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Original article

Treatment of burns using traditional ointment made from extract *Alkanna*

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ABSTRACT

Full treatment of burn is a serious problem in the medical field, due to infections of burn wound and slow healing of damaged tissue. In this regard, there are several traditional treatments in various regions of Iran and the use of different plants has a special position. One of the plants, which its positive effects in the treatment of burns had been approved, is *Alkannatinctoria*, the local name BenjekSuzman. This plant, in combination with some other material, is known as an effective treatment for burns, in Ilam. The aim of this study was to produce an ointment for treating burns and healing of damaged tissue by combining several effective materials in the traditional treatment of burns. For this purpose, we synthesize turmeric oil, *Pistaciaatlanticagum*, BenjekSuzman root and coconut oil and produce an ointment. Then, we test the effect of this cream on the damaged tissue of several patients who had suffered burns, took photos of the burn wound healing process. The results showed that this ointment has a dramatic effect on the wound healing. To identify compounds in BenjekSuzman, its extract was analyzed by GC/MS. A total of 40 combinations with different percent were identified in BenjekSuzman extract.

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1. Introduction

After burns and skin damage, pathogens invade the body and wounds become infected shortly after injury. Infection of burn wounds is the most important cause of death in patients with burns. On the other hand, the

infection affects the process of healing, and delays recovery. Infections of burn wounds are caused by bacteria that the resistance of these bacteria to antimicrobials is being rise (Shahbazi, 2015). *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Acinetobacter*, *Staphylococcus epidermium*, and *Capsiculapneumoniae* are among the most common bacteria that cause infections in burn wounds. Studies have shown that most of these bacteria are resistant to common antibiotics in the treatment of burn wounds such as penicillin, oxacillin, vancomycin, and etc (Song et al., 2001). Therefore, treating infections caused by burn wounds will become a serious medical problem in the future decades. Hence, there are several studies in various fields to find new drugs that affect infections caused by burns.

BenjekSuzman (Fig. 1) is a plant of two or more years old and a herb of the borage family. The height of this plant is 30-60 cm and its roots are pink to red and larger than the size of the whole plant. The roots are harvested in the fall and can be dried and kept. Traditionally, this plant is used to treat wounds caused by burns and various diseases. Several studies have confirmed the positive effects of this plant on the treatment of burns, ulcers, and its anti-inflammatory, antioxidant, and antibacterial effects (Karayannopoulou et al., 2011; Papageorgiou et al., 2008; Assimopoulou et al., 2004; Assimopoulou and Papageorgiou, 2005). The extract of this plant destroys the *pseudomonas aeruginosa* bacteria, which is one of the major bacteria in the development of burn wound infections. In a study performed on mice, the effect of this extract on the improvement of second and third degree burns was observed.



Fig. 1. BenjekSuzman (Alkanna).



Fig. 2. The root of the BenjekSuzman plant.

Turmeric (Fig. 3) is the underground stem of the herb of Ginger family (Scientific name: *Curcuma domestica*). Turmeric is composed of Valerian, Caprice and Flandon Acids, it also has Sabine, Cineol, Toneol and Alcohol Turmerol and Curcumin, and its yellow color is due to the Curcumin. Experiments have shown that curcumin has anti-oxidative stress, anti-inflammatory and anti-cancer effects. It also reveals the high ability of curcumin to absorb and collect free radicals and inhibit its inflammation as a chemical that inhibits cancer and tumor growth. To date, numerous antimicrobial, antifungal and antiviral effects have been reported for turmeric. For example, Microbial effects of turmeric have been observed on gram-positive bacteria, *Salmonella*, *Staphylococcus*, and *Klebsiella pneumoniae*. In a study that specifically investigated the effect of turmeric extract on bacteria isolated from burn infections, it has been observed that this extract has a significant effect on the elimination of these bacteria. Despite the resistance of bacteria isolated from burn wounds to many antibiotics, turmeric had destroyed them (Kuptniratsaikul et al., 2009; Aggarwal and Shishodia, 2006). Therefore, the use of turmeric in the treatment of second-degree burns not only reduces inflammation and accelerates the process of disease recovery, but also preventing the growth of bacteria that lead to infection and are resistant to conventional antibiotic treatments.



Fig. 3. Turmeric oil.



Fig. 4. Coconut oil.

Coconut oil (Fig. 4) is edible oil, rich in short and medium chain fatty acids. Coconut oil has an antiviral, antifungal, and antibacterial properties, by attacking viruses that have a lipid membrane, such as HIV, hepatitis C virus, influenza and... eliminate them. This property also eliminates the bacteria that cause pneumonia, sore throat, urinary tract infections, meningitis, gonorrhea, food poisoning, and many other bacterial infections. Also, in other studies, the anticancer effect of coconut oil has also been shown (Dayrit, 2000; Kabara, 2000; Kabara et al., 1972).

Banehor pistachio mountain (Scientific name: *Pistacia atlantica*) is a tree of Anacardiaceae family. Baneh tree is one of the rarest plants that produce the most diverse products. These products include Baneh fruit (Fig. 6), Mastic, Baneh leaves, gum. Saqqez is a gum, Resin or thick extract of a tree, known as Baneh or Pistachio Mountain. Usually, the gum leaves (Fig. 5) from the trunk of this tree in the fall season, naturally or by giving a gap which is called Saqqez in Persian, and used in gum, and also has a lot of medical and industrial properties. Saqqez juice is Light green, thick and sticky secreted from the tree trunk, and is used locally as a laxative for the treatment of constipation, hypertension, kidney stones, sore throats and jaundice. It also has anti-oxidant and antibacterial properties, and in part, in part, counteracts the main bacterial causes of gastric and duodenal ulcer (Benhammou et al., 2008; Delazar et al., 2004).



Fig. 5. Gum of Baneh tree.



Fig. 6. Fruit of Baneh tree.



Fig. 7. Bee propolis.

Propolis (Fig. 7) is one of the bee products and it is important as a natural drug. Various studies have shown the antibacterial effects of propolis. Based on the results obtained in some studies, ethanolic extract of Propolis destroys gram-positive bacteria such as *Bacillus subtilis* and *Staphylococcus aureus*. Due to the antimicrobial and anti-inflammatory effects of the compounds mentioned above, the purpose of this study was to produce an ointment of these compounds for the treatment of burns. The results of this study show the positive effect of this ointment on the process of wound healing and prevention of infection.

2. Materials and methods

In this study, BunjakSuzaman plant was collected from the Taqtawi area of Ilam province of Iran in the fall season. The roots of this plant were then rinsed after milling. The Grind root (Fig. 2) was blended with coconut oil and was kept under mild heat and swirl. A pink oily mixture was obtained. In the next step, a combination of plant and coconut oil, gum of Baneh, turmeric oil and propolis was added and mixed well using a shaker and heat. After 3 hours, a yellow ointment with a good viscosity was obtained. It should be noted that in the traditional method of preparing this ointment, animal oil is used instead of coconut oil, which has a solvent role. But the addition of animal oil leads to high and bad viscosity and poor absorption of ointment. But in this study, replacing an oil with taller carbon chain, as coconut oil, the better restorative and anti-burning properties were added to proposed ointment, as well as achieving optimum viscosity. Meanwhile, gum of Baneh tree and Bee propolis used in this study were native to Ilam province.

In order to prepare an extract from BenjekSuzman, about 1.5 Kg of the root of the plant was delivered to the pharmaceutical company Razak in Tehran, after being washed with deionized water, the company prepared hexane-soluble pink extract of the plant using clevenger. In the next step, essence of the plant (Fig. 8) delivered to the Kimia Research Institute of Tehran, isolate and identify its compounds using the GC/MS device (Model 5973 of Agilent Corporation).



Fig. 8. Essence of BenjekSuzman.

3. Results and discussion

In order to evaluate the efficacy of produced ointment on burn injuries, this ointment was tested on injured tissue of several burn patients. According to the photos shown in Fig. 1, in the first days of burn, a significant improvement in each of the scars was observed. On the other hand, due to the antibacterial effects of the ointment, no infection was observed in the burn injuries. Therefore, the ointment appears to have antibacterial properties, as antibiotics, in addition to its anti-inflammatory and healing properties. Fig. 9-13 show the steps to treatment and repair of skin burns in a 15-day treatment period.



Fig. 9. Using ointment for the second day.



Fig. 10. Using ointment for the third day.



Fig. 11. Using ointment for the fifth day.



Fig. 12. Using ointment for the eighth day.



Fig. 13. Using ointment for the twelfth day.

As mentioned, GC/MS device was used to identify the compounds in the plant BenjekSuzman extract. After injection of the extract into the device, the constituents of the extract were identified using the inhibition time of the compounds, the mass spectrum and comparing these components with the standard. These compounds are shown in Table 1.

Table 1

Identified compounds in BenjekSuzman extract using GC/MS device.

No.	Compound name	Molecular weight	Inhibition time (min)
1	2-Anilino-4-methylquinoline	234	26.5
2	1,2-Benznedicarboxylic, diisooctyl ester	390	21.8
3	Adipic acid, decyl 2-octyl ester	398	21.6
4	9-Hexyl-heptadecane	324	21.6
5	Hexadecamethyl-heptasiloxane	532	20.3
6	Heptadecane	324	21.0
7	Heneicosane	296	19.8
8	Eicosane	282	18
9	Tetradecamethyl-hexasiloxane	458	15.7
10	Phthalic acid, octyl 2-pentyl ester	292	18.7
11	Docosane	310	18.2
12	2,6,10-Trimethyl-pentadecane	245	17.9
13	Phthalic acid, isobutyl 4-octyl ester	334	17.8
14	N-(2-cyanoethyl)-piperazine	139	16.8
15	Butanamide, N-methyl-4-(methylthio)-2-(2,2-dimethylpropylidene)amino	230	16.5
16	4-Bromo-2,6-di-tert-butylphenol	284	15.8
17	Octadecane	254	14.2
18	5,6-bis(2,2dimethylpropylidene)-(E,Z)-ecane	278	14.0
19	2,5-bis(1,1-dimethylethyl)-phenol	206	13.3
20	Heptadecane	240	13.1
21	2,5-Cyclohexadiene-1,4-dione,2,6-dis(1,1dimethylethyl)-	220	12.8
22	Cyclopentanone,3-(3-hydroxy-1-propenyl)-	140	12.2
23	4-Bromo-1H-imidazole	146	12.2
24	Hexadecane	226	12.1
25	1-ethyl-2,3,4,5,6-pentafluoro-benzene	196	11.1
26	Tetradecane	198	10.2
27	Dodecamethyl-pentasiloxane	384	9.37
28	2-Methoxy-3-(1-methylpropyl)-pyrazine	166	9.28
29	2-phenyl-aziridine	119	8.44
30	Indole	117	8.29
31	Tridecane	184	8.08
32	Isobutyl 4-cyano-benzoate	203	8.04
33	Ethylamphetamin carbamate	221	7.76
34	1-Ethyl-2,4-dimethyl-benzene	134	7.54
35	Methyl 5-O-methyl-a-D-Xylofuranoside	178	7.27
36	2-Allyl-2-methyl-1,3-cyclopentanedione	152	7.04
37	3-(4-methyl-3-pentenyl)-furan	150	6.96
38	Dodecane	170	6.68
39	Undecane	156	5.30
40	Decane	142	4.02

Today, traditional treatments have a special place in medicine, and in this regard, the use of medicinal plants is of the great importance. The aim of this study was to treat the type 2 and 3 burn injuries and their infections using native plants of Ilam. Many studies have proven anti-inflammatory and antibacterial effects of some herbs such as turmeric, BenjekSuzman, Gum of Baneh, and propolis. As mentioned, the use of antibiotics to prevent infection of burn wounds faces problems such as bacterial resistance. However, using this ointment does not have a negative effect on the use of antibiotics to prevent infections caused by burn wounds. Therefore, according to the results of this study, it seems that the use of this traditional herbal ointment can replace existing chemical treatments.

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