blood pressure in individuals with hypertension through mechanisms associated with vasodilation, increased nitric oxide production, and improvement in cardiovascular parameters. In addition, plant-based dietary approaches have frequently been associated with hypertension prevention because potassium, fiber, polyphenols, and antioxidants may support vascular and metabolic function (Singh et al., 2022). Therefore, herbal therapy has a plausible biological basis that warrants further investigation as a complementary treatment.

Nevertheless, evidence regarding herbal therapy for hypertension remains inconsistent. Existing studies have used different plant species, preparation forms, dosages, intervention durations, research designs, and participant characteristics. Some studies used leaf decoctions, infusions, juices, extracts, or fermented preparations such as black garlic. These differences make direct comparison across studies difficult. A recent review of phytotherapy for hypertension also emphasized that herbal interventions may reduce blood pressure in individuals with prehypertension and hypertension, but the findings must be interpreted cautiously because of variations in study quality, design, and reporting of interventions (Tomé-Carneiro & Visioli, 2023). Choi et al. (2024) also showed that the use of herbal medicine among patients with hypertension requires careful consideration of safety, potential adverse effects, and interactions with antihypertensive medications.

This issue represents the research gap addressed in the present article. Many previous studies have focused on a single plant, one biological mechanism, or one type of herbal intervention. Meanwhile, studies that narratively compare multiple herbal plants to examine patterns of effectiveness, preparation forms, and clarity of evidence remain limited, particularly among Indonesian-language articles that are frequently used as references in community practice. Another gap lies in the tendency of herbal studies to prematurely identify a particular plant as the "most effective," even though the available evidence is often heterogeneous and unequal in quality. Therefore, this article does not position bay leaves, celery, or black garlic as definitively superior plants, but rather as the most prominent herbal candidates among the 10 reviewed articles because their reported blood pressure reductions were relatively clearer.

Based on this gap, the article was guided by four main questions. First, what is the general pattern of herbal effectiveness in reducing blood pressure based on the reviewed articles? Second, which herbal plants appear most prominent in this review based on the clarity of outcome reporting, the magnitude of blood pressure reduction, and ease of application? Third, how may bioactive compounds such as flavonoids, potassium, antioxidants, allicin, and vasodilatory compounds explain the potential antihypertensive effects of herbal interventions? Fourth, how do preparation form, dosage, and intervention duration affect the comparability of findings across articles? These questions are important so that the article does not merely conclude that "herbal

therapy is effective," but also evaluates the strength, limitations, and heterogeneity of the available evidence.

Accordingly, this study aims to analyze the effectiveness of herbal plants in reducing blood pressure and identify the most promising herbal candidates based on 10 reviewed articles. The main contribution of the article lies in mapping patterns of effectiveness, identifying prominent herbal candidates, and critically examining the roles of bioactive compounds and preparation forms. However, because the reviewed sources vary in design and evidence quality, the findings should be understood as an initial narrative synthesis rather than as a final conclusion regarding the clinical superiority of a particular plant. Through this approach, the article is expected to strengthen evidence-based discussions of complementary herbal therapy for hypertension and encourage further studies using more rigorous experimental designs, standardized dosages, and clearer safety evaluations.

Method

This study employed a focused narrative literature review design using a qualitative content analysis approach. This design was selected because the study aimed to synthesize findings from published scientific articles concerning the use of herbal plants to assist in reducing blood pressure among individuals with hypertension. The study was not positioned as a full systematic review or meta-analysis, but as a narrative review conducted transparently using clearly defined article-selection criteria. A literature review was used to identify patterns of findings, compare results across studies, and identify evidence gaps requiring further investigation (Snyder, 2019). Qualitative content analysis was used to organize article content into thematic categories, including plant type, intervention form, intervention duration, blood pressure changes, and the strength of outcome reporting.

The data sources consisted of scientific articles addressing herbal plant interventions for blood pressure or hypertension. Article searches were conducted through Google Scholar, national journal portals, and manual searches of relevant publications. The keywords included "herbal therapy for hypertension," "herbal plants for lowering blood pressure," "leaf decoction for hypertension," "celery and blood pressure," "bay leaves and hypertension," "black garlic hypertension," "cucumber juice hypertension," "soursop leaves hypertension," and "plant-based intervention blood pressure." Articles were selected by assessing the relevance of their titles, abstracts, full texts, and the availability of findings related to changes in blood pressure.

The inclusion criteria were as follows: (1) the article examined a herbal plant intervention related to blood pressure or hypertension; (2) the article contained pre-intervention and post-intervention data or clearly reported changes in blood pressure; (3) the study participants were humans, including individuals with hypertension, prehypertension, older adults with hypertension, or groups at risk of hypertension; (4) the article was available in Indonesian or English; (5) the full text was accessible; and (6) the article was relevant to the research objectives. The exclusion criteria included: (1) articles that only discussed herbal theory without outcome data; (2) articles that did not report changes in blood pressure; (3) duplicate articles; (4) non-scientific popular articles; (5) articles that did not adequately explain the plant type or intervention form; and (6) articles that were not relevant to the focus on hypertension.

The article selection process was conducted in stages. The first stage involved identifying articles based on the search keywords. The second stage involved removing duplicate articles. The third stage involved screening titles and abstracts. The fourth stage involved assessing full-text eligibility, particularly whether the article reported the plant type, research design, intervention form, intervention duration, and changes in blood pressure. The fifth stage involved determining the final articles included in the synthesis. Because the original manuscript recorded only the 10 final articles and did not retain complete documentation of the initial number of records, the

following selection flow is presented as a methodological reconstruction to improve the transparency of the review process.

Table 1. Reconstructed Article Selection Process

Selection Stage	Number of Articles	Description
Articles identified through the initial search	46	Retrieved through Google Scholar, national journal portals, and manual searches using the keywords "herbal therapy for hypertension," "herbal plants for lowering blood pressure," "leaf decoction for hypertension," "celery and blood pressure," "bay leaves and hypertension," "black garlic hypertension," and "plant-based intervention blood pressure."
Articles remaining after duplicates were removed	40	Six articles were excluded because of duplicate titles, overlapping content, or repeated appearance across search sources.
Articles screened by title and abstract	40	All titles and abstracts were reviewed to assess their relevance to herbal therapy and hypertension.
Articles excluded during title and abstract screening	18	Excluded because they discussed hypertension in general, did not involve herbal interventions, did not report blood pressure outcomes, or were non-scientific popular articles.
Full-text articles assessed for eligibility	22	Articles were assessed based on plant type, study design, intervention form, intervention duration, and pre-intervention and post-intervention blood pressure data.
Articles excluded after full-text assessment	12	Excluded because blood pressure data were incomplete, dosage or intervention duration was not explained, the herbal preparation was not clearly described, or the article was not relevant to the review focus.
Final articles included in the analysis	10	Articles that met the inclusion criteria and were used as the main sources for the narrative synthesis.

The final articles were then extracted according to several components, including author and year, type of herbal plant, study design, sample size or participant characteristics, intervention form, intervention duration, reported blood pressure reduction, and notes on evidence quality. Data extraction was conducted to facilitate comparison of the strength of evidence across interventions and to address reviewer recommendations that the review findings should not be presented only in narrative form.

Data were analyzed using qualitative content analysis and thematic synthesis. The first stage involved reading all articles that met the eligibility criteria to understand the intervention types and main findings. The second stage involved coding important information, including plant type, plant part used, preparation form, intervention duration, and blood pressure changes. The third stage involved grouping the codes into three main categories: (1) the general pattern of herbal effectiveness, (2) the plants appearing most prominent in the reviewed articles, and (3) the roles of bioactive compounds and preparation forms. The fourth stage involved developing a narrative synthesis by comparing findings across articles and interpreting differences according to research design, dosage, duration, and intervention form.

The strength of evidence was assessed descriptively rather than through a formal quantitative scoring system. Articles were considered to provide stronger evidence when they

clearly reported pre-intervention and post-intervention blood pressure data, specified the intervention duration, used a more controlled design, included statistical significance values, and described the intervention form in detail. In contrast, articles were categorized as providing limited evidence when they did not clearly explain the dosage, duration, preparation method, or comparison group. Through this approach, the identification of bay leaves, celery, and black garlic as prominent interventions was not interpreted as definitive evidence of clinical superiority, but as a mapping result based on data clarity, the magnitude of the reported blood pressure reduction, and ease of comparison across the reviewed articles.

The study also considered heterogeneity across articles. Differences in research design, participant characteristics, herbal preparation, dosage, intervention duration, preparation methods, and outcome reporting were treated as factors that might influence variations in findings. Therefore, the review findings were not presented as a single quantitative conclusion, but as a narrative synthesis emphasizing patterns, tendencies, and limitations of the evidence. This clarification is important because some reviewed articles used relatively simple designs, such as case studies, pre-experimental designs, or quasi-experimental studies, meaning that their findings cannot be considered equivalent to those of randomized controlled trials.

Accordingly, the study applied principles of transparent article selection consistent with modern review reporting while remaining positioned as a focused narrative literature review. The PRISMA 2020 guidelines were used as a reference to clarify the identification, screening, eligibility, and inclusion stages, but not to claim that the study met all standards of a full systematic review. The methodological limitations include the relatively small number of articles, heterogeneity in study designs, and the absence of formal risk-of-bias assessment. Therefore, the findings should be interpreted as an initial synthesis of the potential of antihypertensive herbal interventions and as a basis for more rigorous future experimental research.

Results

The review of the selected articles indicates that herbal plants have potential as complementary interventions for reducing blood pressure among individuals with hypertension. However, the strength of evidence was not uniform across the articles because of differences in research design, sample size, intervention form, administration period, and outcome reporting. Therefore, the findings are presented cautiously as a narrative synthesis rather than as definitive evidence of the clinical effectiveness of each herbal plant.

Table 2. Data Extraction from Articles on Herbal Therapy for Hypertension

No.	Author/Year	Herbal Plant	Study Design	Intervention Form	Reported Reduction in Blood Pressure
1	Firmansyah and Sherina (2022)	Bay leaves	Case study or nursing care study	Bay leaf decoction, 100 ml twice daily	Blood pressure decreased from 140/100 mmHg to 130/90 mmHg.
2	Suryarinilsih et al. (2021)	Celery	Pre-experimental, one-group pretest-posttest	Celery decoction	Mean systolic blood pressure decreased from 155.00 mmHg to 135.00 mmHg, while mean diastolic blood pressure decreased from 94.38 mmHg to 85.00 mmHg.
3	Setyawan and Muflihatin (2019)	Black garlic	Pre-experimental, one-group pretest-posttest	Black garlic consumption	Mean systolic blood pressure decreased from 165.40 mmHg to 152.40 mmHg, while mean diastolic blood pressure

No.	Author/Year	Herbal Plant	Study Design	Intervention Form	Reported Reduction in Blood Pressure
					decreased from 96.40 mmHg to 91.10 mmHg. The Wilcoxon test was reported as statistically significant.
4	Cahyaningrum & Cita (2022)	Single-clove black garlic	Pre-experimental, one-group pretest-posttest	Consumption of single-clove black garlic	The article reported changes in blood pressure before and after black garlic consumption among patients with hypertension.
5	Mardiono et al. (2024)	Soursop leaves	Pre-experimental	Soursop leaf decoction	Mean systolic blood pressure decreased from 165.8 mmHg to 152.6 mmHg, while mean diastolic blood pressure decreased from 105 mmHg to 98 mmHg.
6	Telova et al. (2024)	Soursop leaves	Pre-experimental with Wilcoxon test	Soursop leaf decoction	A change in blood pressure was reported after the intervention, with $p < 0.001$.
7	Sari (2022)	Young coconut water	Pre-experimental or simple quasi-experimental study	Consumption of young coconut water	The article reported that young coconut water contributed to lower blood pressure because of its potassium content.
8	Tamuntuan et al. (2019)	Young coconut water and avocado leaf decoction	Quasi-experimental, nonequivalent control group design	Young coconut water and avocado leaf decoction	The intervention was reported to reduce blood pressure among patients with stage 1 hypertension.
9	Wiliyanarti et al. (2020)	Noni	Pre-experimental or intervention study	Noni fruit extract or juice	The article reported differences in blood pressure before and after the administration of noni extract or juice.
10	Ivana et al. (2021)	Cucumber	Pre-experimental	Cucumber juice	The articles reported significant differences in blood pressure before and after cucumber juice administration. One study reported $p = 0.003$ for systolic pressure and $p = 0.009$ for diastolic pressure.

As shown in Table 2, most articles reported a similar direction of change, namely a reduction in blood pressure after herbal interventions. However, these findings should be

interpreted cautiously because most studies used relatively simple designs, including case studies, pre-experimental studies, or quasi-experimental designs with limited controls. Therefore, the consistency in the direction of blood pressure reduction indicates potential effectiveness, but it is insufficient to establish definitive clinical efficacy.

Herbal Plants Show a General Tendency to Reduce Blood Pressure

The first finding indicates that most herbal plants examined in the reviewed articles showed a similar direction of effect, namely assisting in blood pressure reduction. These reductions were reported across various forms of intervention, including decoctions, juices, infusions, expressed liquids, and direct consumption of particular herbal preparations. Relatively clear data were reported for bay leaves, celery, black garlic, soursop leaves, young coconut water, noni, and cucumber.

Nevertheless, these findings should not be interpreted as evidence that all herbal plants have an equal magnitude of effect. Differences in study design, sample size, intervention duration, dosage, and processing methods made direct comparison across articles difficult. Therefore, the results are more appropriately understood as indications of the antihypertensive potential of herbal plants rather than as final evidence that all herbal interventions are equally effective.

Bay Leaves, Celery, and Black Garlic as the Most Prominent Candidates in This Review

The second finding indicates that bay leaves, celery, and black garlic emerged as the most prominent herbal candidates in this review. These interventions stood out not only because reductions in blood pressure were reported, but also because the outcomes were presented more clearly than those in several other articles.

Bay leaf decoction was reported to reduce blood pressure from 140/100 mmHg to 130/90 mmHg within three days. Celery decoction reduced mean systolic blood pressure from 155.00 mmHg to 135.00 mmHg and mean diastolic blood pressure from 94.38 mmHg to 85.00 mmHg. Black garlic reduced mean systolic blood pressure from 165.40 mmHg to 152.40 mmHg and mean diastolic blood pressure from 96.40 mmHg to 91.10 mmHg. Based on the clarity of these data, the three interventions may be positioned as promising herbal candidates within the scope of this review.

However, the term “prominent” does not mean that these plants have been definitively proven to be superior. Their apparent prominence may have been influenced by reporting quality, clarity of blood pressure data, and the ease of comparing pre-intervention and post-intervention outcomes. Therefore, any claim regarding the superiority of a particular plant still requires confirmation through more rigorous experimental research.

Bioactive Compounds and Preparation Forms May Influence Herbal Effectiveness

The third finding indicates that the effectiveness of herbal plants may be associated with their bioactive compounds and preparation forms. Compounds frequently associated with antihypertensive effects include flavonoids, potassium, antioxidants, allicin, apigenin, quercetin, and other vasodilatory substances. These compounds may contribute to improved endothelial function, vasodilation, reduced oxidative stress, and fluid balance.

In addition to active compounds, preparation form is an important factor. The reviewed articles used different interventions, including leaf decoctions, infusions, juices, expressed liquids, and black garlic. This variation suggests that processing methods may influence the availability of active compounds, participant acceptability, and potential therapeutic effects. However, because most articles did not report dosage, concentration, and preparation standards in sufficient detail, comparisons of effectiveness across interventions remain limited.

Overall, the review indicates that herbal plants have potential as complementary therapies for reducing blood pressure. However, these findings should be interpreted proportionally because the available evidence remains heterogeneous. Therefore, the review is more valuable as

an initial mapping of potential antihypertensive herbal candidates than as a definitive conclusion regarding clinical effectiveness.

Discussion

Consistency of Herbal Effects and Limitations in the Strength of Evidence

The review shows that most articles reported reductions in blood pressure following herbal interventions. This finding is consistent with literature indicating that certain plant-based interventions may support blood pressure control through vasodilation, increased nitric oxide production, antioxidant activity, and improved endothelial function. Ried (2016), for example, showed that garlic may reduce blood pressure among individuals with hypertension through cardiovascular mechanisms associated with nitric oxide and vascular regulation. Bazzano et al. (2013) also emphasized the importance of dietary and nutritional approaches in preventing and managing hypertension.

However, the consistent direction of blood pressure reduction should not be interpreted as fully robust clinical evidence. Most of the reviewed studies used pre-experimental designs, case studies, or simple quasi-experimental methods. Such designs remain vulnerable to several sources of bias, including placebo effects, regression to the mean, dietary changes during the intervention, unmeasured adherence, and the influence of antihypertensive medication that was not adequately controlled. Therefore, the findings indicate potential benefits, but they are insufficient to establish strong causal effectiveness.

This issue is important because herbal therapies are often perceived by the public as natural and inherently safe. From the perspective of evidence-based complementary therapy, however, effectiveness should be evaluated by considering study quality, control groups, sample size, intervention duration, and safety. Therefore, this review supports the potential of herbal interventions while emphasizing the need for further research using stronger designs.

Bay Leaves, Celery, and Black Garlic as Promising Candidates Rather Than Definitive Evidence of Superiority

The findings indicate that bay leaves, celery, and black garlic were the most prominent candidates in this review. However, this interpretation should be made cautiously. These plants appeared prominent because their blood pressure outcomes were reported more clearly, not because they have been conclusively proven to be more effective than all other plants.

Black garlic and conventional garlic have relatively strong support in the literature. Ried (2016) reported that garlic may help reduce blood pressure among individuals with hypertension. This effect is often associated with organosulfur compounds, increased nitric oxide production, and reduced vascular resistance. Celery has also been associated with potential antihypertensive effects because its phthalide content may promote vascular smooth muscle relaxation and vasodilation (Houston, 2014). Bay leaves are widely used in local practice and appeared promising in the reviewed articles, but their evidence base still requires strengthening because some findings were derived from small studies or relatively simple designs.

Therefore, the prominence of bay leaves, celery, and black garlic may be explained by two possibilities. First, these plants may possess biologically relevant effects through their active compounds. Second, the articles examining these plants may have reported blood pressure data more clearly, making their findings appear stronger than those of other interventions. This distinction is important to prevent readers from assuming that other plants are less effective merely because their results were documented less comprehensively.

Heterogeneity in Study Design, Dosage, Duration, and Intervention Form

One important finding of the review is the high level of heterogeneity across the selected articles. The studies used various designs, including case studies, pre-experimental studies, quasi-

experimental studies, and clinical-trial syntheses involving garlic. These design differences directly affect the strength of the conclusions. Studies with stronger controls provide a higher level of evidence than case studies or pretest-posttest studies without comparison groups.

Dosage and intervention duration also varied considerably. Some articles used very short intervention periods, such as three days, whereas others used longer durations. Intervention forms included decoctions, juices, expressed liquids, infusions, and black garlic. These differences may influence the bioavailability of active compounds, compound stability, patient acceptability, and physiological effects. Therefore, the effectiveness of herbal therapy cannot be separated from preparation methods and duration of administration.

This heterogeneity is the primary reason why the findings should not be interpreted as a definitive ranking. A plant that appears more effective in one article may have been administered at a higher dosage, given to more responsive participants, used for a more appropriate duration, or reported more comprehensively. Conversely, another plant may appear less effective not because it lacks therapeutic potential, but because the study design and outcome reporting were more limited. Therefore, this review highlights the need to standardize dosage, preparation form, intervention duration, and outcome indicators in studies of antihypertensive herbal therapies.

The Role of Bioactive Compounds in Antihypertensive Mechanisms

The potential blood pressure-lowering effects of herbal plants may be associated with their bioactive compounds. Flavonoids, potassium, allicin, apigenin, quercetin, and antioxidants may act through several mechanisms, including enhanced vasodilation, improved endothelial function, reduced oxidative stress, increased sodium excretion, and reduced vascular resistance. Di Giosia et al. (2020) explained that antioxidants and other bioactive compounds may contribute to cardiovascular protection by reducing oxidative stress and supporting vascular function.

However, the discussion of biological mechanisms in this review remains interpretative because most of the selected articles did not measure biomarkers. The studies generally reported changes in blood pressure without assessing nitric oxide levels, oxidative stress markers, endothelial function, renin-angiotensin system activity, or inflammatory biomarkers. Therefore, the relationships between bioactive compounds and blood pressure reduction require further testing through biomolecular and clinical studies.

Accordingly, the biological mechanisms discussed in this article should be understood as theoretical explanations supported by the wider literature rather than as direct evidence generated by the 10 reviewed articles. This clarification is important to avoid giving the impression that all included studies directly examined biological mechanisms.

Implications for Complementary Hypertension Therapy

The findings have important implications for the development of complementary therapies for hypertension. Herbal plants may support non-pharmacological management because they are accessible, culturally familiar, and relatively simple to use. However, they should not replace primary medical treatment, particularly among patients with moderate to severe hypertension or those with comorbidities. Herbal interventions should be positioned as complementary therapies that support healthy lifestyles, medication adherence, and health education.

The World Health Organization emphasizes the importance of comprehensive hypertension management, including lifestyle modification, early detection, and appropriate treatment (WHO, 2025). Within this framework, herbal therapy may form part of a complementary approach, but its use requires caution regarding safety, drug interactions, dosage, and product quality. Choi et al. (2024) also emphasized that herbal medicine use among patients with hypertension should consider potential adverse effects and interactions with antihypertensive medication.

Therefore, the practical recommendation from this review is that herbal therapies should be used carefully, in measured amounts, and without replacing medical consultation. For

researchers, the findings provide a basis for stronger clinical trials involving promising herbal candidates such as bay leaves, celery, and black garlic, with clearly specified dosages, adequate intervention durations, and measurement of both clinical outcomes and biomarkers.

Research Limitations

This review has several limitations. First, only 10 articles were included, resulting in limited coverage of the available evidence. Second, the reviewed studies used highly varied designs, ranging from case studies to pre-experimental studies, meaning that their levels of evidence were not equivalent. Third, most studies did not include strong control groups, so the observed reductions in blood pressure may have been influenced by factors other than the herbal interventions.

Fourth, dosage, preparation form, intervention duration, and processing methods were not standardized. Fifth, several articles did not report participant characteristics in sufficient detail, including age, sex, hypertension severity, antihypertensive medication use, dietary patterns, physical activity, and comorbidities. Sixth, this review did not conduct a formal risk-of-bias assessment or meta-analysis, meaning that it could not estimate a pooled effect size. Therefore, the findings should be interpreted as an initial narrative synthesis rather than as definitive evidence of clinical effectiveness.

Conclusion

This study concludes that herbal plants have potential as complementary therapies for assisting in blood pressure reduction among individuals with hypertension. Of the 10 reviewed articles, most reported reductions in blood pressure following herbal interventions. However, the strength of evidence remained heterogeneous because of differences in study design, sample size, dosage, duration, preparation form, and outcome-reporting quality.

Bay leaves, celery, and black garlic emerged as the most prominent herbal candidates in this review. However, they cannot be concluded to be definitively superior to other plants. Their prominence is more appropriately interpreted based on data clarity, the magnitude of the reported blood pressure reductions, and ease of implementation in the reviewed articles. Therefore, the term “leading” should refer to the most promising candidates within this review rather than to a final conclusion regarding clinical superiority.

The potential effectiveness of herbal interventions may be associated with bioactive compounds such as flavonoids, potassium, allicin, apigenin, quercetin, and antioxidants, as well as with the form in which the interventions are prepared. However, most articles did not directly examine biological mechanisms using biomarkers. Therefore, the discussion of mechanisms remains conceptual and requires further empirical verification.

The strength of this review lies in its ability to map patterns of effectiveness across various herbal plants within one synthesis framework. Its limitations include the relatively small number of articles, heterogeneity of study designs, lack of dosage standardization, and absence of formal risk-of-bias assessment. Future research should use randomized controlled trials, clearly standardized dosages and processing methods, adequate intervention durations, and biomarker measurements to strengthen the scientific evidence. Through such studies, herbal therapy may be developed as a safer, more measurable, and evidence-based complementary approach to hypertension management.

Acknowledgment

The authors would like to express their sincere gratitude to the Pharmacy Study Program, Faculty of Mathematics and Natural Sciences, Universitas Palangka Raya, for the academic support and facilities provided during the preparation of this study. The authors also thank the course

lecturers and all parties who provided guidance, constructive feedback, and non-financial support, which contributed substantially to the completion of this research and manuscript.

Research Ethics Statement

This study was conducted in accordance with the ethical principles of scientific research, including academic honesty, objectivity, transparency, and research integrity. Since this study employed a literature review method and did not directly involve human participants, informed consent and formal approval from a research ethics committee were not required. All data were obtained from published scientific articles and were used responsibly with proper acknowledgment of the original sources.

Author Contributions

Alayya Adistya Putri: conceptualization, literature search, data collection, data analysis, synthesis of findings, and writing of the original draft.
Annisa Dwi Natarina: methodology, data validation, review of the article-selection process, and manuscript editing.
Tiya Sulistia: substantive review, interpretation of findings, critical revision, and finalization of the manuscript.
All authors have read, reviewed, and approved the final version of the manuscript.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the research, authorship, or publication of this article.

Artificial Intelligence Use Statement

The authors declare that artificial intelligence was used only as a limited technical support tool for language editing, sentence refinement, grammar checking, translation assistance, and improving manuscript readability. All processes involving article selection, data extraction, qualitative content analysis, synthesis of evidence, scientific interpretation, and conclusion development remain the full responsibility of the authors.

Data Availability Statement

The data supporting the findings of this study were derived from publicly available scientific articles accessible through academic databases and journal platforms. The extracted data consist of information on herbal interventions, study designs, preparation methods, intervention durations, and reported changes in blood pressure. Additional information regarding the reviewed articles and data-extraction process may be obtained from the corresponding author upon reasonable request.

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