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INFLUENCE OF SOLVENT EXTRACTION ON THE ANTI-PSORIATIC ACTIVITY OF MANGIFERA INDICA FLOWER EXTRACTS

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Abstract

Mangifera indica (M. indica), commonly known as mango, is a well-known medicinal plant in Ayurvedic medicine, traditionally used to treat a variety of diseases and disorders. The present study aimed to evaluate the anti-psoriatic potential of M. indica flower extracts prepared using different solvents, with the goal of developing a topical anti-psoriatic spray.

Fresh M. indica flowers were collected from Multan Mango Farm and processed through maceration and grinding using n-hexane, ethanol, and olive oil as solvents. Extracts were stored in airtight glass bottles for seven days, followed by filtration through double-layered muslin cloth. The filtrates were concentrated using a rotary evaporator at 37 °C under reduced pressure to prepare 5%, 10%, and 20% (w/v) solutions in their respective solvents. These formulations were topically applied using spray bottles to Aldara (5% imiquimod)-induced psoriatic skin lesions in rabbits.

A total of 33 rabbits (mean age 34.62 ± 5.11 years) were included, with 27 assigned to the experimental groups and 3 each to positive and negative controls. Corticosteroid ointment and distilled water served as standard and placebo controls, respectively. Notably, 100% recovery from psoriatic symptoms was observed in rabbits treated with the olive oil–based M. indica flower extract, representing 33.33% of the experimental group. Statistical analyses were conducted using SPSS version 22 on the collected data.

The findings demonstrate the therapeutic potential of M. indica flower extracts in alleviating psoriasis symptoms. Variations in efficacy among solvent extracts highlight the importance of solvent selection for optimizing the extraction of bioactive compounds. These results also underscore the promise of natural remedies as safer alternatives to conventional allopathic treatments, which often carry adverse effects.

1. INTRODUCTION

About 1-3% of people worldwide suffer from psoriasis, an inflammatory skin condition that is chronic, genetically based, and immunologically related1. The origin of the disease name is from the Greek word 'psora' which means 'itch2. It is believed to be a chronic skin illness characterized by red areas coated in white scales and an immune system issue that causes skin cells to develop more quickly than normal. There are

several types of psoriasis, and each one has its signs and symptoms. Psoriasis Vulgaris, often known as chronic plaque psoriasis, is the most typical form of the condition. However, the condition can also be divided into four separate subtypes, including inverse, postural, guttate, and erythrodermic psoriasis3. An injury to the skin, such as a cut, scrape, insect bite, or sunburn, which triggers the Keener response, excessive alcohol use, smoking, stress, and hormonal fluctuations, especially in women, are common causes of psoriasis. A significant skin condition called psoriasis can have a negative impact on a person's social and professional life as well as other aspects of daily living. The physical and

psychological symptoms of psoriasis are comparable to those of cancer, heart disease, diabetes, or depression. Epidermal hyperplasia (abnormal differentiation and inadequate maturation of keratinocytes), a thicker epidermis, and a diminished or nonexistent granular layer is the histological features. Fast epidermal keratinocyte hyperproliferation and differentiation, which require 7–10 days instead of 28–50 days for healthy skin.

Recent research on the immunologic causes of the condition has fundamentally altered psoriasis treatment and led to the development of novel medications. Biotechnological medications also referred to as biological drugs, are the new psoriasis treatments. Topical therapies could include Medications including corticosteroids, vitamin D analogues, and retinoids are frequently used in topical creams, ointments, and gels that are used to treat mild to moderate psoriasis. Although some people may acquire a tolerance to topical corticosteroids, chronic use of these drugs can thin the skin. A typical treatment for moderate to severe psoriasis is phototherapy, sometimes referred to as ultraviolet (UV) light therapy 4. UV light therapy may not be appropriate for people with a history of skin cancer or other skin problems since it can raise the chance of developing skin cancer 5-6.

Combination therapy: Combining different types of treatment can be more effective than using just one type. However, it can also increase the risk of side effects and drug interactions. Maintaining a healthy diet, avoiding smoking and alcohol, and managing stress can also be beneficial for managing psoriasis symptoms. However, lifestyle changes alone may not be effective in treating moderate to severe psoriasis

7.There are several plants and plant-based compounds that have been studied for their potential use in treating psoriasis. However, not all of these treatments are equally effective. Aloe Vera gel has been used traditionally to treat skin

conditions, including psoriasis 8.

1. METHODOLOGY

The study was conducted according to the rules of Institute of Laboratory, Commission of Life Sciences, Natural research council (Murray et al., 1999) and approved by The Ethical Committee of Muhammad Institute of Medical and Allied sciences Multan, Pakistan via letter number EC/MIMAS-PK- 1812 dated 18th of June 2023. Participants were randomly assigned into groups for evaluation of anti- psoriatic activity of *Mangifera indica* (*M. indica*) fresh flower extract in a different solvent. Different reagents, solvents, inducer and the standard drug required for experimental procedures were of highest purity.

The flowers of *M. indica* was collected from Multan Mango Farm, it's also called Achari/Desi Aam (Raw Mango) in local areas of Pakistan that have tangy taste and identified by a Botanist from Bahauddin University Multan (BZU). *M. indica* flowers extract was prepared by macerated grinding of 350grams of

M. indica flowers with 500 mL of each solvent (n hexane, ethanol and olive oil). The evaporation of crude extract was done through rotary evaporator at 37°C under very low pressure to get stock solution from all solvents separately. Stock solutions were prepared by dilution method of (5%, 10% and 20%) W/V with their concerned solvents and stored at 4 °C in sprayer bottles[9] as elaborated in Figure.1.

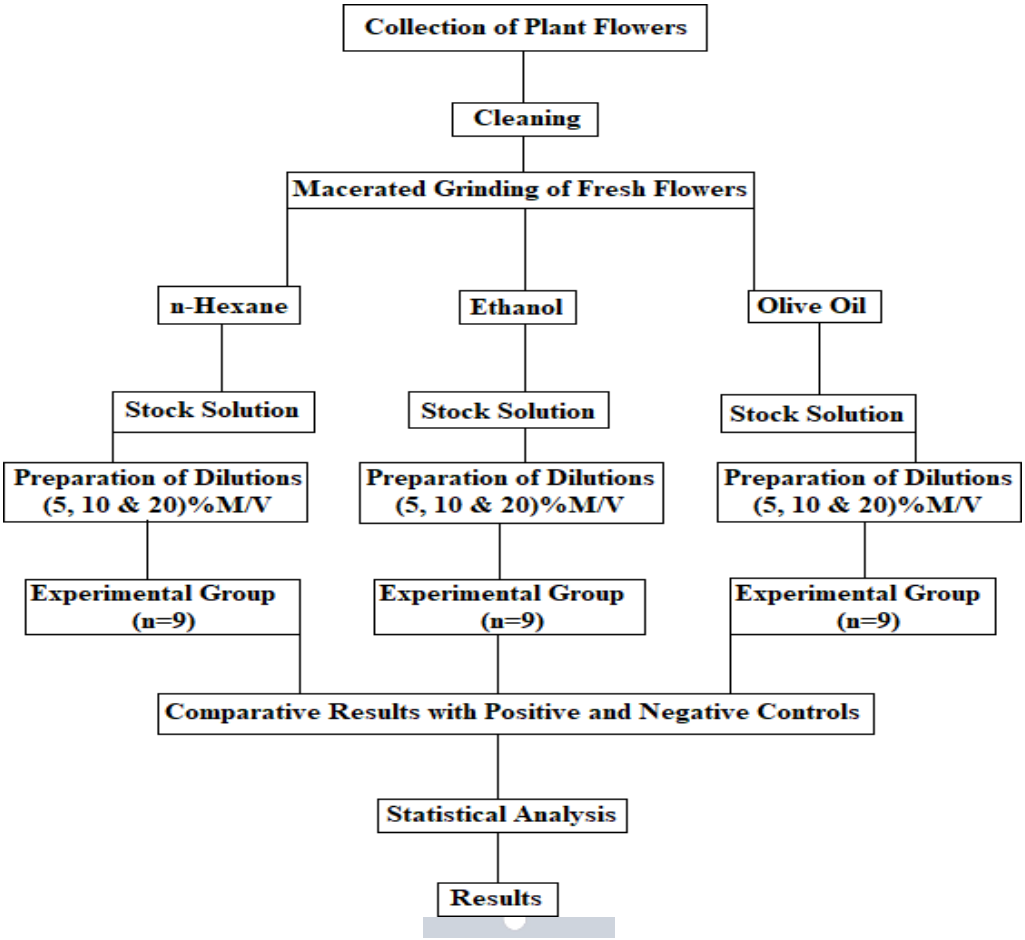

Figure 1. "Methodological Overview: M. Indica Flower Extract Production via Maceration and Evaporation"

Total 33 rabbits with age 34.62±5.11 months were trialed in this study who were divided in positive control group (G1), negative control group (G2) each containing rabbits (n=3) while experimental group (G3) contained rabbits (n=27) who were equally divided into three groups each containing rabbits (n=9) for each solvent who are further subdivided into subgroups each containing three rabbits for each concentration of extract in same solvent. About $3cm^2$ dorsal skin areas of rabbits was shaved, 62.5gm of inducer (Aldara cream containing 5 % imiquimod) was tropically applied once on daily basis for 7days on shaved skin that induced lesions on skin of rabbits exactly resembling the plaques of psoriasis following a previous study. Scaling, redness and skin thickening were the three parameters that made up the severity score based on some previous research studies, which was graded on a scale of 0-4 (absent=0, mild=1, moderate=2,severe=3,andverysevere=4) were measured before trial, after a week and at the end of trial [10-11]. At the end of this trial, 3 healthy rabbits were shaved to find cytotoxicity or any other harmful effects on skin of rabbits by these flowers extracts in all three solvents.

All rabbits were kept free of any other oral or topical medications against psoriasis two weeks before trial and two weeks during trial. Standard drug corticosteroid ointment [12] were applied 0.5g/square inch [13] topically once a day on psoriasis skin on dorsal area of participants group of G1 (positive control), while distilled water (10mL) was used for topical application of group G2 (negative control) for two weeks.

Extract concentration of 5%W/V, 10% W/V and 20% W/V was topically applied by squeezing the sprayer bottle (3.5mL/sqeez) to cover whole psoriasis affected skin area once a day for two weeks in experimental group (G3) against each solvent accordingly as mentioned in Table 1. Statistical analysis was done with SPSS version-22, based on obtained data during research trial.

Table 1. Proposed dosing Trial of all rabbits for two weeks

Severity Score Absent=0, Severe=3 &Verysevere	Positive Control (n=3) Per Gram	Negative Control (n=3)	Experimental Group (n=27)								
			n-Hexane (n=9) w/v%			Ethanol (n=9) w/v%			Olive Oil (n=9) w/v%		
	0.5	10	5	10	20	5	10	20	5	10	20
Before Trial											
7th Day											
14th Day											

2. RESULTS

Thirty-three rabbits were included in this study with mean age 34.62±5 11 months. There were (42.2%) male rabbits and (57.57%) female rabbits. In our study, 33.33% rabbits were partially recovered, 33.33% were fully recovered which were 100% to be recovered with flowers extract in olive oil and 33.33% rabbits were not recovered. **(Figure. 2).** No evidence of any adverse effects on rabbit's skin by flowers extract in olive oil was found during this research study. The mean age of the participants who had recovered was greater than the partially and fully recovered rabbits.

Table 2. Dosing trial of all rabbits for two weeks

Severity Score Absent=0, Severe=3 &Verysevere	Positive Control (n=3) Per Gram	Negative Control (n=3)	Experimental Group (n=27)								
			n-Hexane (n=11) w/v%			Ethanol (n=11) w/v%			Olive Oil (n=11) w/v%		
	0.5	10	5	10	20	5	10	20	5	10	20
Before Trial	4	4	4	4	4	4	4	4	4	4	4
7th Day	3	4	4	3	3	4	3	3	3	2	1
14th Day	2	4	3	3	2	3	2	2	0	0	0

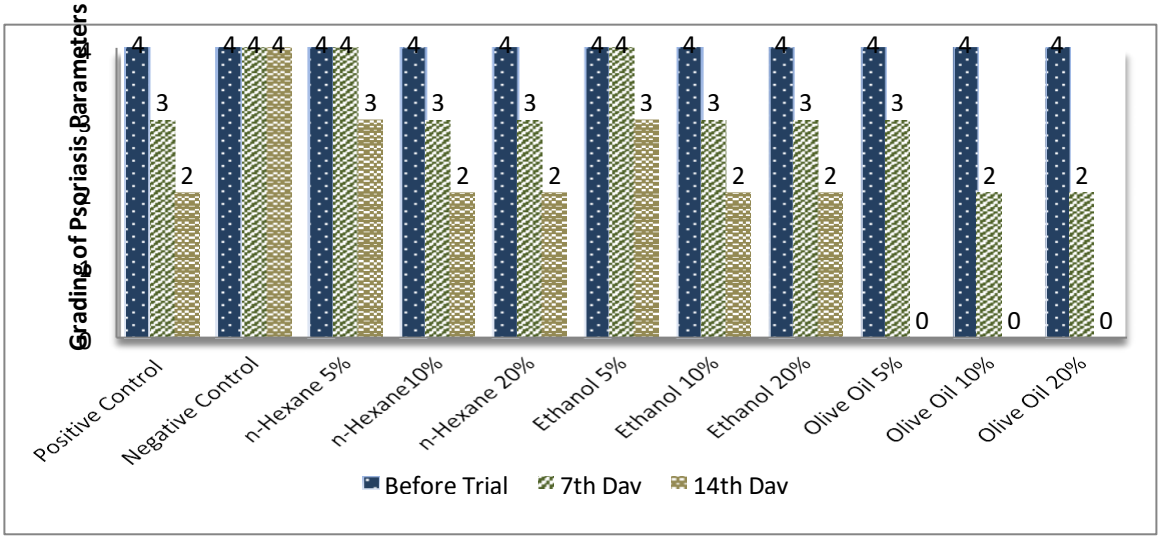

Figure 2. Effect of *M. indica* flowers extract in different solvents on psoriasis parameters in two weeks

Figure 3. Outcome visualization: Before and After Treatment Images

3. DISCUSSION

Psoriasis affects people of all ages and ethnic backgrounds and is a common ailment throughout the world [14]. While psoriasis prevalence varies by population, it is estimated that 2-3% of people worldwide suffer from the condition[15]. Because of its obvious symptoms and possible complications, it can significantly affect one's quality of life. Even though psoriasis presents problems, effective management options such as medication, lifestyle modifications, and psychological support can help individuals with the illness enjoy satisfying lives. In this study we have evaluated the anti-psoriatic activity of *Mangifera Indica* flower extract in different solvents. Our study on mangiferin's anti-psoriatic properties in different solvents provides important information about the drug's potential for treating psoriasis. Different solvents can affect mangiferin's pharmacological efficacy by changing its solubility, stability, and bioavailability. Scaling, redness and skin thickening were the three parameters which form the basis of evaluation of mangerferin's anti-psoriatic activity. We found that mangeferin extract in olive. oil at concentration of 5%W/V, 10% W/V and 20% W/V when topically applied by squeezing the sprayer bottle (3.5mL/sqeez) to cover whole psoriasis affected skin area once a day for two weeks showed more profound results in decreasing redness, scaling and increasing the skin thickeness as compared to mangeferin appilied with different extracts.

Mangiferin can be effectively delivered by olive oil, which also improves its ability to dissolve, stability, skin penetration, and synergistic effects [16]. The effectiveness of mangiferin in treating psoriasis can be greatly increased by adding it to formulations based on olive oil, which presents a viable method for the creation of new treatment approaches.A number of bioactive substances found in olive oil, including squalene, polyphenols, and oleic acid, have been demonstrated to have anti-inflammatory, antioxidant, and immunomodulatory qualities [17]. These substances may work in concert with mangiferin to increase the formulation's overall anti-psoriatic efficacy. Increased treatment efficacy and better results in the treatment of psoriasis may result from this combination.Oxidation, heat, and light are some of the conditions that might cause bioactive molecules like mangiferin to break down over time. Tocopherols and phenolic compounds, which are found naturally in olive oil[18], can help shield mangiferin from deterioration and preserve its stability while it is being stored and transported.

It has been demonstrated that mangiferin prevents immune cells and keratinocytes [19] from producing pro-inflammatory cytokines such tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), and interleukin-1 beta (IL-1β). Mangiferin helps reduce the irritation, swelling, and itching that come with psoriatic lesions by inhibiting inflammation.[7]Mangiferin stimulates keratinocyte migration and proliferation, augments extracellular matrix component formation, and regulates inflammatory responses during the healing process to enhance wound

healing. Mangiferin's ability to heal wounds may aid in the restoration of damaged skin and enhance the therapeutic results of psoriasis treatments [19-20].

In treating psoariasis many drugs have been used and many researches have been done highlighting the use of these drugs at the same time many researches have been done highlighting the side effects of these drugs [14]. For mild to moderate cases of psoriasis, topical corticosteroids are frequently recommended [21]. Their effectiveness in lowering the scaling, itching, and inflammation linked to psoriatic plaques has been shown by research. Corticosteroids can, however, have negative side effects over time, including telangiectasia, skin thinning, and adrenal suppression [22]. Studies have demonstrated the efficacy of calcipotriene and topical tazarotene in the treatment of psoriasis lesions, especially when combined with corticosteroids. Itching, burning, and skin irritation are possible side effects due to their use [23].

Methotrexate is useful in treating moderate-to-severe psoriasis and psoriatic arthritis, according to research. On the other hand, chronic use may cause gastrointestinal adverse effects, bone marrow suppression, and hepatotoxicity [24]. To reduce toxicity, research has concentrated on improving dosage schedules and monitoring techniques.

A systemic immunosuppressant, cyclosporine lowers inflammation and prevents T-cell activation. Studies have indicated that it is effective in treating serious cases of psoriasis and has a quick start of action. On the other hand, prolonged use may result in hypertension, nephrotoxicity, and an elevated risk of infections [25].

The main goals of our research is to minimize long-term negative effects of these drugs and find alternate therapy approaches which are easy to use, less expensive, have less side effects, increases patients compliance and maximize efficacy by refining treatment regimens and formulations. *M. indica* fresh flowers extract in olive found a promising candidate with no side effects on rabbits skin even after its tropical application for two weeks.

In summary, the use of mangiferin to the treatment of psoriasis is a fresh and creative approach that may help with the intricate pathogenesis of the condition. In the realm of dermatology and autoimmune illnesses, the use of mangiferin to treat psoriasis is a new and promising strategy. Furthermore, to completely understand its therapeutic benefits, ideal dose schedules, and long-term safety profile in psoriasis patients, more investigation—including clinical trials—is necessary.

4. CONCLUSION

In conclusion, the study investigated the anti-psoriatic activity of *Mangifera indica* flower extract in various solvents. The findings suggest that the flowers extract in olive oil possesses significant potential in mitigating psoriasis-related symptoms. The diverse solvents used for extraction demonstrated variations in efficacy, emphasizing the importance of solvent selection in extracting bioactive compounds.

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