International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 5 Sep-Oct 2022, pp: 197-204 www.ijprajournal.com ISSN: 2456-4494

Formulation and Evaluation Of Anti Acne Gel Containing Citrus Aurantifolia Fruit Juice Using Carbopol 934 as Gelling Agent

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Submitted: 05-09-2022 Accepted: 13-09-2022

ABSTRACT
The current formulation was performed to discover a result of anti-acne gel containing Citrusaurantifolia organic product juice as a successful antibacterial to treat skin inflammationbrought about by Propionibacterium skin break out and Staphylococcus epidermidis utilizingCarbopolas agellingspecialist.The new squeeze of C. aurantifolia organic product was gotten by juicer and pasteurized. Thebaseinhibitoryfixation(MIC)oftheorganicproductjuicewasresolvedutilizingthemicrodilution strategy. At that point, Carbopol in various concentrations was joined in a gelbase formulation to get a steady gel base. The new squeeze in various formulations (F1 to F5)was assessed for 28 d. The Colour, pH, Extrudability, Spreadability and thickness of everyformulation were watched. Likewise, the antibacterial power of every formulation was brokedownutilizing theagardisseminationtechniqueagainstbothtriedmicroorganisms.
The citrus MIC estimations of both test microorganisms indicated various outcomes, 20-40%v/v for P. acne inflammation and 5-10% v/v for S. epidermidis. The MIC esteems werechanged over into in vivo concentration and the resulted concentration for every formulationwas 25, 50, 75, 78 and 80% v/v. For supporting the formulation, the steadiest base gel wasaccomplished utilizing Carbopol 1.7% as the gelling operator. Among 5 formulations, theanti-acne gel formula containing 80% organic product juice with Carbopol 1.7% was the bestdetailing dependent on the physical andmicrobiological parameters.in this way,itwasinferred that the antiacne gel of organic product juice of C. aurantifolia with Carbopol as agelling specialist could deliver the compelling and stable gel of hostile to skin break out item.So, it was concluded that the antiacne gel of fruit juice of C. aurantifolia with Carbopol as agellingagentcouldproducethe effectiveandstablegelofanti-acne product.

Keyword:C. aurantifolia, Lemon Juice, Acne

I. INTRODUCTION

Acne

Acne is a skin condition that occurs when your hair follicles become plugged with oil anddead skin cells. It causes whiteheads, blackheads or pimples. Acne is most common amongteenagers, though it affects people of all ages. Effective acne treatments are available, butacne can be persistent. The pimples and bumps heal slowly, and when one begins to go away,others seem to crop up. Depending on its severity, acne can cause emotional distress and scarthe skin. The earlier you start treatment, the lower your risk of such problems. Acne vulgariseor simplyknown asacne is a human skin disease characterized by skin with scalyredskin (Seborrhoea),blackheadsand whiteheads(Comedones), pinheads(papules), Large papules(nodules)pimples andscarring[1].
Acne affects skin having dense sebaceousfolliclesinareasincludingface, chestand backacnemay beofinflammatoryornon-inflammatoryforms[2,3].

Symptoms

Acnesignsvarydepending ontheseverityofyourcondition:

- Whiteheads(closedpluggedpores).
- Blackheads(openplugged pores).
- Smallred,tenderbumps(papules).
- Pimples(pustules), whicharepapuleswithpusattheir tips.
- Large,solid, painfullumpsundertheskin(nodules).
- Painful,pus-filled lumpsundertheskin(cystic lesions).
- Acneusuallyappearsontheface,forehead, chest,upperbackandshoulders[4,5]

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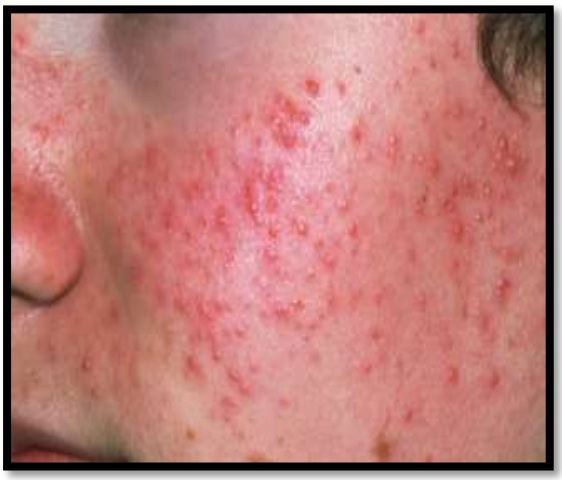

Figure 1 Common acne

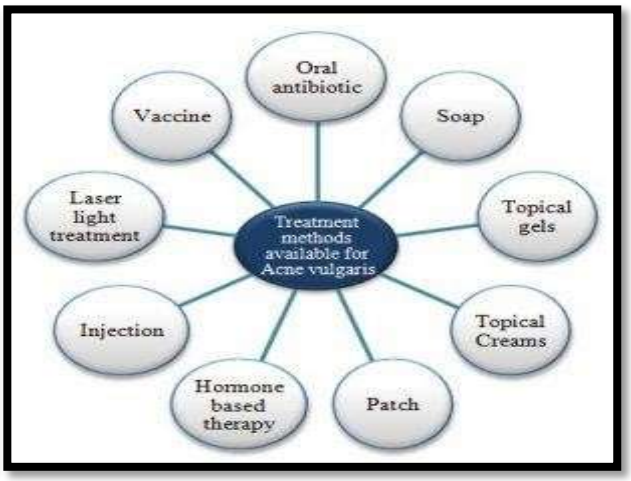

Figure 2 Treatment medicine category

Causes of acne formation:-

Fourmain factorscauseacne:

- Excessoil(sebum)production.
- Hairfolliclescloggedbyoilanddeadskincells .
- Bacteria.
- Inflammation

Treatment

Most commonly used medication is topical creams and gels and they are used in case of mildandmoderateacne.Whereas,theoralantibioticsar eusedinthecaseofsevereacnevulgaris Citrusfamilyisawidelyconsumedgroupoffruitswhich containsseveral metabolitessuchasflavonoids,ascorbicacidandcarote noids.Citrusaurantifoliaisoneofthecitrusspeciesthat widespreadandconsumedlimespeciesinIndonesia.Tr aditionally,thisfruitjuicehaslongbeenusedasanantac neherbanditeffectivelyhasbeenproven.Butifthefruits mustbesqueezedfirst,thenthetreatmentbecomesnoto ptimalandnotpractical.Meanwhile,toovercomethepr oblemofacneagainstP.acneandS.epidermidisrequire danti-acnepreparations that have good penetration and long contact time. Therefore, in this study C.aurantifoliajuiceisformulatedintheformofanti-acnegelpreparations.Gelpreparationcanbeusedasan optionforanti-acnepreparations.Thegel dosageformcanlastlongintheskinandthereleaseofgoo dactivesubstances.Gel formulationmakesthepreparationmoreeasilyremova blefromtheskinthenointmentandcream [6,7]

Material

The fruit juice Fruits(C.aurantifolia) ,was extracted the extraction process performed in college campus, Carbopol 934,PEG is purchased SwamiEnterprisesShivRamPark,Delhi, Agar, Methylparaben and Triethanolamine is buy form sigma Aldrich.

The tested bacteria used in this study were Propionibacterium acnes andStaphylococcus epidermidis, obtainedfrom PT. Bio-Pharma and Microbiology Laboratory, The growth medium used was Mueller HintonAgar (MHA-OXOID) and Mueller Hinton Broth. The chemicals used wereamyl alcohol, 10% NH3, 2N-HCl, iron (III) chloride, ether, CCl4, anhydrous acetic acidsolution in Conc. H2SO4, 1% Gelatin, Dragendorff Reagent (potassium bismuth iodidesolution).Mayerreagents (potassium mercury iodide solution),10%vanillin solution inConc. H2SO4, 1N- NaOH, KMNO4 Powder, Mg powder & Sterile physiological NaCl,DistilledH2O, C2H5OH,Carbopol, PropyleneGlycol, Methylparaben&Triethanolamine.

Method:-

FruitJuicePreparation:-

Complete fresh fruits ware washed with 1.5% KMNO4, after juice was collected and filteredby a separated funnel using filter paper, and pasteurization process used for juice sterilizationat65-70C for30min.

PhotochemicalScreening:-

Photochemicalscreeningdetectingfromphot ochemicalscreeningofplantmethodtofindoutthe secondary metabolite group found in the fruit juice of C. aurantifolia. Metabolites like,Alkaloids,Flavonoids,Polyphenols,Tannins,Mo noterpenoids&Saponins[8].

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MinimumInhibitory Concentration.-

Micro dilution method was used for determination of MIC, with plates 96 wells. Each columnis filled with 100µl column 4; it was taken as much as 100µl and put into column 5 to find outa juice concentration less than half concentration compared to the juice concentration incolumn 4. Thus, until column 12 and last was removed 100µl from column 12, thus allColumns only contain 100µl test media suspension. As a positive control filled with 100µlMHB and 10µl suspensions of the test bacteria. Then into all columns, except column 2inoculated with 100µl suspensions of the test bacteria. The micro filter plate was closed andincubated at 37°C for 18-24hrs. Petri dishes contain the most active test materials with thesmallest concentrations showing the least growth and the last growth of test bacteria wasdetermined as the range of MIC values. The incubation of MIC, observed by its turbidity andconcentration resulting in a clear test medium, was taken as much as 10µl to be re inoculatingd o n a solid MHA surf ace. The test medium was incubated at 37°C for 18-24h. The Petridish contains the most active test material with the smallest concentration that did not showthe growthoftestbacteriadeterminedas the MBC value range.

Table.1Preformulationofbasegel

S.No.	Composition	F1	F2	F3	F4	F5
1	Citrusaurantifolia					
2	Methylparbean	500mg	-	-	-	-
3	Triethanolamine	0.20	0.25	0.30	0.35	0.40
4	Carbopol934	0.8g	1g	1.2g	1.5g	1.7g
5	Propyleneglycol	9ml	8ml	10ml	12ml	14ml
6	Distilledwater	100ml	100ml	100ml	100ml	100ml

FormulationandEvaluationofAnti-acneGel:-

Lemonjuicehasbeenaddedtothebasegelmethylparaben&addsethanolfordilution.Stirringwassto ppedandthegelwasstoredinasealedcontainer.Thegel waskeptfor24hrsuntil the bubbles were disappeared.The detailed formula of fruit juice showing in below tableAfterobservethephysicalstabilityofC.aurantifolia juicepreparationcomprisedanexamination of Morphology, pH & Viscosity during storage in climatic chamber for 28 days.In the morphology of this preparation we have to observe the colour, odour, and texture of thepreparation[9].To know the particle and substance that have been not homogenously, the gel preparationwas tested for homogeneity by applying it to a glass, if the particle have not mixed properlythencandetecteasily.The preparation was prepared in a 100 ml beaker glass and then the spindle with a certainnumber and a certain speed (rpm) was set and then dipped into the preparation until theapparatus showed the viscosity value of the preparation. The viscosity value (CPS) shown inthe RIONViscometertoolwas theviscosityofthedosage.Evaluation of viscosity, done by using spindle R5 with speed of 30 rpm The pH of gelpreparationwasmeasuredusinga calibratedpH meter[10-12].All formulas gel evaluation was observed on 0, 7, 14, 21 & 28 days of gel storage at roomtemperature.

PreparationofBacterialSuspension:-

McFarlandsolutionconsistedoftwocomponents,1%BaCl2&1%H2SO4.Atotalof0.05ml of 1% BaCl 2 solution was mixed with 9.95 ml of 1% H2SO4 solution and shakenhomogeneously. The turbidity of the solution was measure d at a wavelength of 530nm byusing dist ille d water as a blank. The absorbance value of the standard solution should be i nthe range of 0.08 to 0.13. The standard McFarland 0.5 solutions are equivalent to a bacterialcell suspension with a concentration of 1.5 x 108CFU/m l. The tested bacteria were scratchedon the surface of slant agar, and then incubated for 18-24h at 37°C. Each of P. Acnes and S.epidermidiscolonieswereTakenusingOse,thensusp

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endedintosterilephysiologicalNaCl. Thebacterialturbiditywasmeasuredusingaspectrophotometeratλ530nm,comparedwitha 0.5McFarlandsolution[13,15].

Anti-acneActivity:-

Agar diffusion method, perforation techniqu1e against P.acneand S. epidermidis is used toknowtheefficacyofantiacnegelA total of 20µl bacterial suspension was fedinto sterile Petri dishes and suspendedin 20mlof the MHA which was poured into the sterile Petri dish. The test medium was homogenizedand allowed to solidify. Media that has been solidified then perforated to make holes forsample reservoir.

The negative and positive control was prepared, where the negative control containstheonlymedium,meanwhilethepositiveControlconsistedoftheinoculatedbacterialsuspension using the streak inoculation method. All test and control media were incubated at37°Cfor24h.Theinhibitorydiameterformedwasmeasuredusinga calliper.

Drugcontent:-

The drug content of the formulations was determined by dissolving an accurately weighedquantity of gel 1gin 100ml of solvent(phosphate buffer pH 6.8 + ethanol in ratio40:60).Thesolutionswerekeptforshakingfor4hrs andthenkeptfor6hrsforcompletedissolutionof the formulations. Then the solutions were filtered through 0.45mm membrane filters andproperdilutionsweremade,andthesolutionwassubjectedtotheSpectrophotometricanalysis. The drug content was calculated from the linear regression equation obtained fromthe calibrationdata.

In-vitrodiffusionstudies:-

The in-vitro diffusion studies for all formulations (F1-F5) were carried out using the Franz-diffusioncell.Thediffusioncellapparatuswasfabricatedasanopenendedcylindricaltube.A weighed quantity of formulation equivalent to 1gm of the drug was placed onto the dialysismembrane-70(Hi-Media)andwasimmersedslightlyin100mlofreceptor medium(phosphate buffer pH 6.8+ ethanol in ratio 40:60) which was continuously stirred and thetemperature was maintained at 37±1°C. Aliquots of 1ml were withdrawn from each of thesystem at time intervals of 5, 10, 15, 30, 60, 120, 240, and 360 minutes were analyzed fordrugcontentusingultravioletspectrophotometer[16].

Release kinetics studies

To study the release kinetics and mechanism of release in-vitro release data was applied to kinetic models such as zero order (Cumulative % drug release vs. time), first order (Log Mean % drug unreleased vs. time), Higuchi (Mean % cumulative drug release vs. square root of time)

Stabilitystudies:-

ThestabilityoftheformulationswasassessedaccordingtotheguidelinesissuedbyInternationalConferenceonHarmonisationonOctober27,1993, for 6 months[17,18].

II. RESULT

PhotochemicalScreening:

TablePhotochemicalScreening

S.No.	Metabolites	Result
1	Alkaloids	+
2.	Flavanoids	+
3.	Tannins	+
4.	Monoterpenoids	-
5.	Sesquiterpenoids	-
6.	Quinines	-
7.	SaponinGlycosides	-
8.	Steroids	-

Note:-(+)Presenceand (-)Absence

MICDetermination:-

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Table MICstudy

S.No.		BacterialGrowth	
	Conc.%w/v	P. Acnes	S. Epidermidis
1.	40	-	-
2.	20	+	-
3.	10	+	-
4.	5	+	+
5.	2.5	+	+

Evaluationofbasegelpreformulation

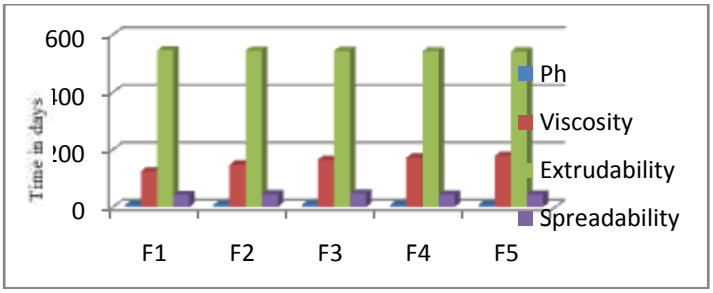

Figure3A diagrammatically graph gel base preformulation

EvaluationofAnti-acneGel

Table3.4 EvaluationofAnti-acneGelEvaluation

Days	FormulationCode	pH	Viscosity (cps)	Extrudability(g)	Spreadability(g/second)	Colour
1	1	6.8±0.05	140±0.50	548.2±0.2	44±0.4	Transparent Yellow
7	2	6.6±0.00	147±0.00	546.4±0.4	47±0.2	-
14	3	6.7±0.04	139±0.50	545.5±0.5	49±0.5	-
21	4	6.8±0.03	145±0.00	542.2±0.4	45.5±0.3	-
28	5	7±0.00	144±0.00	549.5±0.3	42±0.2	-

Drugcontent:-

We have to find out the % drug content & % cumulative release of all formulation F1 to F5,the drug contentdata found between 90.4 to 97.5, % cumulative release between 90% to95%

In-vitroreleaseStudies

We have to find out the % drug release of all formulation F1 to F5,% drug release between 90% to 95%.

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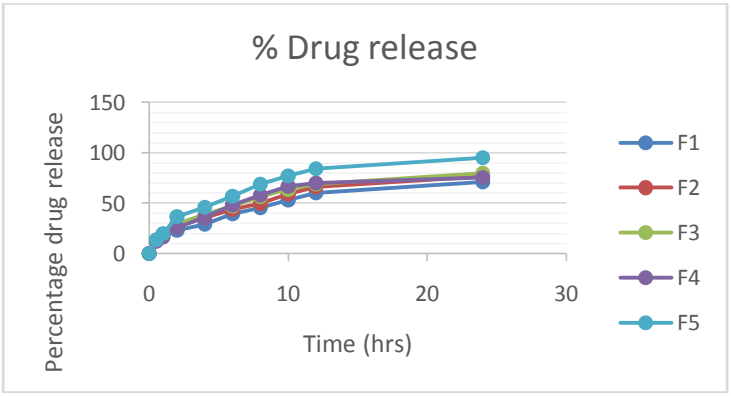

Figure 4 In vitro release profile of optimized gel formulation

Antibacterialactivityofallformulations

P. acne:Propionibacterium SD:StandarddeviationandS. epidermidis.

Thus,from the whole study carried out, itcan be said that formulation F5 having1.7gconcentration of gelling agent, Carbopol 934, with good consistency, better spread ability, &viscosityandhigherextrudabilitywasfoundtobe the most optimizedformulation.

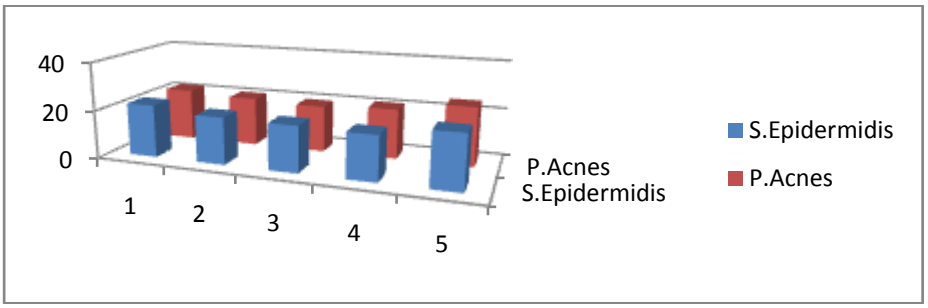

Figure 5comparison of antibacterial potency of P .Acnes, and S. epidermidis

Stability study

Table stability study

S.No	Time in Months	% Drug release	Viscosity	pH	Colour
1	1	95.24	144	8	Transparent
2	2	95.10	143	8	-
3	4	95	143	7.9	-
4	6	95	142	7.9	-

All parameter of stability study was found to be good and validate the standard value

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III. CONCLUSION

AntiacnegelcontainingCitrusaurantifoliawaspreparedbyusingCarbopol934,methylparabean,andtriethanolaminedifferentratios.CitrusaurantifoliafruitjuiceasaneffectiveantibacterialtotreatacnecausedbypropionibacteriumacneandStaphylococcusepidermidisusingCarbopolasagellingagent.Fruitwasobtainedbyjuicer,allbasegelformulationswere evaluated for their physical parameter like, pH (8±0.00 to 9±0.002), viscosity (125±0.52to 178±0.52) Extrudability (541.5±0.6 to 546.2±0.2), Spread ability (42±0.2 to 47±0.4). Andphysicalparameters ofantiacnegelfoundtobe (6.6±0.00 to 7±0.00), viscosity(139±0.50to147±0.00), Extrudability(542.2±0.4to549.5±0.3),Spreadability(42±0.2to49±0.5) We have find out the % drug content & % drug release of all formulation F1 toF5,thedrugcontentdatafoundbetween90.4to97.5,% drug releasebetween90to95.Wehavealsodonetheantibacterialactivityofallformulationandfoundtobeof S.Epidermidis(19.6±0.8to22.4±1.12),P.Acnes(19.5±1.10to24.5±0.6)

It can be concluded that the fruit juice of C. aurantifolia gel formulations prepared with thedifferentconcentrationofCarbopol(accordingtoformulationcode)asgellingagents,confirm the stable physical characteristics of the base gel.In this study,the formulation 5with a concentration of 80 % fruit juice presented the excellent anti-acne topical against P.acneandS.epidermidis.The new squeeze of C aurantifolia organic product taken and pasteurized for30 min at 65-70 °C. The base inhibitory fixation (MIC) of the organic product juice wasresolved utilizing the microdilution strategy. At that point, carbopol in variousconcentrationswas joined in a gel base formulation to get a steady gel base. The new squeeze in variousformulations (F1 to F5) was assessed for 6 months. The Color, pH, Extrudability, Spreadability and % drug release of every formulation were watched. Likewise, the antibacterial power of everyformulation was broke down utilizing the agar dissemination technique against both triedmicroorganisms.

The citrus MIC estimations of both test microorganisms indicated various outcomes**20-40 %v/v** for P. acne inflammation and 5-10 % v/v for S. epidermidis. The MIC esteems werechanged over into in vivoconcentration and the resulted concentration for every formulawere 25, 50, 75,78 and80% v/v.Forsupporting the formulation, themoststeady base gelwas accomplished utilizing carbopol 1.7 % as the gelling operator. Among 5 formulation, theanti-acne gel formula containing 80 % organic product juice with carbopol 1.7 % was the bestdetailing dependent on the physicalandmicrobiological parameters. in this way, itwasinferred that the antiacne gel of organic product juice of C. aurantifolia with carbopol as agelling specialist could deliver the compelling and stable gel of hostile to skin break out item.So, it was concluded that the antiacne gel of fruit juice of C. aurantifolia with carbopol as agellingagentcouldproducethe effectiveandstablegelofanti-acne product.It can be concluded that the fruit juice of C. aurantifolia gel formulations prepared with theconcentration of 1% carbopol as gelling agents, confirm the stable physical characteristics ofthe base gel. In this study, the formulation 5 with a concentration of 75% fruit juice presented theexcellentanti-acne topicalagainstP.acneandS.epidermidis.

REFERENCES

[1]. Adityan,Balaji,RashmiKumari,andDevinderMohanThappa."Scoringsystemsinacnevulgaris."IndianJournalofDermatology,Venereology,andLeprology75,no.3 (2009):323.

[2]. Benner, Nicholas, and Dawn Sammons. "Overview of the treatment of acnevulgaris."Osteopathic FamilyPhysician5,no.5(2013):185-190.

[3]. James,KirkA.,CraigN.Burkhart,andDeanS.Morrell."Emergingdrugsforacne."Expertopinononemergingdrugs14,no.4(2009):649-659.

[4]. James,WilliamD."Acne."NewEnglandJournalofMedicine352,no.14(2005):1463-1472.

[5]. Arndt,KennethA.,andJeffreyTSHsu.Manualofdermatologictherapeutics.LippincottWilliams&Wilkins,2007.

[6]. Laurence,Anderson."LookingGood,theAustralianGuidetoSkinCare."(2006).

[7]. Thiboutot, Diane M., and John S. Strauss. "Diseases of the sebaceous glands." Burns, Tony;Breathnach,Stephen; Cox, Neil; Griffiths, Christopher.Fitzpatrick's dermatology in generalmedicine(6thed.).NewYork: McGraw-Hill(2003):67287.

[8]. Farnsworth NR. Biological and phytochemical screening of plant. J Pharm Sci 1966;55:243-69.].

[9]. Djajadisastra J, Mun' im A, Dessy NP.

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Formulasi gel topical dariekstrak nerii folium dalamsediaanantijerawat.JFarmasiIndonesia2009;4:210-6.].

[10]. Sudjono TA, Honniasih M, Pratimasari YR. Pengaruh konsentrasi gelling agent carbomer 934dan HPMC pada formulasi gel lender bekicot (Achatina Fulica) terhadap kecepatan penyembuhanlukabakar padapunggungkelinci.Pharmacon2012;13.].

[11]. Panigarhi L,John T, Shariff A,Shobarani RS. Formulation and evaluation oflincomycinHCLgels.IndianJPharmSci1997;59(6):610-3.

[12]. DuaK,PabrejaK,RamanaMV.Aceclofenactopicaldosageforms:Invitroandinvivo

[13]. characterization.ActaPharm2010;60(4):467-8.

[14]. DasK,DangR,MachaleUM.Formulationandevaluationofanovelherbalgelof Stevia

[15]. extract. IranJDermatol2009;12(4):117-22.

[16]. Kusuma SAF, Soraya RM, Indah F, Resmi M. Study on the antibacterial activity of fruitextracts of Klutuk Banana (Musa balbisianacolla) against Shigella dysenteriae ATCC 13313.AsianJPharmClinRes2017;10:220-3.].

[17]. Dua K, Pabreja K, Ramana MV. Aceclofenac topical dosage forms: In vitro and in vivocharacterization.ActaPharm2010;60(4):467-8.].

[18]. ICHGuidelines.StabilityTestingofNewDrugSubstancesandProducts.27 Oct 1993.

[19]. Carl AB, Edward RA, David EB, Tietz NW, Editors. Textbook of Clinical Chemistry andMolecularDiagnoistics.4threved.Philadelphia,PA:WBSaunders;2001.)

[20]. Kum H, Roh KB, Shin S, Jung K, Park D, Jung E. E valuation ofanti-acne properties ofphloretininvitroandinvivo.IntJCosmetSci2016;38:85-91.