

Full Length Research Paper

Management of superficial fungal infections with *Senna alata* (“alata”) soap: A preliminary report

A. T. Oladele^{1*}, B. A. Dairo², A. A. Elujoba¹ and A. O. Oyelami²

¹Department of Pharmacognosy, Obafemi Awolowo University, Ile - Ife, Osun State, Nigeria.

²Department of Paediatrics and Child Health, Obafemi Awolowo University, Ile - Ife, Osun State, Nigeria.

Accepted 11 February, 2010

The paper presents a preliminary report on the observational studies on *Senna alata* soap for the management of superficial skin infections among the inmates of Ilesa Prison, Nigeria. Thirty three inmates were recruited for the study and randomly distributed into 19 treatments and 14 controls. *S. alata* leaf powder was incorporated into the soap consisting of caustic soda (NaOH) and palm kernel oil (PKO) to make 1.5% w/w. The herbal soap mixture was poured and allowed to solidify and then cut into stable tablets (65 g each). *Tinea versicolor* and *Tinea corporis* were the major fungal infections found on the skin lesions at diagnosis prior to commencement of study, while *Epidermophyton floccosum* and *Cryptococcus* sp were microscopically observed to be responsible for the lesions. The ‘alata soap’ significantly cleared the lesions on 16 subjects (94.1%), comprising (11) *T. versicolor* and (5) *T. corporis*. None of the controls was cleared significantly. The study clearly confirmed the folkloric claims on *S. alata* as an antimicrobial agent for treating skin infections.

Key words: Superficial skin infections, *Senna alata*, *Tinea versicolor*, *Tinea corporis*, alata soap.

INTRODUCTION

Skin infections are very common in childhood worldwide and between 49 - 80.4% of African school children are affected (Dagnew et al., 1991). It has been observed to be common in adolescent and young adult males in hot climates (Kevin, 2008). The prevalence of fungal skin infection is about 20% among the American populations at any given time while in Ethiopia, 49.2% and Taiwan, 28.2%, (Dagnew et al., 1991; Wu et al., 2000; Frank, 2008). Skin infections have been reported to be a major problem in Tanzania where about 34.7% of the rural populations have skin diseases (Mollel, 1994; Satimia et al., 1998). In Nigeria, the prevalence rate is about 40.4% among pupils in primary schools (Oyedeji et al., 2006). Two separate surveys in Ile-Ife and Ibadan, both in Nigeria, have shown that, *Tinea* and *Scabies* are the most common skin diseases among young children, constituting 15 - 17 and 16% respectively (Odueko et al., 2001; Ogunbiyi et al., 2005).

Clinical investigations have shown that, dermatophytosis of *Tinea versicolor* and *Tinea corporis* are responsible

for more than 15% of all skin infections in Nigeria (Ogunbiyi et al., 2005). An increase in the prevalence of *T. versicolor*, among others, was once re-corded in the University College Hospital (UCH), Ibadan, between 1994 and 1998 (Satimia et al., 1998; Ogunbiyi et al., 2005). Poor socio-economic status was identified as the major cause of skin infections in the developing countries (Odueko et al., 2001). *T. versicolor* (Synonym - *Pityriasis versicolor*) is a common, innocuous and chronic fungal infection of the stratum corneum caused by the dimorphic yeast *Malassezia furfur*.

The synonyms *Pityrosporum ovale* and *P. orbiculare* were used previously to identify the causal organism. The common sites on the human body include the chest, neck, back, upper and under arms. The infection is associated with persistent patches of discoloured skin portions, sharp edges, fine scales and sometimes accompanied by body itching. The predisposing factors to infection include a warm, humid environment, excessive sweating, occlusion, high plasma cortisol levels, immunosuppression, malnourishment and genetically determined susceptibility (Darmstadt, 2000). Most infections of dermatophytosis are usually treated with drugs e.g. clotrimazole, ketoconazole, fluconazole, itraconazole, etc,

*Corresponding author. E-mail: kunleladele@yahoo.com.

(Michael, 1998).

These drugs are relatively expensive and mostly unaffordable by people with low socio-economic status, who invariably form the bulk of people with skin infections. Both rural and urban residents in the tropical regions, with pronounced Tinea infections, usually resort to herbal remedies that are sourced locally from their native environments. Herbal preparations such as poultices, ointments and soaps have been applied by 65% of patients with eczema, seborrhoeic dermatitis, impetigo, *T. capitis* and scabies before attending orthodox hospital in Lagos, Nigeria, (Ajose, 2007). Benjamin et al. (1981) and Abatan (1990) reported that leaf juice and decoctions of *S. alata* are used in the treatment of ringworm and other skin diseases in many parts of Nigeria. Among several plant species used in the treatment of skin infection locally without any reported risk or allergic reaction is *S. alata* (L) Roxb - Caesalpinaceae (formally - Leguminosae).

The plant is widely used in India, Jamaica, Australia, West African countries and other tropical regions (Gills, 1992; Morton, 1998; Idu et al., 2006; Cheryl, 2007; Anithu et al., 2008). *S. alata* which is an official drug in the Nigerian Herbal Pharmacopoeia (NHP, 2008), is a perennial shrub widely distributed in tropical regions of the world, and commonly called "Ringworm bush" or candle stick.

The inhibition of the growth of *Epidermophyton floccosum*, *Trichophyton rubrum* and *Basidiobolus haptosporus* by the ethanolic extracts of *S. alata* leaves have been reported by Okafor et al. (2001), while Benjamin et al. (1981) have implicated the anthrones contained in the leaves to be responsible for the anti-septic properties. Fuzellier et al. (1982) also found that, rhein, emodol and some anthrones in *S. alata* leaves possessed antifungal activity against some dermatophytes and yeast. *S. alata* leaves have also been found to contain anthraquinones and anthracene derivatives of rhein, emodol, aloe-emodin, sennosides A and B, 4,5-dihydroxy-1-hydroxymethylanthrone and 4,5-dihydroxy-2-hydroxymethylanthrone (Fuzellier et al., 1982; Abo et al., 1999).

The plant is well known as a relatively cheap alternative to the expensive standard drugs due to its acceptable potency in managing skin infections. The antifungal activities of *S. alata* had been established by Idu et al. (2006) and Anitha et al. (2008) thus, confirming the folkloric claims. Developing an affordable and acceptable drug for the treatment of *T. vesicolor* and *T. corporis* from this medicinally important plant is exploitable. This is the aim of the present study.

MATERIALS AND METHODS

"Alata" soap preparation

Fresh leaves of *Senna alata* (L) Roxb - Caesalpinaceae were collected from Ile-Ife and identified at the Botany herbarium of

Obafemi Awolowo University, Ile-Ife, Nigeria by comparison with previous specimen voucher (UHI 13918). The leaves were oven dried at 30 °C and subsequently powdered. The powdered leaf was incorporated into the soap consisting of caustic soda (NaOH) and palm kernel oil (PKO) to make 1.5% w/w. The herbal soap mixture was poured and allowed to solidify and then cut into stable 6 × 3 × 2 cm soap tablets (65 g each).

Clinical procedure

The study was carried out at the Ilesa Prison, Nigeria between April and May 2008 after obtaining ethical clearance from Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) ethical committee. The prison has a fairly well equipped clinic staffed with a resident doctor, a pharmacist, and five nurses who assist in gathering the inmates for monitoring weekly, which helps to alleviate difficulties in the conduct of the study. Thirty three (33) prison inmates were recruited as subjects for this preliminary pilot work before extending it to a larger population, (for careful monitoring of side effects - if any). They were randomly distributed into two groups of 19 treatments and 14 controls (Placebo).

Subjects with obvious skin infections were recruited and samples collected as skin peels from the edges of the observed lesions on the skin. Subjects were clinically diagnosed, clerked and the soaps administered with detailed instructions on the usage. The soap (treatment and control) was used for bathing the whole body twice daily and the lather rubbed onto the lesion after bathe for four (4) consecutive weeks. No other treatment/medication for the lesion was allowed throughout the period of investigation.

Microscopic investigations of the samples after they have been taken at the prison were carried out in the department of paediatrics and child health laboratories, Obafemi Awolowo University, Ile-Ife, Nigeria, where the causative organisms were identified accordingly (Tables 5 and 6), and unfortunately there were no facilities to culture the organisms at the time of the study. (Microscopic examination result was obtained from the randomization allotment and carried out in an independent laboratory. The subjects were examined and monitored on weekly basis for four consecutive weeks to assess the effectiveness of the herbal soaps.

RESULTS AND DISCUSSION

A total of 33 subjects were recruited for the study at commencement, 5 were unable to conclude due attrition (discharged or out for court hearing); hence, only 27 concluded the 4 weeks monitoring. Table 1 indicates that most of the volunteer subjects (96.7% - Treatment and Control) were below 50 years of age, representing (the active age for criminal tendencies) while the remaining 5.3% belonging to the treatment group were above 50 years of age. Most of the subjects (79 and 100%, respectively in treatment and control groups) do not have more than secondary education, as presented in Table 2. This is in line with Oduoko et al. (2001) who reported that, low socio-economic status does increase the prevalence of skin infections. This is likely because of the overcrowded human populations in the homes as clearly simulated in the prisons where inmates are lumped together in the cell rooms which could be hot and humid. The prison cell rooms were small and inmates crowded with average of about four per room which facilitates the spread of the skin infections. Sharing clothing and

Table 1. Age distribution of subjects.

Age (Years)	Treatment group		Control group	
	Freq.	%	Freq.	%
20-30	11	57.9	07	50
31-40	05	26.3	04	28.5
41-50	02	10.5	03	21.4
51-60	01	5.3	-	-
Total	19	100	14	100

Table 2. Educational background of subjects.

Education level	Treatment group		Control group	
	Freq.	%	Freq.	%
No formal education	-	-	-	-
Primary school	07	36.8	07	50
Secondary school	08	42.1	07	50
Tertiary education	04	21.1	-	-
Total	19	100	14	100

Table 3. Clinical diagnosis prior to treatment.

Diagnosis	Treatment group		Control group	
	Freq.	%	Freq.	%
<i>T. versicolor</i>	12	63.2	09	64.3
<i>T. corporis</i>	05	26.3	01	7.1
Scabies	01	5.3	03	21.7
Others	01	5.3	01	7.1
Total	19	100	14	100

Table 4. Microscopic examinations of skin peel samples.

Organism observed	Treatment group		Control group	
	Freq.	%	Freq.	%
<i>Epidermophyton</i>	06	31.6	02	14.3
<i>Cryptococcus</i> spp.	07	36.8	-	-
Nil	06	31.6	12	85.7
Total	19	100	14	100

personal effects would further improve the spread of infection.

Meanwhile the findings have shown *T. versicolor* to be the most prevalent of the infections at the initial diagnosis, with 63.2 and 64.3% in the treated and control groups, respectively (Table 3). *T. corporis* on the other hand, was only 26.3% prevalence in the treated and 7.1% in the control populations. Brooks et al. (2004) have observed that, dermatophytes were among the most prevalent skin infections in the world and Table 4 showed the presence of *Epidermophyton* (*E. floccusum*, *T.*

versicolor or *T. corporis*) in the samples (31.6% in treated and 14.3% in control populations) which confirmed the report of Brooks et al. (2004) as illustrated in Table 3 above. Unknowingly control samples without organism observed in the result could as well occur in the treatment group or vice versa.

In conclusion, the observations presented in this work demonstrate that, all the patients treated with the "alata" soap had the lesions on their skins, cleared considerably (Figure 1) with virtual disappearance in 47.1% of the patients, another 47.1% still had the edges of the lesions fairly visible (Table 7). Only 1 of the patients in the treated group did not complete the 4 weeks observation period indicating 5.3% attrition rate, while another one had itchy weepy lesions. The skin lesions treated with *S. alata* leaves soap for 4 weeks (Table 5) showed 47.1% completely cleared and edges no more visible, while another 47.1% lesions cleared and edges still visible, only 5.8% have their skin lesions slightly cleared but losing edges. In the control group (Placebo), at 4 weeks of treatment, the skin lesions are only slightly cleared with few losing their edges, which could be related to improved hygiene as a result of daily bathing. The results in Tables 5 and 6 showed that *S. alata* leaves possess some antifungal agents such as rhein, emodol and some anthrones (Fuzellier et al., 1982), which can be extracted and processed to finished products like soaps and creams/ointments, affordable by low income populations.

The treatment could however be extended beyond four weeks due to the recalcitrant nature of fungal infections in order to ensure total clearance and to prevent recurrence of the lesions. The little improvement observed in the control group might have been due to improved hygiene in the course of soap administration and better personal hygiene as recommended during the study (Figure 2). A faster therapeutic action (shorter than 4 weeks) could also be achieved by using "alata" soaps, containing higher concentrations of *S. alata* leaf powder as 1.5% w/w concentration was used in this study. This is the current effort in our clinics and would be reported shortly.

Incorporating the leaves in the soap will ensure washing of the lesion as well as application of herb onto the skin. Secondly, bathing is done routinely and incorporating the herb into the soap will help ensure compliance. However, the clinical data in this communication have clearly confirmed the folkloric claims on this plant against skin infections as used locally without soap base, and at the same time justifying it as a candidate for herbal drug development in Nigeria.

ACKNOWLEDGEMENT

The authors wish to acknowledge the Management and staff of Nigeria prison service, Ilesha, Osun state and all the prison hospital staff for their cooperation in assembling the subjects for the duration of the study.



Figure 1. Effects of “alata” soap on *T. versicolor* (upper arm) in 4 weeks. (lesions and edges virtually cleared - A06).

Table 5. Weekly clinical observations of the skin lesions (treatment group).

S/No	Symptoms	Diagnosis	Microscopic exam.	Week 1	Week 2	Week 3	Week 4
A01	Rashes + itching	<i>T. corporis</i>	<i>E. floccusum</i>	+	++	+++	+++
A03	Rashes	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	+	+++	++++	++++
A04	Rashes	<i>T. versicolor</i>	Nil	+	Absent	+	+
A05	Rashes	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	+	++	+++	+++
A06	Rashes	<i>T. versicolor</i>	<i>E. floccusum</i>	+	++	++	+++
A07	Itching	<i>T. corporis</i>	Nil	+	++	+++	++++
A08	Rashes + itching	<i>T. versicolor</i>	<i>E. floccusum</i>	+	++	Absent	+++
A09	Rashes + itching	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	++	++	+++	++++
A10	Rashes + itching	<i>T. corporis</i>	<i>E. floccusum</i>	+	++	++++	++++
A11	Rashes + itching	<i>T. versicolor</i>	<i>E. floccusum</i>	+	++	+++	+++
A12	Itching	<i>T. corporis</i>	Nil	+	+	++	++++
A13	Rashes + itching	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	+	Absent	+++	+++
A16	Rashes + itching	<i>T. corporis</i>	<i>E. floccusum</i>	+	+++	+++	++++
A17	Rashes + itching	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	++	+++	++++	++++
A18	Rashes + itching	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	Absent	++	++	+++
A20	Rashes + itching	<i>T. versicolor</i>	<i>Cryptococcus</i> spp	Absent	++	Absent	+++
A34	Rashes + itching	<i>T. versicolor</i>	NIL	+	++	++++	++++

+ - Lesions slightly cleared, losing edges; ++ - Lesions moderately cleared, losing edges; +++ - Lesions cleared, edges still visible; ++++ - Lesions completely cleared, edges not visible; Absent - Subject not available.

Table 6. Weekly clinical observations of the skin lesions (control group).

S/No.	Symptoms	Diagnosis	Mic. exam	Week 1	Week 2	Week 3	Week 4
C03	Rashes + Itching	<i>T. corporis</i>	Epidermophyton	+	+	+	+
C04	Rashes + Itching	<i>T. versicolor</i>	-	+	+	+	Absent
C06	Rashes + Itching	<i>T. versicolor</i>	-	+	+	Absent	Absent
C07	Rashes + Itching	<i>T. versicolor</i>	-	0	+	+	+
C08	Rashes + Itching	<i>T. versicolor</i>	-	+	+	+	+
C09	Rashes + Itching	<i>T. versicolor</i>	-	+	+	+	+
C10	Rashes + Itching	<i>T. versicolor</i>	-	+	+	+	+
C12	Rashes + Itching	<i>T. versicolor</i>	-	0	0	0	+
C18	Rashes + Itching	<i>T. versicolor</i>	Epidermophyton	0	+	Absent	+
C19	Rashes + Itching	<i>T. versicolor</i>	-	+	+	+	+

0 - No change; + - Lesion slightly cleared, losing edges; ++ - Lesion moderately cleared, losing edges; +++ - Lesion cleared, edges visible
 ++++ - Lesion cleared, edges not visible; Absent - Subject not available.

Table 7. Summary of results after 4 weeks observation of “alata” soap on skin infections.

	No change		Lesions slightly cleared, losing edges		Lesions moderately cleared, losing edges		Lesions cleared, edges visible		Lesions cleared, edges not visible	
	(0)		(1)		(2)		(3)		(4)	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Treated (17)	-	-	01	5.88	-	-	08	47.06	08	47.06
Control (10)	01	10	09	90	-	-	-	-	-	-



Figure 2. Effects of control soap on *T. versicolor* (chest) in 4 weeks (lesions slightly cleared, edges still visible - C08).

REFERENCES

- Abatan MO (1990). A note on the anti-inflammatory actions of plants of some *Cassia* species. *Fitoterapia* 61: 336-338.
- Abo KA, Lasaki SW, Adeyemi AA (1999). Laxative and Antimicrobial properties of *Cassia* species growing in Ibadan. *Niger. J. Nat. Prod. Med.* 3: 47-50.
- Ajose FAO (2007). Some Nigerian plants of dermatologic importance. John Wiley Inc. *Int. J. Dermatol.* 46(s1): 48-55.
- Anitha B, Mohan VR, Athiperumalsami T, Sutha S (2008). Ethnomedicinal plants used by the Kanikkars of Tirunelveli District, Tamil Nadu, India to treat skin diseases. (<http://www.siu.edu/~ebl/leaflets/mohan.htm>).
- Benjamin TV, Lamikanra A (1981). Investigations of *Cassia alata*, a plant used in Nigeria in the treatment of skin diseases. *Pharmaceut. Biol.* 19(2-3): 93-96.
- Brooks GF, Butel JS, Morse SA (2004). Jawetz, Melnick and Adelberg's Medical Microbiology, 23rd Edition, Mc Graw Hill Companies Inc, NY, USA.
- Cheryl L (2007). Comparison of plants used for skin and stomach problems in Trinidad and Tobago with Asian ethnomedicine. *J. Ethnobiol. Ethnomed.* 3: 3.
- Dagnew MB, Erwin G (1991). Epidemiology of common transmissible skin diseases among primary school children in North-West Ethiopia. *Trop. Geogr. Med.* 43: 152-155.
- Darmstadt GL (2000). Cutaneous Fungal Infection – In Wilson Textbook of Paediatrics. W.B. Saunders Pub. USA. p. 2036.
- Frank B (2008). Treating ringworm and other fungal infections. www.associated.com/article/725971/treating_ringworm_and_other_fungal.html
- Fuzellier MC, Mortier F, Leetard P (1982). Antifungal activity of *Cassia alata* L. *Ann. Pharm. Fr.* 40: 357-363.
- Gills LS (1992). Ethnomedicinal uses of plants in Nigeria. University of Benin Press, Benin City, Nigeria. 1st Edition. pp. 61-64.
- Idu M, Oransaye FE, Igeleke CL, Omonigho SE, Omogbeme OE, Ayinde BA (2006). Preliminary Investigation on the Phytochemistry and Antimicrobial activity of *Senna alata* leaves. *J. Appl. Sci.* 6(11): 2481-2485.
- Kevin B (2008). A.D.A.M. Medical Encyclopedia, Drug information online. Drugs.com, (<http://www.adam.com>).
- Michael O (1998). Skin and wound infections: An overview. American Family Physician, USA.
- Mollet V (1994). Prevalence of skin diseases and associated factors under-five children at Lepurko Village in Monduli District, Tanzania: Muhimbili University College of Health Sciences. ADDV Research Report.
- Morton JF (1981). Atlas of medicinal plants of Middle America, C.C Thomas Pub. USA.
- NHP (2008). (The Nigeria Herbal Pharmacopoeia). First Edition. Pub. Federal Ministry of Health, Federal republic of Nigeria, Abuja.
- Odueko OM, Onayemi O, Oyedeji GA (2001). A Prevalence survey of skin diseases in Nigerian Children. *Nig. J. Med.* 2: 64-67.
- Ogunbiyi AO, Owoaje E, Ndahi A (2005). Prevalence of skin disorders in school children in Ibadan, Nigeria. *Paediatric Dermatol.* 22(1): 6-10.
- Okafor JI, Eze EA, Njoku OU (2001). Antifungal activities of the leaves of *Baphia nitida*, *C. alata*, *F. exasperata* and *Gossypium arboreum*. *Niger. J. Nat. Prod. Med.* p. 5.
- Oyedeji OA, Okeniyi JAO, Ogunlesi TA, Onayemi O, Oyedeji GA, Oyelami OA (2006). Parental factors influencing the prevalence of skin infections and infestations among Nigerian primary school pupils. ISSN: 1531-3018 *Internet J. Dermatol.* 3: 2.
- Satimia FT, McBride SR, Leppard B (1998). Prevalence of skin diseases in rural Tanzania and factors influencing the choice of health care, modern or traditional. *Arch. Dermatol.* 134: 1363-1366.
- Wu YH, Su HY, Hseih YJ (2000). Survey of infectious skin diseases and skin infestations among primary school students of Taitung County, Eastern Taiwan. *J. Formos Med. Assoc.* 99: 128-134.