

# Effects and mechanisms of medicinal plants on diaper dermatitis: A systematic review

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## Abstract

Diaper dermatitis (DD) is one of the most common skin disorders in infants and, if not treated properly, causes several complications such as infection, pain, and itching. The present review was conducted to report the findings on the action mechanisms and effects of medicinal plants on the treatment of DD and diaper rash.

The key words “diaper dermatitis” or “diaper rash” or “nappy rash” in combination with “medicinal plant”, “herb\*”, and “phyto\*” were used to conduct this review. Relevant articles were retrieved from databases including Institute for Scientific Information (ISI), PubMed, Scopus, Islamic World Science Citation Database (ISC) and Google Scholar.

Medicinal plants and plant-based compounds reduce and treat DD mainly due to their anti-inflammatory, antimicrobial (mainly antibacterial and antifungal), and antioxidant properties. Helping to accelerate the recovery and regeneration of the skin and to reduce moisture in the diaper environment is another mechanism of medicinal plants, for treating DD. Plants such as *Calendula officinalis*, *Matricaria chamomilla* L., *A. barbadensis* Mill., *Prunusdulcis*, *Hamamelis*, and *Lawsonia inermis* L. can be useful to treat this condition.

Medicinal plants and their compounds comprise an effective treatment for DD and can be used as a supplementary or adjuvant therapy because of low cost, easy use, availability, and lack of systemic effects.

**Key words:** Medicinal plant; Diaper dermatitis; Diaper rash.

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## Introduction

Diaper dermatitis (DD) is one of the most common disorders in infants (1), which is caused either directly by diapers or by the environment caused by the diaper (2). DD is associated with several factors; for example, contact dermatitis (3), allergic contact dermatitis, and fungal, viral, and bacterial infections that can cause suck disorder and, following such infections, certain complications such as skin rashes appear. (4).

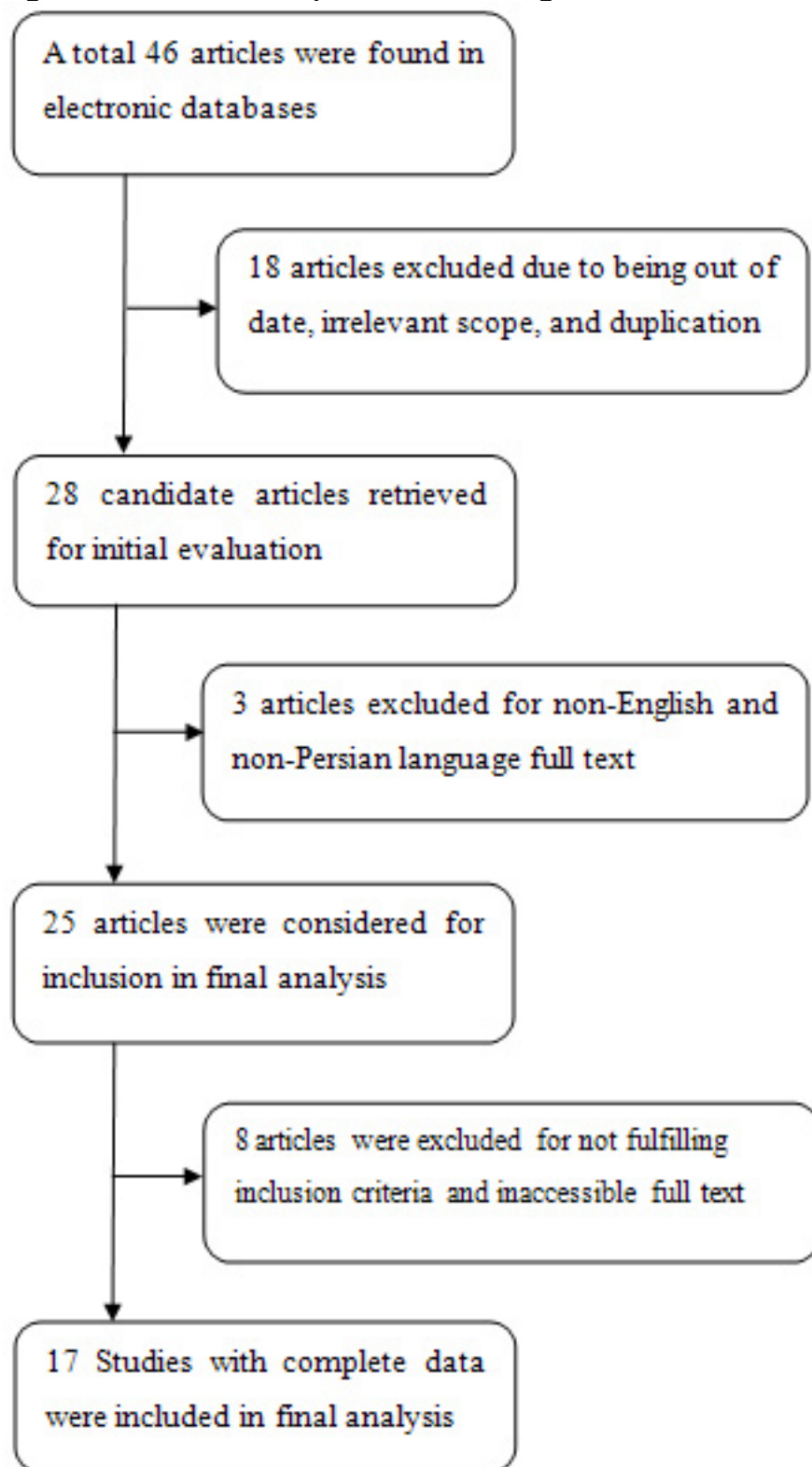
Itching, infection, and pain are the symptoms of DD (1, 5). If this disorder is caused by allergic reactions and leads to an increase in IgE, it requires a more complex treatment process (6). There are several therapies for treating this disorder depending on pH balance, microbial load, and moisture (6-8).

Today, chemical and plant treatments are of particular importance for the treatment of various disorders and diseases (4, 9, 10). Meanwhile, the use of medicinal plants is increasing due to their comparatively fewer side effects and lower cost. Medicinal plants can represent effective treatments for various disorders (19-19), including dermatological diseases (20). Hence, in this study, we examined the medicinal plants and plant-based compounds affecting the treatment of DD and diaper rash.

## Materials and Methods

The key words diaper dermatitis or diaper rash or nappy rash in combination with medicinal plant, herb, and phyto as well as the Endnote software were used to retrieve the relevant articles from the databases InstituteForScientificInformation, PubMed, Scopus, Islamic World Science Citation Database, and Google Scholar. Then, the plants and the plant-based products that had been reported to be effective on diaper dermatitis and diaper rash were selected according to the comments of two colleagues. The articles included in this review were published between 2005 and 2017. The articles whose full texts were not accessible, studies with non-positive effects, published in non-English and non-Persian language, and not related to the purpose of this study were excluded after the authors' agreement was achieved. Figure 1 illustrates the process of selecting the articles for final analysis.

Figure 1. Flowchart of the process of selecting articles



## Results

Plants are rich sources of effective compounds that can be used to treat skin diseases and cutaneous lesions by certain routes of administration such as topical, oral, and acupunctural use (20, 21). Medicinal plants and plant-based compounds, through various mechanisms, can be effective in reduce complications of, or treatment of DD (Table 1).

**Table 1: Effective medicinal plants for diaper dermatitis**

Plant names	Method of application	Main effects and action mechanisms	References
<i>Calendula officinalis</i>	Cream/Ointment	Antibacterial, anti-inflammatory, water-absorbing and skin-protecting properties and as a result accelerating improvement of lesions	(22-27)
<i>Matricaria chamomilla</i> L.(Chamomile )	Ointment	Antibacterial and anti-inflammatory effects and reducing rash sites	(24, 27)
<i>A. barbadensis</i> Mill. (Aloe vera)	Methanol extract	Antibacterial and anti-allergic effect	(28)
<i>Lawsonia inermis</i> L.(Henna)	Dried leaves	Reducing the severity of diaper dermatitis	(29)
<i>Prunus dulcis</i> (Almond)	Oil-based ointment	Decreasing frequency or completely treating diaper dermatitis, improving dryness and exerting protective effect against future episodes of diaper dermatitis	(7)
<i>Hamamelis</i> (Witch-hazel)	Ointment	Reducing total scores of signs and symptoms of skin injuries, diaper dermatitis, or localized inflammation of skin	(30)

In addition, there are other medicinal and nature-based compounds that reduce the symptoms of DD in many ways. As an example, a natural combination of honey, olive oil, and beeswax can reduce the complications of DD by reducing prostaglandin synthesis, inhibiting fungal or bacterial growth, increasing nitric oxide concentrations in the lesions, and exerting antioxidant and anti-inflammatory effects (31).

A topical application of a plant combination was investigated in an innovative manner. This combination consisted of zinc oxide (serving as a barrier material), cod liver oil (for conditioning; source of vitamins A and D), lavender and chamomile (for fragrance), natural vitamin E (for skin conditioning), lanolin (for skin conditioning), fragrance, petrolatum or petroleum jelly (serving as a barrier material), talc, and purified water. It was found that this combination can be used to treat diaper rash by exerting antimicrobial effects and due to a compound, namely, anthocyanin (32, 33).

In the study of Chatterjee et al., a herbal cream was studied for its therapeutic effects on diaper-like skin rashes. That study showed that its antibacterial properties were due to a compound called zinc calx, *Aloe vera*, *Vitexnegundo*, and *Rubia cordifolia*, its anti-inflammatory properties were attributed to *A. vera*, *V. negundo*, and *R. cordifolia*, which in turn have wound-healing activity due to the presence of *A. vera*, and its antioxidant properties were due to *V. negundo*, *Prunus amygdalus*, and *R. cordifolia* (34).

Another compound consisting of honey, beeswax and olive oil was studied by El Sakka et al. In that study, it was found that this natural combination could be used as an

alternative or a complementary treatment for the treatment of DD (35).

Obviously, it should be kept in mind that some herbs (even those that have been reported to be effective in the treatment of dermatitis) have not only no healing properties for the skin, but their use or contact with skin can cause dermatitis as an allergen.

Therefore, necessary precautions should be taken into account even in local and dermal application of medicinal plants (36, 37).

In some studies, the response to herbal treatments was less encouraging than that to chemical treatments, and was found to have no effect on the treatment of DD (38). The design, sample size, and randomisation can lead to different results in clinical trials.

But, in general, it seems that medicinal plants protect against H<sub>2</sub>O<sub>2</sub>-induced oxidative stress due to their antioxidant properties (such as phenolic compounds) on keratinocytes (39, 40).

Also, medicinal herbs can reduce the microbial activity of damaged skin environment by affecting certain bacteria such as *Streptococcus pyogenes*, *Staphylococcus aureus*, and methicillin-resistant *S. aureus* (MRSA), exerting antibacterial effect, and making growth medium inappropriate for bacterial growth and pathogenic fungi (41-44).

For example, the ethanolic extract of *Calendula officinalis* can have antimicrobial activity against *Escherichiacoli*, *Vibrio cholera*, and *Candida albicans*.



Its methanol extract can also have antifungal activity against *C. albicans*, and its chloroform and acetone can have antimicrobial activity against *E. coli* (45).

Medicinal plants and their derivatives have generally been shown to reduce Scoring Atopic Dermatitis (SCORAD) index, erythematic intensity, pruritis, itching, and trans-epidermal water loss (TEWL), as well as to improve skin sebum contents, hydration level, and expression of various inflammatory mediators (21). Considering the increasing importance of taking medicinal herbs in the treatment of various diseases in Iran (46-58), topical use of medicinal herbs can be used in children for safety reasons.

## Conclusion

The use of medicinal plants and their compounds is an effective therapeutic strategy for DD. They can be used as supplementary or adjuvant therapy because of their low cost, easy use, availability, and lack of systemic effects. But using them in some infants and children may have allergic reactions that should be addressed and avoided.

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