



Formulation and Evaluation of Topical Gel Using Avocado Extract

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ABSTRACT

The aim of the current study was to explore the possibility of formulating a topical gel using avocado extract. The avocado oil was extracted by the locally procured fruit. Different formulations were prepared by changing the concentration of avocado oil and carbopol. The formulations were tested for pH, spreadibility, viscosity, sunscreen activity and antibacterial effect. All the parameters were found to be satisfactory. The formulation exhibited good sunscreen activity and was found effective against selected microorganism. It can be concluded that the formulation can be used in the treatment of different skin infections and for the protection from Sun.

Keywords: Avocado, gel, spreadibility and sunscreen.

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INTRODUCTION

Avocado, or *Persea Americana* Mill is a tropical fruit which belongs to Lauraceae family. It is well known that Avocado has high nutritional contents and active therapeutic contents. Avocado composition is rich in oil content compared to other types of fruits and it contains many mono unsaturated fatty acids such as Palmitic acid, Palmitoleic acid, Stearic acid, Oleic acid, Linoleic acid and Linolenic acid^{1,2}. Also, this oil retains most of carotenoids and phytochemicals which is inside the fruit. In addition, Avocado oil also contains many vitamins, minerals, lecithin, B-sitsterol, polyphenol and Flavonoids content, thus due to its previously mentioned content, Avocado extract has antioxidant, sunscreen, antimicrobial activity and many more therapeutic activities^{3,4}. In reference to the sunscreen activity of avocado extract, Avocado oil absorption is quick through the skin and it is found to be good for tissue and massage creams, muscle oils, and other products where lubrication and penetration are essential. Avocado oil is one of the most penetrating oils available for cosmetics⁵. In addition to the antibacterial activity of avocado extract, Avocado rhizobacteria emit organic compounds with antifungal activity against fungal infections⁶. The lack of in vivo genotoxic activity of the extract supports that *P. americana* seed extract could be used as a possible food, cosmetic, or pharmaceutical material for formulation of topical dosage forms⁷.

Therefore, the aim of the current study was to develop a semisolid formulation of *Persea Americana* and to evaluate its activity in vitro.

MATERIALS AND METHOD

Extraction of Avocado Oil

The oil of avocado was extracted using Pulp drying method where the ripe avocados were peeled with a peeler, the seeds were removed and then the pulp was scooped out into a manual grinder which turned it into a paste. The paste was then transferred into a beaker and then placed on the water bath at 75 – 80 degrees Celsius. It was left on the water bath for 3 days to evaporate the water content. After the water had evaporated, the avocado paste was pressed through a muslin cloth and the resultant oil was centrifuged and collected⁸.

Formulation of gel

Avocado oil extract formulation was composed of Itraconazole as the drug along with the avocado oil extract. The other ingredients were, Carbopol 940 as a gelling agent, Methyl and propylparaben as preservatives, Glycerine was used as a wetting agent while propylene glycol was added as a permeation enhancer. Triethanolamine was added to adjust the pH to the desired pH range of 6.8-7.

The formulation was prepared by taking Avocado oil in specific quantity then itraconazole was dissolved and mixed with it. Glycerin and propylene glycol were subsequently added and then the mixture was heated. In the other beaker, Carbopol was mixed with warm water and then stirred on a hot plate. Finally, the first beaker was transferred into second beaker and then methyl and propyl paraben were added and mixed. Triethanolamine was added and then subsequently pH was checked. In the same way, different formula proportions was prepared as per Table- 1^{9, 10, 11}.

Table 1: Formulation chart

Ingredients	F1	F2	F3	F4
Itraconazole (gm)	1	1	1	1
Avocado oil (gm)	0.5	1	1.5	2.0
Carbopol 940 (gm)	0.5	0.75	1.0	1.25
Methylparaben (gm)	0.18	0.18	0.18	0.18
Propylparaben (gm)	0.02	0.02	0.02	0.02
Glycerine (ml)	5	5	7.5	5
Propylene glycol (ml)	0.5	1	1.5	2
Triethanol amine (ml)	0.1 (2 drops)	0.05 (1 drop)	0.05(1 drop)	0.05 (1 drop)

Determination of PH

pH measurement of the formulation was carried out using a digital pH meter. The glass electrode was completely dipped into the gel system so that it covers the electrode completely. Each of the four gel formulations prepared were tested^{8, 10, 11}.

2.4 Determination of Spreadability

Two sets of glass plates 20 x 20cm of standard dimensions were taken. 0.5gm of the avocado gel formulation was placed over one of the slides. The other slide was placed on the top of the gel, such that the gel was sandwiched between the two slides. 125 g weight was placed on the upper slides for 5 minutes so that the gel between the two slides was pressed uniformly to form a thin layer. The diameter of the circle due to the spread of gel was measured^{10, 11}.

Determination of Viscosity

The viscosity of gel was determined by using a Brookfield viscometer DVII model. The sample container size was 50gm of gel filled in a 100ml beaker. The T-bar spindle was lowered perpendicular to the center of the beaker taking care that the spindle doesn't touch the bottom of the beaker. Few parameters like temperature, pressure and sample size which affect the viscosity were maintained during the process. The spindle was rotated at a rate of 200 rpm (rounds per minute)^{8, 10}.

Determination of sunscreen activity

To test the sunscreen activity of Avocado gel, a 20%w/v solution of the gels was made and the absorbance of each gel formulation was measured using UV spectrophotometer. The absorbance

was measured at different wavelengths of 290nm, 330nm, 370nm, and 410nm. The same procedure was repeated for the oils and the standard sunscreen agent (zinc oxide). The values obtained were compared with the standard sunscreen agent ⁸.

Determination of Antibacterial activity

The antibacterial activity of avocado oil was tested using a culture media containing Staphylococcus Aureus bacteria where in the control drug (amoxicillin), avocado oil extract, and prepared gel were studied for the given effect by observing the zone of inhibition produced around each component after inoculation for a period of 24hours at 37 degrees Celsius^{8, 10}.

RESULTS AND DISCUSSION

Determination of pH

The PH for the four formulations prepared was in the range of 6.7 to 7.1 which are considered acceptable to avoid the risk of irritation upon application to the skin because adult skin pH is 5.5 ^{8, 10, 11}.

Determination of Spreadability

The spreadability was acceptable which was found to be within 5.2-8.0 cm and was compared with the marketed product and was found to be comparable. Also, it was observed that the spreadability of the gel decreased with increase in the concentration of the polymer which indicates that the gel formulations with the Carbopol had the less spreading capacity. Thus, F1 showed better spreadability than other formulation due to less polymer content as shown in Table 2.

Table 2: Spreadability of different formulations

Formulation	Spreadability (cm)
F1	8.0 cm
F2	7.2 cm
F3	6.1 cm
F4	5.2 cm
Marketed antifungal gel	8.4 cm

Determination of Viscosity

As per viscosity data presented in Table-3, the results showed that as the concentration of the polymer increases, the viscosity also increased which can be observed in F4, which showed highest viscosity compared to other formulations due to the increase in the concentration of the polymer.

Table 3: Viscosity of different formulations

Formulation	Viscosity (mPas)
F1	2000 mPas
F2	3300 mPas
F3	5200 mPas
F4	6000 mPas

Determination of Sunscreen Activity

Sunscreen activity is the ability of a substance to absorb ultraviolet light. The role of sunscreen is provided by the lipid content of Avocado extract that contain Polyhydroxylated fatty acids ¹². As per the results obtained, the gel formulation showed an absorbance at wavelength within the ultra violet region of 290 to 410nm. In comparison with the standard sunscreen agent, Zinc Oxide, the absorbance of the gel was equivalent to that of zinc oxide at wavelength of 390 and 410 nm. The results shows that the avocado gel and oil could be highly useful as an effective sunscreen agent and can also help to protect the skin against sun rays.

Determination of Antibacterial Activity

Avocado extract activity as an antibacterial is as a result of its contents such as Flavonoids, Saponins, Tannins and steroids ¹³. The evaluation test of antibacterial activity was done with *Staphylococcus Aureus* using control drug (amoxicillin) and avocado oil extract and gel formulation as shown in Figure 1. It was observed that avocado oil showed antibacterial activity along with gel, hence it was concluded that the preparation is useful against multiple infections i.e infections caused by both bacterial and fungal infection as it contains itraconazole along with avocado oil.

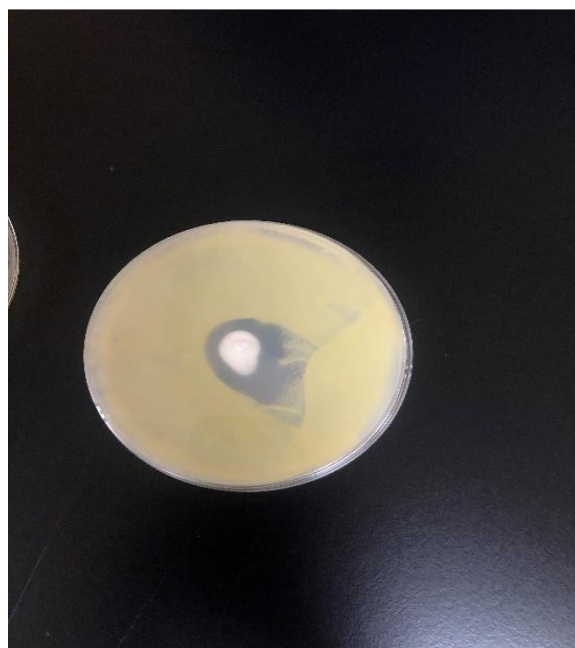


Figure 1: Antibacterial test of the formulation.

CONCLUSION

The gel formulation of Avocado extract was found to be effective as a natural Sunscreen and antibacterial agent. By adjusting the formula proportion, different gel characterizations and properties can be controlled and managed to enhance the effectiveness of Avocado extract gel. The

formulation can be used in the treatment of different skin infections and also for the protection from Sun.

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