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FORMULATION AND EVALUATION OF HERBAL ANTI - ACNE GEL

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ABSTRACT

Acne vulgaris is a common skin disorder affecting more than 85% population of the world, specifically teenagers and adolescents. Antibiotics have been used to treat Acne. However, antibiotic resistance has been increasing in prevalence within the dermatologic setting. To overcome the problem of antibiotic resistance, medicinal plants have been extensively studied as alternative treatments for skin diseases. Herbal medication are considered safer than allopathic medicines, since allopathic medicines are associated with side effects like contact allergy, local irritation, scaling, photosensitivity, itching, pruritis, redness, skin peeling, cirrhosis of the skin. The present study, has been aimed to develop a topical formulation (Gel) containing hydroalcoholic extract of *Ocimum basilicum, Aloe vera, Curcuma longa, Acalypha indica* which have been reported for their antimicrobial, antiinflammatory and antioxidant activities. The developed formulation was examined for physical parameters such as colour, consistency, odour, pH, viscosity, spreadability, extrudability, washability and *invitro* antimicrobial activity against *Propionibacterium acne*, *Staphylococcus albus* and *Staphylococcus aureus* which are frequently involved in acne inflammation and compared with the marketed formulation.

Key words : Acne Vulgaris **,** Anti Acne gel.

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INTRODUCTION

Acne vulgaris is an extremely common skin disorder that affects areas containing the largest oil glands including the face, back and trunk. It is an inflammatory disease of sebaceous follicles of skin marked by comedones, papules & pustules and presence of bacteria like *Propionibacterium acne, Staphylococcus epidermidis* and *Malassezia furfur* in follicular canal. Multiple factors are responsible for pathogenesis of acne as sebum, abnormal follicular differentiation, harmones, *Propionibacterium acne*, inflammation and nutrition. [1]

The plants having phytoconstituents like alkaloids, phenolic compounds, volatile oil, essential oil, might be used for the preparation of topical herbal formulations. Among the alternate systems of

medicine, the topical therapeutic agents are more convenient for application. The herbs as ingredients in topical acne treatment are occupying the prime importance as they are safe, dilute, patient familiar, economic, easily available and multifunctional. So, herbal anti-acne preparation would be highly acceptable and improves the patient compliance. [2]

The present research work deals with the development of herbal anti-acne gel comprising the phytoconstituents which is extracted from the plants such as *Ocimum basilicum, Aloe vera, Curcuma longa* and *Acalypha indica.* The following microorganisms such as *Propionibacterium acne, Staphylococcus albus* and *Staphylococcus aureus* are selected for the evaluation of *invitro* antimicrobial activity. Since it is implicated in the development of inflammatory acne as it activates, complement and metabolize sebaceous triglycerides into fatty acids which chemotactically attract neutrophils. These organisms are involved in superficial infection within sebaceous glands. Thus *Propionibacterium acne, Staphylococcus* species are target site for Anti-acne drugs. [3]

MATERIALS AND METHODS

Plants

The plants *Ocimum basilicum, Aloe vera, Curcuma longa and Acalypha indica* were collected from local area of Tiruchirappali district in the month of March, 2014 and authenticated by the department of Pharmacognosy, Periyar College of Pharmaceutical Sciences,Tiruchirappali.

Preparation of Extracts

The fresh leaves of *Ocimum basilicum* and *Acalypha indica*, rhizomes of *Curcuma longa* and gel from the leaves of *Aloe vera* were dried in shade & powdered. The powdered leaves and rhizome materials (100 g) respectively were defatted with petroleum ether and then subjected to Soxhlet extraction to obtain hydroalcoholic extracts. The extracts thus obtained were filtered, concentrated on water bath to a thick paste and dried under vacuum**.**

Formulation development

Aloe vera gel and Carbapol 934 were dissolved in sufficient quantity of water and kept overnight. To this sodium hydroxide was mixed together with vigorous stirring to form a gel and kept in a beaker. The beaker was kept on a water bath and the temperature was allowed to reach above 50^0c. To this mixture, the weighed quantities of extracts of *Ocimum basilicum, Acalypha indica* and *Curcuma longa* were added. At the same time in another beaker weighed quantities of methyl paraben and propyl paraben were added in water and heated to dissolve. In another beaker weighed quantities of propylene glycol and polyethylene glycol were taken. Mixtures obtained were finally mixed to obtain a gel. Then remaining quantity of purified water was added and pH was adjusted to 6.8 with 10% sodium hydroxide solution.[4]The composition of the herbal formulation is shown in Table 1.

Table 1: Composition of Herbal anti-acne gel

S.No	Ingredient	Quantity taken
1.	*Ocimum basilicum* leaves extract	100g
2.	*Acalypha indica* leaves extract	100g
3.	*Curcuma longa* rhizome extract	100g
4.	*Aloe vera* gel powder	100g
5.	Methyl paraben	4g
6.	Propyl paraben	4g
7.	Carbapol 934	30g
8.	Propylene glycol 200	300g
9.	Polyethylene glycol	100g
10.	Sodium hydroxide (10%)	q.s
11.	Purified water	q.s

EVALUATION OF HERBAL FORMULATION

Physical parameters

Physical parameters such as colour, consistency, odour, pH, viscosity, spreadability, extrudability and washability were evaluated as per the standard procedure and it is compared with the marketed formulation.The results are shown in Table 2

Table 2: Evaluation of Herbal anti-acne gel

S.No	Parameters	Marketed Formulation	Developed Formulation
1.	Colour	Brownish Yellow	Light Green
2.	Consistency	Semisolid	Semisolid
3.	Odour	Acceptable	Acceptable
4.	Ph	7.05	7.98
5.	Viscosity	4400	4500
6.	Spreadability (Gm-Cm/Sec)	27.71	62.5
7.	Extrudability	Excellent	Excellent
8.	Washability	Good	Good

Invitro **Antimicrobial activity – Disc diffusion Method [5]**

Sample Preparation

The solutions of the gels were prepared using 100mg of gel in 10ml of Di Methyl Sulf Oxide (DMSO). Similarly, solution of marketed formulation was prepared. Tetracycline (10mg/ml) was used as a positive control and DMSO as a negative control.

Microorganisms

Propinibacterium acne was obtained by scraping acne from a volunteer, incubated in agar medium for 48 hrs under anaerobic conditions and confirmed to be *P. acne* by the Microbiologist of our Institution. The strains of *S.albus* and *S.aureus* were obtained from the stock culture maintained in the Microbiology department of our Institution.

Method

The solidified agar plates were uniformly swabbed with inoculums on the surface. In each of the fiter paper discs, the gel solutions in DMSO were placed and the plates were left at ambient temperature for 30 min. to allow pre diffusion prior to incubation at 37^0 C for 72 hrs under anaerobic conditions in a anaerobic bag (Hi-Media) with gas pack and indicator tablets and the bag was kept in an incubator for 72 hrs at 37 ± 1^0c. Gas packs containing citric acid, sodium carbonate and sodium borohydride were used to maintain and check the anaerobiosis. The indicator tablet of methylene blue changed from dark pink, blue, light pink finally, which indicated the achievement of anaerobic condition.

The culture of S. *albus* and *S.aureus* were prepared in nutrient agar medium at 24 hrs under aerobic conditions. Test samples of this aerobic bacterium were incubated at 37^0c for 24 hrs under aerobic conditions. The anti bacterial activity was estimated by measuring the diameter of the zone of inhibition (in mm).The experiments repeated four times.

RESULTS & DISCUSSION

The results of this investigation showed that the developed formulation had satisfactory gel properties (shown in Table 2) and inhibitory effect on the *P.acne*, *S.albus* and *S.aureus*. The activity of the developed formulation has been comparable to that of marketed preparation.

The Zone of inhibitions for the antibacterial activity for the developed formulation were compared with the standard tetracycline and herbal marketed preparation for *Acne vulgaris* (shown in Table 3) . The developed formulation has shown comparable zones of inhibitions to that of the marketed preparation (Fig.1, 2, 3). Zones of Inhibitions for tetracycline were found to be greater than that of the marketed and developed formulations. From the literature, it is observed that the phytoconstituents like triterpenoids, flavonoid, tannins and saponins are responsible for anti microbial property. This suggests that the active ingredients of the formulations containing secondary metabolites like triterpenoids, flavonoid, tannins and saponins may have contributed for antibacterial effect. Their activity probably may also be due to their ability to complex with extracellular and soluble proteins and to complex with bacterial cell walls. *P. acne*, an anaerobic pathogen is implicated in the development of inflammatory acne. The formulation having antibacterial agents inhibiting the *P.acne*, might also had reduced the development of inflammatory acne.

Table 3: Evaluation of antimicrobial activity of Herbal anti-acne gel

S.No	Formulation	Zone of inhibition(mm)		
		P.acne	***S.albus***	***S.aureus***
1.	Solvent control	-	-	-
2.	Standard	18 ± 0.340	18 ± 0.316	19 ± 0.33
3.	Marketed gel	7 ± 0.24	7 ± 0.326	7 ± 0.28
4.	Herbal Anti-acne gel	7 ± 0.35	5 ± 0.33	6 ± 0.323

n=4, Mean ± S.D

Fig.1.Anti microbial activity against *Staphylococcus albus*

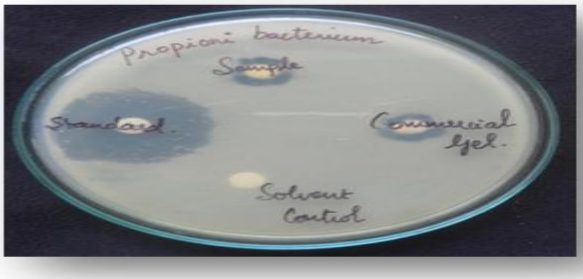

Fig.2.Antimicrobial activity against *Propionibacterium acne*

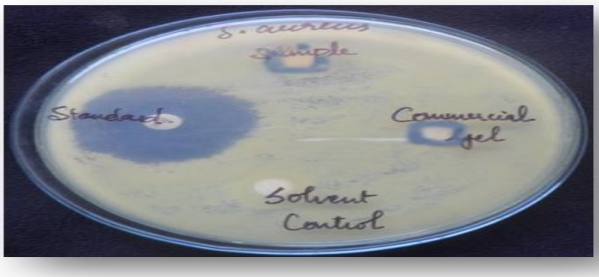

Fig.3.Anti microbial activity against *Staphylococcus aureus*

CONCLUSION

Acne vulgaris is an extremely common skin disorder and the importance of acne treatment should be enhanced as it can also lead to symptoms of serious depression and anxiety. In the present study, an anti-acne herbal gel comprising of *Ocimum basilicum, Acalypha indica, Curcuma longa* and *Aloe vera* plant extracts were developed and found to have potency against acne inducing bacteria. In future, the gel may be completely standardized and further processed for commercial use for the treatment of Acne.

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