



Treatment of tinea corporis with *Tacca chantrieri*'s extract

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Abstract

Tinea corporis is usually treated by antifungal agents which are chemicals that are not produced domestically and have to be imported. The use of indigenous herbs, if possible, would be a sustainable solution. We therefore established a double blind study to evaluate a short term treatment of tinea corporis with the extract of *Tacca chantrieri*, a local herb found in many parts of Thailand. Eighty patients were randomly selected to apply tacca extract or the base solution alone for 14 days, and the lesions were periodically assessed on day 0, 7, 14 and 42. Each assessment consisted of clinical evaluation of redness, scaling and pruritus and direct microscopy examination. The extract recipients showed significant clinical mycologic improvement beginning at day 7 through day 14. Microscopic examination of the skin scrapings showed negative results in all extract recipients on day 14. Clinical evaluation and microscopic examination on day 42 indicated some mycologic infections in both control and test groups. It was concluded that the extract of *Tacca chantrieri* could be used as an effective agent to treat tinea corporis. However, recurrent infections after the cessation of treatment are possible.

Keywords: Tinea corporis, *Tacca chantrieri*, Extract

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1. Introduction

Tinea corporis, often called ringworm of the body, is a skin fungal infection caused by genera of dermatophytes on any parts of superficial skin, particularly those with excessive sweating and poor blood circulation [1]. The lesion typically presents as an erythematous, scaling, oval or annular eruption with a sharply defined papulovesicular border and some central clearing [2]. Topical antifungal agents such as ketoconazole are the main treatments of choice, but systemic treatment may be necessary in severe cases [3]. However, the active compounds, currently used antifungal products in Thailand, are synthetic chemicals from overseas companies.

The use of local herbs, if possible, as a substitute for the imported chemical would lead to a sustainable solution in terms of economic and accessibility. It is commonly believed, as well as mentioned in traditional folk medicine, that many herbs can cure skin fungal diseases. However, the efficacy of those reputed herbs has not been verified. Recently antibacterial and antifungal activities of a local Thai herb, *Tacca chantrieri* Andre [DIOSCOREACEAE] have been reported [4]. This plant is an indigenous perennial of the tropics, and can be found growing wild in rain forests all over the country. Its leaves and flowers are edible and the decoction of rhizomes, alone or in combination with other herbs, is used by local healers in the north of Thailand to relieve pains of the body and stomach, and as an antidote for food poisoning. As the safety use of *Tacca chantrieri* is evidenced by its traditional uses, it is therefore reasonable to conduct a clinical trial to evaluate the effectiveness of this plant in the treatment of tinea corporis.

2. Materials and Methods

Plant material and extraction

The rhizomes of *Tacca chantrieri* were collected from Chiangrai province in February 2014. The plant was authenticated by the author (Dr. Rujjanawate) and the voucher specimen (no. 167) is deposited at the school of Medicine, Mae Fah Luang University, Thailand. The air dried powdered rhizome was macerated with 95% ethanol overnight and then filtered. The filtrate was concentrated in vacuo at 55 °C and lyophilized to obtain a dry ethanolic extract (15.5% yield) which from now on is referred to as TCE.

Gas chromatography/mass spectrometry (GC/MS) analysis

GC/MS analysis of the TCE was carried out on a gas chromatograph (GC 7890 Agilent Technologies) fitted with a DB-5MS column (30m x 0.25 mm i.d., 0.25 µm film thickness). The GC oven temperature was programmed from 50 °C held for 5 min, raised to 200 °C at 10 °C/min, then to 250 °C at 5 °C/min and held for 10 min. The injection temperature was 250 °C; and the flow rate of carrier gas, helium, was at 1.5 ml/min; 1:25 split ratio. The gas chromatograph was coupled to a mass selective detector (Agilent HP 5973). The MS operating parameters were as follows: ionization voltage, 70 eV; ion source temperature, 230 °C. Identification of the TCE components was performed by comparison of their relative retention times and mass spectra with those in the NIST05a.L Database (Agilent Technologies Inc.).

Preparation of the test samples

Test medication (TCE-tm) was prepared by dissolving 10 grams of TCE in 1400 ml ethyl alcohol. Ethylene glycol was then added to make a total volume of 2000 ml of solution. Forty ml aliquots were dispensed into 50 bottles. The concentration of TCE in such test medication was 5 mg/ml. The base solution used as a placebo in this study was prepared by adding 700 ml of ethylene glycol to 1400 ml ethyl alcohol. Forty ml aliquots were dispensed into 50 bottles.

Participants and procedures

A double blind clinical trial described by Greer et al., with modifications was conducted [5]. Briefly, 80 male and female volunteers were randomly selected into control and test groups. To qualify for enrollment, volunteers were required to be in good health, from 12 to 75 years of age, and had to have at least two of the three major signs and symptoms of *tinea corporis* (erythema, scaling, and pruritus), with a minimum combined score of 5, when these signs and symptoms were scored on a 0 to 3 scale (0 = absent, 1 = mild, 2 = moderate, 3 = severe). The fungal infection was confirmed by direct microscopy examination (potassium hydroxide, KOH) of skin scrapings from the target lesion.

Qualifying volunteers were randomly assigned in a 1:1 ratio to receive the TCE-tm or the matching placebo. Application of the TCE-tm commenced at the baseline visit (day 0), and volunteers were scheduled to return at days 7, 14, and 42 (visits 2 through 4). The study medication was applied to the infected areas and to the immediate surrounding skin once daily, after bathing, for the first 2 weeks of the study. Clinical assessments of the target lesion, and of disease severity excluding the target lesion, were performed at each visit. Microscopic examination of skin scrapings from the target lesion were performed at all four scheduled study visits. The study had approval from the Human Research Ethics Committee of Mae Fah Luang University (document no. 6/2557 dated on April 4, 2014), and each patient signed an informed consent.

Statistical analysis

T test for continuous variables and Chi-square test for categorical variables were used to assess the differences between control and test groups. P value less than .05 was considered statistically significant.

3. Results and Discussion

GC/MS analysis of the plant extract

The GC/MS chromatogram of TCE is shown in Fig. 1. The analysis of the chromatogram indicated the presence of 9 identified compounds (Table 1). The three most abundant constituents were diosgenin (42.15%); ethyl alpha-d-glucopyranoside ethane, isothiocyanate (35.79%); and oxalic acid, monoamide, n-propyl, pentadecyl ester (6.13%). The present finding together with previous reports, indicate the presence of saponins which can be used as markers in further studies [6 - 8].

Participants

Three participants randomly selected to receive the control vehicle did not return for their second visit and were excluded from the study. Another single subject in the control group and four in the TCE-tm treated group were found to be KOH negative and were also excluded from all analyses. No statistically significant differences were found between the two treatment groups in the comparison of their age and gender.

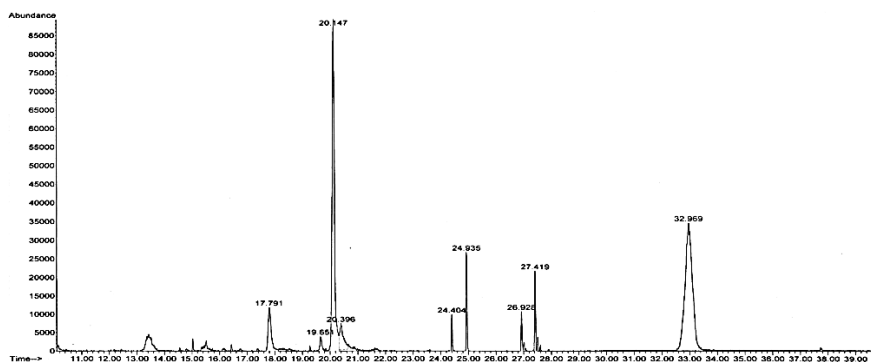


Fig. 1 GC–MS chromatogram of TCE showing the presence of 9 compounds

Table 1 Chemical components of TCE as analyzed by GC–MS

Peak	RT	% of Total	Compound
1	17.791	6.13	Oxalic acid, monoamide, n-propyl, pentadecyl ester
2	19.651	1.33	Propanoic acid, ethyl ester
3	20.147	35.79	Ethyl alpha-d-glucopyranoside
4	20.396	4.38	beta-D-Glucopyranose, 4-O-beta-D-galactopyranosyl
5	24.404	1.36	n-Hexadecanoic acid
6	24.935	3.81	Hexadecanoic acid, ethyl ester
7	26.928	1.72	9,12-Octadecadienoic acid (Z,Z)-11-Octadecynenitrile
8	27.419	3.32	Linoleic acid ethyl ester
9	32.969	42.15	Diosgenin

RT = Retention time (min)

Microscopy examination

At day 0 of the study, both the vehicle and TCE-tm treated groups consisted of 36 KOH positive subjects. The number of the KOH positive were 21, 5 and 5 in the vehicle treated group and 8, 0 and 5 in the TCE-tm treated group at day 7, 14 and 42 respectively. The decrease of the number of positive KOH subjects denoted the effectiveness of the treatment. The number of the subjects with effective treatment in the TCE-tm treated group was significantly higher than that of the vehicle treated group at day 7 and 14 but not at day 42 as shown in Fig. 2. This finding not only indicated the effectiveness of the Tacca extract but also hinted that recurrent infections after the cessation of treatment is possible. It should be noted here that ethanol and ethylene glycol used as the vehicle in this study, also exerted antifungal activity which is in accordance with previous reports [9, 10].

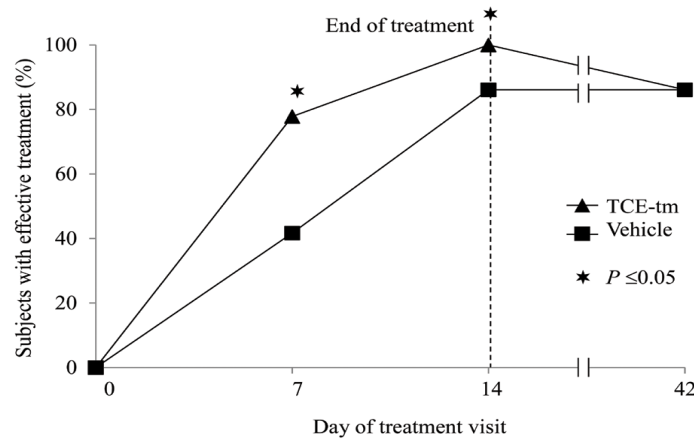


Fig. 2 Percentage of volunteers who had negative KOH test during treatment and 4 weeks later

Clinical assessment

Assessments of clinical responses are shown in Table 2. The mean scores of erythema, scaling and pruritus in TCE-tm treated subjects were found to be significantly lower than those of the vehicle treated group at day 7 and 14 but not at day 42. The combined score of clinical responses also indicated the effectiveness of the TCE-tm during but not after the treatment period (Fig. 3). The effectiveness of TCE-tm in Tinea treatment seen in this study is possibly due to the anti-inflammatory and antifungal effects previously reported [4, 11].

Table 2 Assessments of clinical response in TCE-tm treated subjects during treatment and 4 weeks later

Clinical response		Day 0	Day 7	Day 14	Day 42
Erythema	Control	2.53 ± 0.61	2.08 ± 0.73	1.03 ± 0.61	2.28 ± 0.57
	Test	2.36 ± 0.68	1.36 ± 0.64	0.17 ± 0.38	2.11 ± 0.67
Scaling	Control	1.69 ± 0.89	0.36 ± 0.49	0.17 ± 0.38	1.14 ± 0.72
	Test	1.36 ± 0.76	0.19 ± 0.40	0.00 ± 0.00	1.19 ± 0.75
Pruritus	Control	2.14 ± 0.68	1.28 ± 0.61	1.25 ± 0.73	1.86 ± 0.80
	Test	2.64 ± 0.49	0.89 ± 0.46	0.08 ± 0.28	2.56 ± 0.56

Values are expressed as mean ± S.E.M. (n=36)

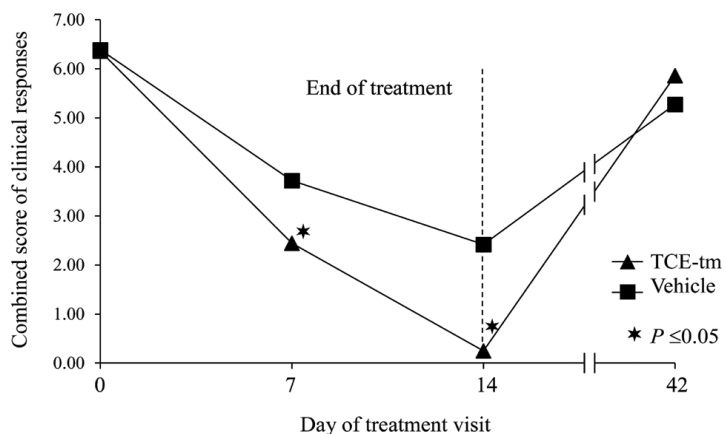


Fig. 3 Combined score of clinical responses in TCE-tm treated subjects during treatment and 4 weeks later

4. Conclusion

Findings from this study not only confirm the antifungal activity of *Tacca chantrieri* extract previously reported but also indicate the potential use of this plant as an alternative cure for tinea corporis. However, the persistence of the infection following cessation of treatment needs further investigation particularly in regards to sanitary factors. At present, *Tacca chantrieri* is commonly seen in Thai households either as an ornamental or indigenous vegetable. This means the mass production of its rhizome as a starting raw material in cosmeceutical production is likely to be possible.

5. Acknowledgement

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