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Therapeutic Potential of Topical Cannabis for the Treatment of Psoriasis: A Preliminary Clinical Evaluation of Two Different Formulations

Thanvisith Charoenying[1], Kamolrak Lomwong[2], Pichit Boonkrong[3], Wantika Kruanamkam[4*]

[1]Faculty of Allied Health Sciences, Pathumthani University, Pathum Thani 12000, Thailand
[2]Biomedical Sciences Graduate Program, Department of Medical Science, Faculty of Science, Rangsit University, Pathum Thani 12000, Thailand
[3]College of Biomedical Engineering, Rangsit University, Pathum Thani 12000, Thailand
[4]Department of Biomedical Sciences, Faculty of Science, Rangsit University, Pathum Thani 12000, Thailand

[*]Corresponding author; E-mail: wantika.k@rsu.ac.th

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Abstract

This study aims to explore the potential therapeutic benefits of two distinct formulations of topical cannabis cream for the treatment of psoriasis. Both formulations comprised a cannabis extract of a standardized concentration of 1.35 mg/g delta-9-tetrahydrocannabinol (THC) and 1.25 mg/g cannabidiol (CBD). The first formulation contained cannabis alone, while the second formulation combines cannabis with a polyherbal formulation. To evaluate the efficacy and safety of both formulations, a crossover, randomized, single-blinded study was conducted involving 20 volunteers. Key indicators such as PASI score, PDI, DLQI, and blood profile were monitored. The study consisted of two eight-week treatment periods with each formulation, separated by a two-week washout period. The results showed that the group using the cannabis cream with cannabis alone experienced a significant reduction in disease severity, as observed through the PASI score, after four weeks over the course of the 8-week study. Furthermore, the combination of cannabis and the polyherbal formulation exhibited greater efficacy in reducing disease severity and improving patient quality of life. No significant adverse reactions were observed, and there was no change in blood profile before and after treatment. The findings of this study highlight the clinical benefit of using topical cannabis, whether used independently or in combination with other herbs, for psoriasis management. The combined formulation appears to exhibit a greater therapeutic advantage over the use of topical cannabis alone.

Keywords**:** *cannabis; medicinal plants; psoriasis; therapeutic potential; THC; CBD*

1. Introduction

The cannabis-based medicines (CBMs) have been used for medical purposes for a variety of conditions, including pain management (Fisher et al., 2021; Howlett et al., 2002; Moore et al., 2021), an anti-seizure medication (Wallace et al., 2001). There are more than four hundred compounds present in cannabis (Atakan, 2012: Madaka et al, 2021), but two primary components of cannabis, delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD), have been the focus of extensive research in recent years (Jaipakdee et al, 2022). THC is the psychoactive compound responsible for the "high" experienced by users, while CBD is non-psychoactive and possesses numerous therapeutic properties, including anti-inflammatory and antioxidant effects (Pathompak et al., 2022). Over the past few years, researchers

have explored the potential of using cannabis to manage dermatological disorders such as pruritus and inflammatory skin disease (Martins et al., 2022). THC and CBD, as agonists of the endocannabinoid system, may help to modulate the immune response and reduce inflammation in skin lesions. Research has shown that topical cannabis may be effective in reducing inflammation and itching (Martins et al., 2022; Yuan et al., 2014). CBMs or a combined THC and CBD was reported to reduce pain, reduced pruritus and in patients with epidermolysis bullosa (Schräder et al., 2019; Schräder et al., 2021). A study in a small group of patients found that a topical cream containing CBD and plants ingredients was also effective in some skin disorders, for reducing symptoms of some skin diseases especially on inflammatory condition including, atopic dermatitis, and psoriasis (Palmieri et al., 2019).

Believed to affect around 2% of the global population (Christophers, 2001) psoriasis is an inflammatory skin condition characterized by silvery scaly patches on reddened areas on our skin surface typically accompanied by itching and discomfort, affecting daily living significantly. Its underlying causes are not fully understood; even though evidence suggests the combination of genetic predisposition and environmental factors contribute towards its onset (Nestle et al., 2009). Despite not finding a cure so far for this lifelong ailment; modern medicine offers relief for the conditions signs and symptoms employing various options like light therapies alongside topical or oral medications such as corticosteroids or coal tar topicals that soothe any irritable plaques within a time frame of treatment schedule advised by dermatologists specifically tailored according to each patient's psoriasis severity index scores (PSI). A preferred option more frequently these days is herbal remedies over conventional medicines. Compared to many conventional therapies, they offer prospective advantages such as lower cost, greater accessibility, and fewer side effects.- A prior study as a different of this study pinpointed "ThaiBio®, a commercial herbal formulations comprising natural ingredients such as coconut oil, clove oil, and others combined with sesame oil, turmeric powder, licorice extract, mangosteen peel powder, and pomegranate, has proved to be effective in managing psoriasis symptoms by accelerating healing and alleviating itching and discomfort (Boonyaroon, & Sirisutisuwon, 2020).

Cannabinoids within cannabis have shown promise for mitigating psoriasis symptoms by inhibiting the proliferation of keratinocytes (Ramot et al., 2013; Shao et al., 2021). The skin endocannabinoid system (ECS) has been implicated in the pathogenesis of skin conditions (Bíró et al., 2009). The ECS has been shown to modulate the proliferation and differentiation of keratinocytes (Ständer et al., 2005), therefore targeting the ECS may help mitigate symptoms associated with psoriasis. THC and CBD cannabinoids possess anti-inflammatory properties and modulate keratinocytes to reduce cytokine production involved with psoriasis' development. Additionally, they exerts a reduction in markers of inflammation within tissues, both locally on the skin area or within systemic environments (Sheriff et al., 2020; Wroński et al., 2023). This suggests that therapeutic modulation of ECS through cannabis compounds warrants further study alongside advancing our knowledge of underlying skin physiology impacted by this promising therapy option. Recent studies have shown that CBD elicits various pharmacological effects, not via CB1 or CB2 receptors, but through interactions with, for examples, G protein-coupled receptor, serotonin receptors, transient potential ion channels, and peroxisome proliferator activated receptors (Costa et al., 2004; Martins et al., 2022; Morales, & Reggio, 2017; Pertwee et al., 2010; Russo et al., 2005). A clinical trial found that a CBD-enriched ointment containing botanical ingredients was effective in reducing symptoms of inflammatory skin diseases, including in 5 patients with psoriasis (Palmieri et al., 2019). Research conducted both *in vitro* and in animal models has provided evidence indicating that both natural and synthetic cannabinoids exhibit therapeutic potential in relation to the pathogenesis of psoriasis. These cannabinoids have demonstrated the ability to inhibit the proliferation of human keratinocytes (Wilkinson, & Williamson, 2007), possess anti-inflammatory properties, and exhibit anti-angiogenic effects (Hashiesh et al., 2021; Norooznezhad, & Norooznezhad, 2017; Xu et al., 2007).

In Thailand, the rapid implementation of new regulations resulted in the legalization of medicinal cannabis since Feb 2019 (Assanangkornchai et al., 2022). Currently, the studies that delved into the potential use of cannabis for psoriasis treatment have been limited, with only a few studies conducted, and those have involved a relatively small number of subjects. The objective of this

study is to explore the potential application of a topical cannabis in the management of plaque psoriasis as mentioned in Section 2. The material and method including formulations, participants, trial design, dosage regimen and statistical data analysis are elaborated in Section 3. The research was carried out over a duration of eight weeks with a crossover study design and the results are presented in Section 4. Considering the efficacy and safety of the two topical botanical formulations, their feasible application for the treatment of psoriasis is discussed in Section 5 and the conclusion is given in Section 6.

2. Objectives

This study aims to provide valuable information about the efficacy of topical cannabis formulations for the treatment of psoriasis. Particularly, the potential therapeutic benefits of two different topical creams including cannabis-alone and cannabis + ThaiBio® formulas were examined. The objectives are listed as follows:

1) To evaluate and compare the efficacy between cannabis-alone and cannabis + ThaiBio® formulas in treating psoriasis. The efficacy of the two formulations was assessed by the severity of psoriasis using the Psoriasis Area and Severity Index (PASI) score, and the quality of life of the participants using the Psoriasis Disability Index (PDI) and Dermatology Life Quality Index (DLQI).

2) To evaluate and compare the safety between cannabis-alone and cannabis + ThaiBio® formulas for in treating psoriasis. The complete blood count, liver and kidney functions were measured for evaluating the toxicity of the two different formulas.

The results of the study could lead to the development of new and more effective treatments for psoriasis.

3. Materials and methods

To investigate the efficacy and safety of two different topical creams, this section illustrates formulations, participants, trial design, dosage regimen, data collection and statistical analysis.

3.1 Formulations

The present study evaluated two different topical botanical formulations for the treatment of psoriasis including cannabis-alone and cannabis + ThaiBio® formulas. To be more specific, each formula contained the active ingredients as follows.

3.1.1 Formula A: Formula A referred to the topical cream used in the study containing cannabis alone. The cannabis extract GPOCE (Government Pharmaceutical Organization Cannabis Extract), purchased from the Government Pharmaceutical Organization (GPO), contained 27 mg/ml and 25 mg/ml of THC and CBD, respectively. Formula A has a final concentration of 1.35 milligrams (mg) of THC per gram (g) and 1.25 mg of CBD per g in topical cream.

3.1.2 Formula B: Formula B was formulated by combining a GPOCE comprising a final concentration of 1.35 milligrams (mg) of THC per gram in cream and 1.25 mg of CBD per gram in topical cream, with a polyherbal skin care product (ThaiBio®). The ThaiBio® cream consisted of botanical extracts, including coconut oil, clove oil, sesame oil, *Suregada multiflorum* (bark), *Eclipta prostrata* (leaf), *Acanthus ebracteatus* (leaf), *Rhinacanthus nasutus* (leaf), licorice (root), turmeric (rhizome), and mangosteen (peel).

The cream base was comprised of Polysorbate 60, lecithin, camphor, menthol, glycerin, keratin, and water. The ingredients were blended to achieve the same final concentrations of THC and CBD in both Formulas A, and B, specifically concentration of THC and CBD is 1.35, and 1.25 mg per g, respectively. The creams were formulated and packed at a GMP-certified pharmaceutical company, namely Otop - Mattay Company Limited., Chumphon, Thailand.

3.2 Participants

A total of 20 participants diagnosed with plaque psoriasis were recruited and evenly divided into two groups, referred to as “Group 1” and “Group 2”. The ethical consideration and eligibility criteria are explained below.

3.2.1 Ethical considerations: The research received approval from the Ethics Committee at Rangsit University, COA. No. RSUERB2021-043, as well as the Pathum Thani Provincial Public Health Office in Thailand. The investigation was carried out in compliance with the principles outlined in the Helsinki Declaration. Prior to commencing any study procedures, all participants were provided with information regarding the study and written informed consent.

3.2.2 Eligibility criteria: To recruit participants for the study, the inclusion and exclusion criteria are described below.

Inclusion criteria: Psoriasis patients, male or female, age 18 and up, were recruited and interviewed. Physical examinations and medical background were performed and evaluated. Only patients with a psoriasis rash from mild or higher level of a psoriasis area severity index (PASI) score greater than or equal to 3 were enrolled in the study.

Exclusion criteria: Patients who were on systemic or dependent systemic therapy or had photodamaged keratoses skin lesions were excluded from the trial. Other criteria for exclusion from the clinical trial involving applicants that could be at risk from using cannabis products i.e., applicants with a history of allergy to cannabis products, severe cardio-pulmonary disease, psychosis, or a history of illnesses. Additionally, pregnant, or lactating women, those who have missed appointments, and those experiencing severe adverse reactions were excluded. The physician had given the final decision to exclude participants for other reasons they deem appropriate.

3.3 Trial design and dosage regimen

Participants in either Group 1 or Group 2 were initially treated with one cream formulation (either Formula A or Formula B) for 8 weeks. After this initial treatment period, participants were given a 2-week washout period, during which they did not receive any treatment. The washout period was limited to 2 weeks instead of the typical 4 weeks due to ethical considerations of reducing the suffering of the participants who lacked topical medication. Following this washout period, the participants were switched to receive treatment with the formulation they did not receive during the initial treatment period. The crossover study design allowed for comparison of the effectiveness of the two products by measuring the participants' responses to both treatments. Both groups of participants were clearly instructed on how to use the cream formulas. In brief, participants were advised to apply the cream formulas twice a day, following morning and evening bathing, using the fingertips unit (FTU) to measure the amount. One FTU is equivalent to approximately 0.4-0.5 grams of cream, which is the amount of topical cream squeezed out from its tube along an adult's index fingertip that is adequate to treat a surface area of a skin lesion twice the size of the flat of an adult's hand. The clinical evaluation of each formulation lasted for eight weeks, during which participants were scheduled for clinical assessments in weeks 2, 4, 6, and 8 for each formulation. The clinical benefit of the formulas was evaluated by the PASI score, and the products' safety was evaluated by reviewing patient report forms, conducting interviews, and physically observing participants during each visit for symptoms of erythema, induration, scaling, and itching. The participants' quality of life was assessed using the DLQI questionnaire every week and the PDI questionnaire in weeks 4 and 8 of treatment. During the trial, participants were advised to avoid foods that could trigger psoriasis symptoms, such as a gluten-containing diet, foods high in added sugar and salt, cow's milk, and alcohol.

3.4 Data collection and statistical analysis

The place of testing and/or data collection was at Department of Biomedical Sciences, Faculty of Science, Rangsit University. Investigating the efficacy of the two formulations, each patient's skin lesion was captured and PASI score was evaluated in weeks 0, 2, 4, 6 and 8. Evaluating patients' quality of life, the self-reported measures including DLQI and PDI questionnaires were assessed. The DLQI score was evaluated every week while the PDI score was evaluated only in weeks 0, 4 and 8. Based on the crossover randomized controlled trial, each participant needed to complete the clinical trials in the total study period of 18 weeks. Theoretically, the lower PASI, DLQI and PDI scores indicate the higher efficacy of treatments and better patients' quality of life over the trial period. Throughout the entire study, a significance level of $\alpha = 0.05$ was used. The descriptive statistics were employed to summarize the PASI, DLQI and PDI scores. The distribution of PASI, DLQI and PDI scores were evaluated using the Shapiro-Wilk test and it was found that are not normally distributed. Thus, non-parametric tests were employed for further statistical analyses. Comparing the efficacy of the two formulations, the proportion of patients with decreasing PASI scores was examined by the Fisher's exact test. The comparison of DLQI and PDI scores between the two formulations along the trial period of 8 weeks using linear regression and Friedman test for one-way repeated measures. Comparing complete blood count, kidney and liver functions before and after treatment (week 0 against

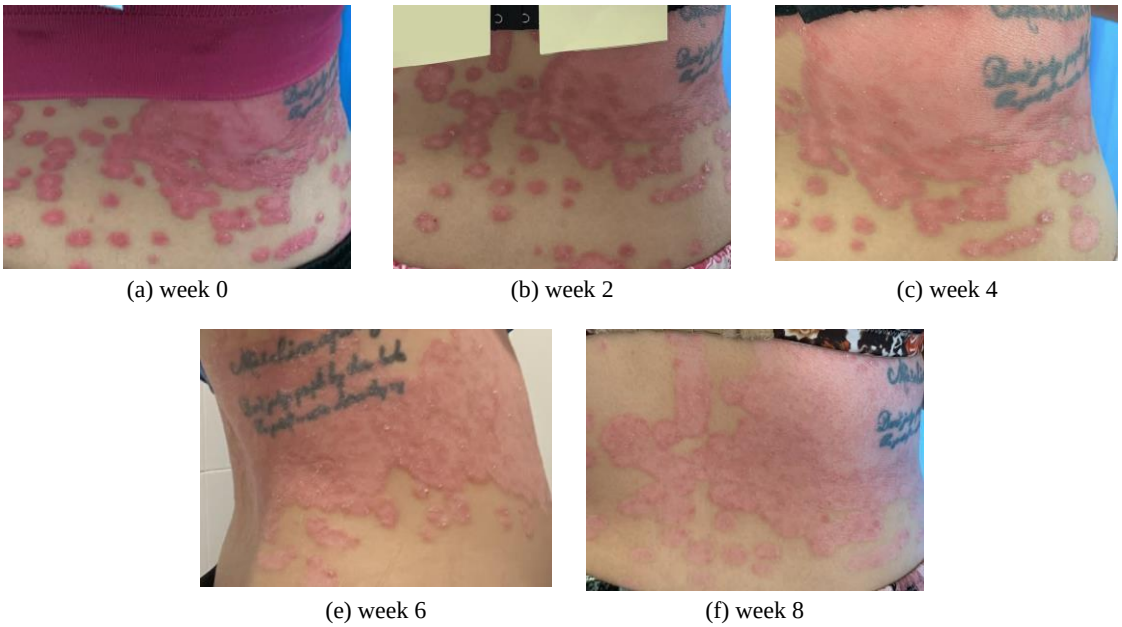
week 8), the paired difference Wilcoxon signed-rank test were implemented.

4. Results

This study involved 20 psoriasis patients, including 13 men (65%) and 7 women (35%). The participants' age range was 18 to 69 years, with a mean age of 38.94 years. In the crossover study design, all participants received both treatments, which included cannabis-enriched topical cream with or without the polyherbal formulation (ThaiBio®). Participants were initially treated by one formula for 8 weeks (either Formula A or Formula B), followed by a switch to a different formula for another 8-week treatment period. After the initial treatment period, participants were given a 2-week washout period such that they did not receive any treatment. The research findings including skin lesion, severity, dermatology patients' quality and psoriasis disability indices are illustrated as follows.

4.1 Skin lesions

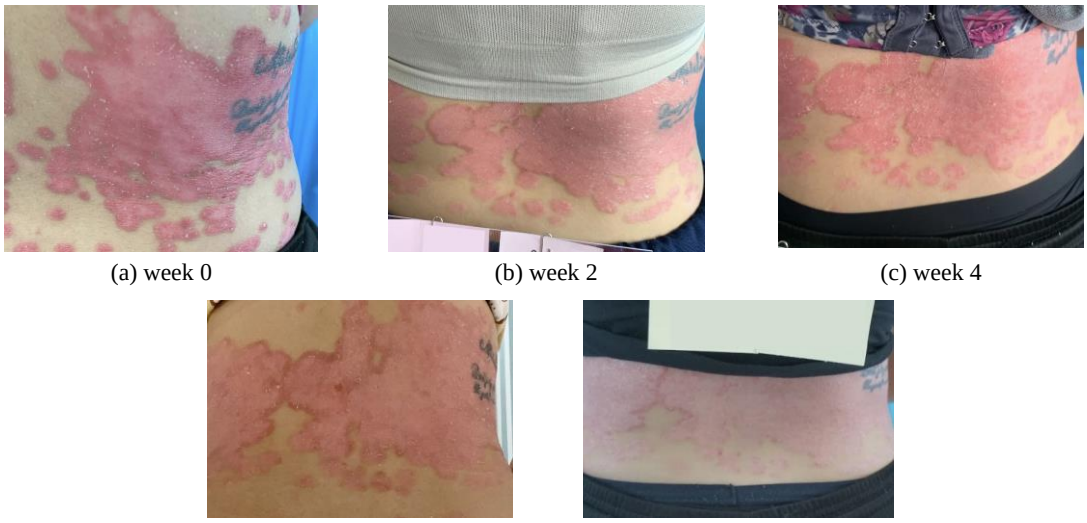
Before the study began, the location of psoriatic lesions from all 20 participants were found at head (95%), trunk (100%), lower (100%) and upper limbs (95%) with different severity levels. During the 8-week study period, the severity of psoriasis (PASI scores) was evaluated every two weeks for all patients who received treatment with Formula A and B. The results showed a significant decrease in the PASI score for the treatment group, with a significant reduction observed after four weeks of the agent use. Figures 1 and 2 depict the visual representation of a patient's psoriasis lesion along the trial periods of 8 weeks. From the observation, there was the reduction of psoriasis lesions in a single patient after using the cream Formulas A and B. Interviewing some participants, it was mentioned that treatment with Formula B resulted in the more significant reduction of psoriatic symptoms as can be quantified via the PASI score of the treatment group over the 8-week study period. To validate the experimental results, this study evaluated and performed statistical data analyses on the PASI, DLQI, PDI, and blood chemistry, as described in the next subsections.



(a) week 0 (b) week 2 (c) week 4

(e) week 6 (f) week 8

Figure 1 The reduction of psoriasis lesions in a single patient after using the cream Formula A for 8 weeks.



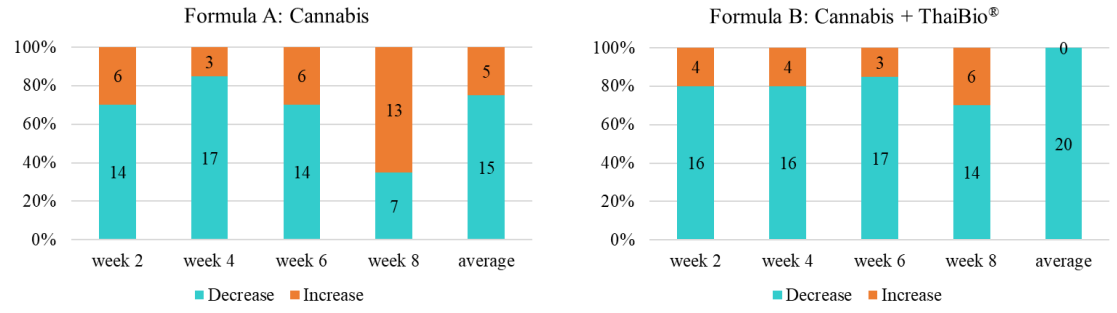
(a) week 0 (b) week 2 (c) week 4

(e) week 6 (f) week 8

Figure 2 The reduction of psoriasis lesions in a single patient after using the cream Formula B for 8 weeks.

Table 1 Descriptive statistics of PASI scores along 8 weeks

Week	Formula A: Cannabis (*N* = 20)				Formula B: Cannabis + ThaiBio® (*N* = 20)			
	Min	Max	Median	Mean ± S.D.	Min	Max	Median	Mean ± SD.
0	6.60	48.80	23.65	24.32 ± 11.81	3.00	56.30	25.55	26.03 ± 17.78
2	5.20	58.00	19.10	21.93 ± 14.41	3.00	46.10	15.40	19.79 ± 14.28
4	4.60	47.20	12.85	18.10 ± 12.13	3.00	43.20	15.20	17.88 ± 12.68
6	5.50	44.10	11.90	15.34 ± 11.22	2.00	38.40	12.80	14.34 ± 10.58
8	4.40	46.20	10.40	16.66 ± 12.15	1.20	40.70	11.30	13.06 ± 11.29



(a) (b)

Figure 3 The proportion of patients with decreasing PASI scores in weeks 2, 4, 6, and 8 for Formulas A and B.

4.2 Severity index

To assess and grade the severity of psoriatic lesions, the PASI scores were measured every couple week. Four variables including erythema, scale, thickness, and area of psoriasis are included in the evaluation of PASI score. The baseline severity of the disease, represented by the PASI scores before treatment (week 0), was 24.32 ± 11.81 and 26.03 ± 17.78 for Groups 1 and 2. Descriptive statistics for the PASI scores during the 8 weeks of medication are presented in Table 1. Based on the distribution of PASI scores at the significance level $\alpha = 0.05$, the Shapiro-Wilk test indicated that PASI scores were non-normally distributed for almost every week, and therefore non-parametric statistics were recommended for further analysis.

To assess the efficacy of each formulation, the number of patients with decreasing PASI scores

was counted in weeks 2, 4, 6, and 8, as illustrated in Figure 3. It is seen that there was a variation of PASI score along 8 weeks, i.e., some participants exhibited either an increase or decrease of severity. However, the average decrease of PASI scores in Formula A was 80% (15 patients) whereas Formula B was 100% (20 patients). Thus, all participants using Formula B showed better efficacy than Formula A in psoriasis treatment. Statistically, Fisher's exact test with a significance level of 0.05 found a dependence between the proportion of patients with decreasing PASI scores and the formulations used ($p = 0.024$). Binary logistic regression revealed that the odds of having a decreasing PASI score were 2.333 (95% CI: lower = 1.592, upper = 3.421) times greater for Formula B compared with Formula A ($p = 0.033$).

4.3 Dermatology patients' quality of life index

Using the Dermatology Patients' Quality of Life Index (DLQI) questionnaire, the quality of life from the 20 participants was weekly evaluated. The DLQI was used to assess the impact of psoriasis on quality of life and treatment efficacy. Figure 4 displays the profiles of DLQI scores from the two different medications. It was found that there was a gradual decline DLQI score in Formula A (decreased by 0.4333 per week) whilst it was more decline in Formula B (decreased by 1.3833 per week). By assessing the DLQI scores of psoriasis patients, healthcare professionals can track changes in quality of life over time, evaluate the effectiveness of different treatment approaches, and compare the impact of psoriasis to that of other skin conditions or general population norms. Notably, all 20 patients reported that they had less effect of skin problem on their everyday lives and more positive feeling with the Formula B.

4.4 Psoriasis disability index

Participants' Psoriasis Disability Index (PDI) is a self-reported measure completed by psoriasis patients, and it provides a quantitative assessment of the physical disability experienced due to the disease. The quality of life before treatment was affected by the psoriasis condition and it then improved after treatments, as shown in the bar charts in Figure 5. In this study, the PDI score was evaluated in weeks 0, 4, and 8. The PDI questionnaire encompasses six key areas, examining the effects of psoriasis on (a) daily life, (b) professional and educational pursuits, (c) non-work and non-school activities, (d) personal relationships, (e) leisure time, and (f) medication usage. Comparing the mean PDI scores across formulations by Mann-Whitney U-test at the significant level $\alpha = 0.05$, it was found that there is no difference in mean PDI scores, i.e., Formula A was as effective as Formula B. Focusing on the effect of each formula on the PDI score, the Friedman test (one-way repeated measures) verified that there was a reduction along weeks 0, 4 and 8 at the significant level $\alpha = 0.05$. The lower PDI score suggests that the individual experiences fewer limitations in physical functioning due to their psoriasis. This can indicate better overall functional ability and less disruption to daily activities. However, the mean PDI scores in personal relationship, leisure, and medication remained nearly the same for both formulations as they were not easy to make such self-evaluation. Measuring the impact of psoriasis, the 20 patients felt more positive and comfortable with Formula B rather than Formula A. To assess the impact of psoriasis on physical functioning and track changes in disability over time, disease severity, location of psoriatic lesions, and comorbidities can influence the level of disability experienced by each person.

4.5 Blood chemistry

Changes of blood chemistry due to topical cannabis treatment were monitored. Table 3 presents the results of a comparison test of the complete blood count between week 0 and week 8. At a significance level of $\alpha = 0.05$, the Wilcoxon signed-rank test was performed for each formulation and the analysis found insufficient evidence to conclude that there were any differences in the white blood cell (WBC) count, red blood cell (RBC) count, hemoglobin, hematocrit, neutrophil, lymphocyte, monocyte, eosinophil, and basophil between the two weeks. Therefore, it can be concluded that the complete blood count tests did not indicate any significant changes between week 0 and week 8 for both formulations. Tables 4 and 5 present the results of kidney and liver function tests between weeks 0 and 8. At the significance level of $\alpha = 0.05$, the Wilcoxon signed-rank test indicates that there were no significant differences in blood urea nitrogen (BUN) and creatinine levels between the two weeks for both medications using different formulations. Similarly, no significant differences were found in three liver function tests, including aspartate transaminase (AST), alanine transaminase (ALT), and alkaline phosphatase (ALP) between weeks 0 and 8.

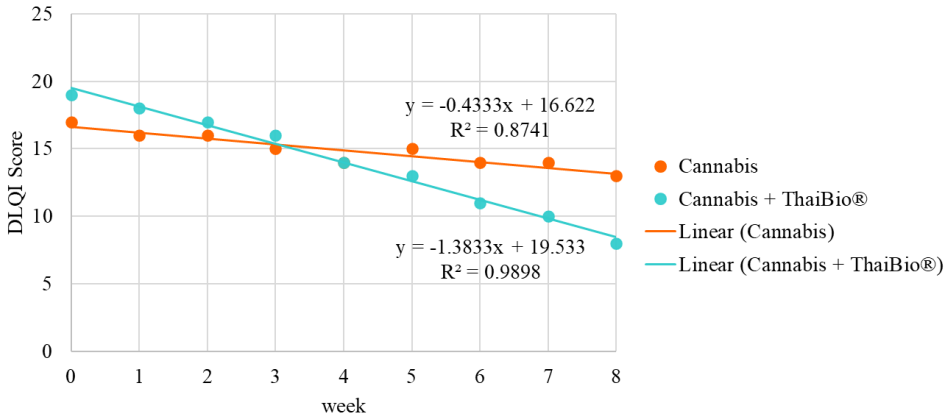
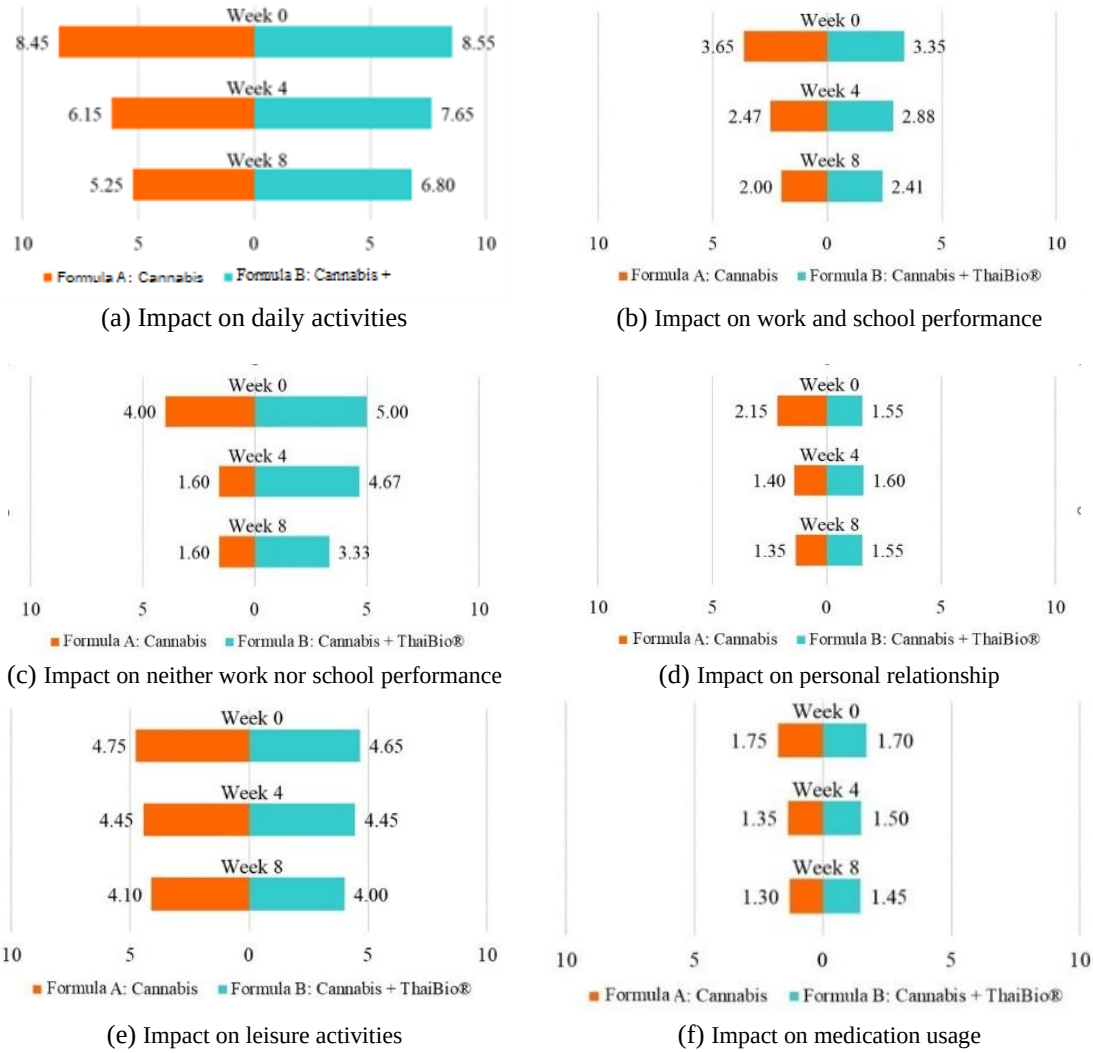


Figure 4 Comparison of the DLQI scores between Formulas A and B over the course of 8 weeks.



(a) Impact on daily activities

(b) Impact on work and school performance

(c) Impact on neither work nor school performance

(d) Impact on personal relationship

(e) Impact on leisure activities

(f) Impact on medication usage

Figure 5 Comparison of mean PDI score in six different aspects.

Table 3 Comparison between the complete blood count before and after medication (*N*=20)

Complete Blood Count	Formula A: Cannabis			Formula B: Cannabis + ThaiBio®		
	Week 0 (Mean ± SD)	Week 8 (Mean ± SD)	Sig. (2-tailed)	Week 0 (Mean ± SD)	Week 8 (Mean ± SD)	Sig. (2-tailed)
WBC Count	5.67 ±1.70	5.56 ± 1.66	0.8713	6.28 ± 1.64	5.57 ± 1.49	0.2220
RBC Count	4.92 ± 0.49	4.85 ± 0.47	0.7191	5.08 ± 0.54	4.89 ± 0.49	0.3187
Hemoglobin	13.89 ± 1.31	13.23 ± 0.90	0.1724	13.97 ± 1.09	13.79 ± 1.39	0.6845
Hematocrit	42.29 ± 4.37	40.53 ± 2.26	0.2186	43.06 ± 3.64	42.12 ± 4.86	0.5360
Neutrophil	60.35 ± 9.46	59.50 ± 8.66	0.8182	61.56 ± 6.23	57.62 ± 9.25	0.1593
Lymphocyte	29.88 ± 9.02	29.90 ± 9.10	0.9956	28.08 ± 6.60	32.23 ± 9.35	0.1506
Monocyte	6.29 ± 1.40	5.90 ± 1.45	0.4965	6.20 ± 1.19	6.38 ± 1.39	0.6974
Eosinophil	2.59 ± 1.33	2.70 ± 1.70	0.8530	2.61 ± 1.25	2.85 ± 1.41	0.6162
Basophil	0.88 ± 0.49	1.00 ± 0.47	0.5386	1.03 ± 0.42	0.92 ± 0.28	0.4158

** The mean difference is significant at the 0.05 level.*

Table 4 Kidney function test before and after medication (*N*=20)

Kidney Function Test	Formula A: Cannabis			Formula B: Cannabis + ThaiBio®		
	Week 0 (Mean ± SD)	Week 8 (Mean ± SD)	Sig. (2-tailed)	Week 0 (Mean ± SD)	Week 8 (Mean ± SD)	Sig. (2-tailed)
BUN	11.69 ± 3.41	11.05 ± 4.46	0.6779	11.19 ± 4.73	10.54 ± 2.27	0.6496
Creatinine	0.79 ± 0.20	0.70 ± 0.20	0.2695	0.78 ± 0.20	0.78 ± 0.21	0.9998

** The mean difference is significant at the 0.05 level.*

Table 5 Liver function test before and after medication (*N*=20)

Liver Function Test	Formula A: Cannabis			Formula B: Cannabis + ThaiBio®		
	Week 0 (Mean ± SD)	Week 8 (Mean ± SD)	Sig. (2-tailed)	Week 0 (Mean ± SD)	Week 8 (Mean ± SD)	Sig. (2-tailed)
AST	23.56 ± 8.45	22.87 ± 9.46	0.8461	24.64 ± 10.49	23.28 ± 8.99	0.7059
ALT	23.37 ± 17.62	20.62 ± 17.96	0.7006	28.07 ± 26.06	23.01 ± 20.16	0.5604
ALP	70.29 ± 25.50	63.30 ± 20.43	0.4680	70.94 ± 30.13	61.23 ± 17.46	0.3044

** The mean difference is significant at the 0.05 level.*

4.6 Adverse reactions

Patients' safety was monitored throughout the study, and participants were evaluated for any adverse drug reactions (ADR). Mild increases in redness and itching at the lesion site were reported, but the symptoms resolved within a few days and did not require the cessation of cream use. No severe ADR was observed.

5. Discussion

The current study assessed the efficacy of two cannabis-based topical formulations, Formula A (cannabis-alone) and Formula B (cannabis + Polyherbal ThaiBio®), in treating psoriasis lesions and their impact on patients' quality of life. The findings present the understanding of the effects of these treatments on psoriasis patients, encompassing the physical manifestations of the disease and the consequent psychosocial impacts.

The prevalence of psoriatic lesions among the participants underscored how background the condition was. Interestingly both formulas showed a decrease in the PASI score suggesting that they could be potential treatments. Additionally, patient feedback leaning towards Formula B aligned with the objective measure indicating its higher efficacy. It's worth noting that this reduction was observed within four weeks of starting treatment with the cannabis-based cream. Although the severity of psoriasis varied among participants the consistent decrease in PASI scores across the study group indicates the potential of these formulas. Yet, there was an observed that a higher number of patients experienced an increase in their PASI scores by the 8th week when treated with Formula A. It would be prudent to consider extended treatment durations in future studies for a more comprehensive assessment. Formula B performed better than

Formula A showing a 100% decline in PASI scores. This difference in outcomes is crucial when making decisions of treatment options.

Beyond the direct physical effects, psoriasis significantly influences the daily experiences of patients. This is evident from the DLQI scores, with both formulas causing a decline in scores, suggesting an improvement in patients' quality of life over time. The more pronounced decline associated with Formula B further establishes its greater efficacy. The PDI offers a more detailed look into individual facets of patients' lives, breaking down the overall quality of life into specific areas. While the overall trend indicated improvements in disability, certain areas like personal relationships and medication remained unchanged, emphasizing the multifaceted challenges psoriasis patients face. The lack of a significant difference between the two formulas in terms of PDI suggests that while there might be variations in their efficacy in treating physical symptoms, their impact on disability remains comparable.

Apart from the physical effects, psoriasis has a substantial impact on the daily experiences of patients. This was evident from the scores of DLQI as both formulas show a decrease in scores indicating an improvement in patients' quality of life over time. The decline was more noticeable with Formula B, which suggested that it was more effective. The PDI (Psoriasis Disability Index) provides an analysis of aspects of patients' lives breaking down the overall quality of life into different areas. While there was an improvement in disability, certain areas like relationships and medication did not change significantly highlighting the diverse challenges faced by psoriasis patients. The absence of a difference between the two formulas in terms of PDI indicates that although there may be variations in their effectiveness for treating symptoms their impact on disability appears to be unchanged.

The analysis of blood chemistry ensures the safety of treatments. Encouragingly, neither formula appears to have a significant impact on blood counts or kidney and liver function tests. This suggests that both treatments may be considered safe from a hematological and hepatic perspective over the 8-week period. Although minor side effects were noted by some participants, the absence of serious adverse reactions indicates that both formulas are likely safe.

In Thailand, there are GPO's guidelines that support the alternative use of cannabis-infused coconut oil for treating psoriasis through topical application, either with or without sublingual administration depending on disease severity (The Government Pharmaceutical Organization (GPO) Thailand, 2019). The concentration of cannabinoids in cannabis-infused coconut oil can vary based on the cannabis strain used as the source material, as well as the extraction and dilution technique employed. For example, the specific cannabis oil formulation known as "Deja formula" has higher levels of THC, approximately 2% (Silarak, 2022), and minimal to undetectable level of CBD (Ministry of Public Health, n.d.). On the other hand, Karun O-sot oil formulation contains 10 % CBD, and less than 1% THC (Department of Thai Traditional and Alternative Medicine, 2022). It is crucial to highlight that sublingual administration may have the potential side effect of inducing a THC-induced "high" sensation in certain patients, as well as other potential side effects. In contrast, topical application is less likely to cause such effects. According to a study report, the application of THC-containing products topically does not result in detectable levels of cannabinoids in blood or urine samples (Hess et al., 2017).

When treating psoriasis through conventional means such as using corticosteroids, phototherapy, or oral medications. It is worth noting that these treatments may not be without their shortcomings and possible adverse effects. Topical corticosteroids, while providing temporary relief, may lead to skin thinning, irritation, and systemic side effects when used long-term (Kohda et al., 1995; Takeda et al., 1988). Phototherapy, while effective and is often used in combination with other treatments, requires frequent sessions and carries the potential risk of skin damage and skin cancer (Thatiparthi et al., 2022). Oral medications often come with the potential for systemic side effects, such as liver toxicity and increased susceptibility to infection (Institute for Quality and Efficiency in Health Care (IQWiG), 2017). Given the limitations and potential risks associated with conventional treatments, there is a clear rationale for exploring alternative therapies like cannabis. The utilization of cannabis and its byproducts provide a new avenue to combat the fundamental mechanisms behind psoriasis without inducing substantial negative consequences. While existing research indicates some potential benefits of

cannabis-based treatments for psoriasis, however, there is still a need for further exploration into their effectiveness ideal dosing regimens, and safety over time.

Currently, there is no standardized concentration of THC and CBD established for the treatment of psoriasis. However, the current findings indicate that a topical formulation with a low concentration of 1.35 mg/g THC and 1.25 mg/g CBD in topical cream exhibits good efficacy in treating psoriasis and enhancing the patients' quality of life. Taken together of the present results with the GPO's guideline and earlier study, the findings suggest that using the cannabis strains or preparations dominant in either CBD or THC could be a practical choice for topical application. The data provides a holistic approach to harnessing the potential therapeutic benefits of CBM. However, at present, there is insufficient evidence to determine the optimal concentration or ratio of THC and CBD for effectively treating psoriasis.

A valid concern regarding the study is the restricted concentration of THC and CBD cannabinoids used in the cream. This could limit the ability to extrapolate the results to other populations and to compare the efficacy of different concentrations of these compounds. Additionally, the lack of a dose-response analysis makes it difficult to determine the most effective concentration of THC and CBD for the treatment of psoriasis. These limitations emphasize the need for additional research to establish the appropriate dose and administration of topical cannabis-based therapies for effectively addressing psoriasis symptoms. Furthermore, while the cannabis alone or combination of cannabis with other medicinal plant extracts shows promise as a treatment option for psoriasis, it is essential to note that the long-term safety and efficacy of this topical plant-based therapy are still lacking comprehensive evidence. As a result, it is crucial to closely monitor the use of these therapies to evaluate their prolonged effects and potential risks associated with this treatment approach. Additionally, this study did not investigate stability studies, recognizing this as a limitation. Prior research has shown that CBD is thermally unstable and highly susceptible to photolytic reactions and oxidation (Fraguas-Sánchez et al., 2020; Osiripun, & Labua, 2023). Future studies should emphasize stability analyses to determine the effects of environmental conditions, including temperature, humidity, and light, on the formulation's longevity and integrity over extended periods.

Although the potential of herbal-based treatments for psoriasis appears promising, it is important to note that much of the existing evidence is derived from preclinical studies, case reports, and small-scale clinical trials. Further research, including larger and well-controlled clinical studies, is necessary to firmly establish the efficacy and safety of these treatments. There is a need for research to comprehensively understand the underlying mechanisms of action of cannabis-based remedies. Such investigations can contribute to the development of more targeted and efficacious treatments for psoriasis. By gaining a deeper understanding of the pharmacokinetics (absorption, distribution, metabolism, and excretion) and pharmacodynamics (mechanism of action) of cannabis-based remedies, new opportunities can arise for improving their therapeutic potential and maximizing their efficacy in the management of psoriasis symptoms. This knowledge can guide the development of more targeted formulations, precise dosing regimens, and personalized treatment approaches, ultimately leading to better outcomes for individuals with psoriasis.

6. Conclusion

The current study assessed the advantages of using two cannabis infused formulations for treating psoriasis lesions and their impact, on the quality of life of patients. Although the findings are preliminary, they highlight the benefits of incorporating cannabis formulas as a viable alternative. Combining cannabis with cannabis herbal extracts seems to provide enhanced therapeutic effects. Safety evaluations indicated no complications related to the medication or noticeable effects on blood parameters, liver and kidney functions. However, it is important to note that this investigation has limitations, such as the absence of a dose response analysis for THC and CBD concentrations and the exclusion of stability studies. While comprehensive scale clinical studies and long-term safety and efficacy assessments are necessary to evaluate cannabis treatments, fully further research is required to understand their mechanisms of action and potential risks. Additionally regulatory and legal barriers may restrict access to cannabis-based medicines for psoriasis patients in some regions. Despite these

limitations the promising therapeutic benefits of cannabis-based treatments for psoriasis suggest they could be additions, to existing treatment options.

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