ANTIBACTERIAL ACTIVITIES OF CASPIR (*Capsicum frutescens L.*) LEAVES GELE EXTRAC AGAINST *Propionibacterium acnes* CAUSES OF ACNE

Anggraini Gobel[1)], Srimuliani Arbie[2)], Agusrianto Yusuf[3)]
[1,2,3)]Bina Mandiri University Gorontalo
E-mail: megagobel47@gmail.com

ABSTRACT

This study aims to determine the effectiveness of the spray gel preparation of cayenne pepper leaf extract (Capsicum frutesens L) in inhibiting the growth of Propionibacterium acnes bacteria and to determine the best concentration of the spray gel preparation of cayenne pepper leaf extract (Capsicum frutesens L) tested on acne-causing bacteria.

The method in this study used a completely randomized design (CRD) with five treatments based on preparations with three concentrations, positive control and negative control. The treatments were: P1 (25% cayenne pepper leaf extract preparation), P2 (50% cayenne pepper leaf extract preparation), P3 (75% cayenne pepper leaf extract preparation), P4 (Control +), and P5 (Control -) .

The results showed that the results of phytochemical screening for flavonoid compounds were positive and for the results of the inhibition zone testing of the extract preparations there was an average inhibition zone in the preparation with a concentration of 50% cayenne pepper leaf extract of 11 mm and 75% of 12 mm. While the results of statistical data analysis using One Way Anova get results > 0.05, which is 0.945, which means that H0 is accepted.

Keywords: Spray Gel, Cayenne Pepper Leaf Extract, Flavonoids, Acne

INTRODUCTION

The skin is the outer part of the body has a changeable nature, the outermost cells are regenerated with the latest skin cells. The skin plays a role in the exchange of carbon dioxide, protects from pathogenesis, and has a role in maintaining fluid content in the skin. The skin has three components, namely the epidermis, dermis and subcutis. Hair, nails, sebaceous glands, sweat glands and apocrine are interpreted as derived from the skin.

The outermost layer of the epidermis forms the presence of keratin compounds in the cornium forming through the old skin. In some parts of the skin produces a profile such as thin scales. The coating slows down and can come off when rubbed in the shower with the base layer filling in the loose layer [27].

Dermis layer, this section includes the skin is located at the base of the epidermis. In this section there are blood vessels and others [1]. Hypodermis or subcutis, this section consists of connective tissue as well as adipose tissue in the form of a superficial fascia seen in an anatomical way. This part is composed of lipid cells, blood vessels and other components, has benefits in defense against internal body organs, maintaining body temperature and for storing food reserves [10].

Facial skin is something that is very visible to women or men. Everyone likes

Submit: January 18th, 2022 Accepted: March. 9th, 2022 Published: March. 28th, 2022

clean, beautiful and healthy facial skin. The main reason is the look of the face. There are four types of facial skin, namely as follows [24]:
Dry skin, in this part of the skin, the sebaceous glands with sweating are quite a bit with characteristic dry skin and have a non-radiant appearance. Normal skin, in normal skin types, the amount of sebaceous with sweating is not too much because it spreads evenly. The characteristics of this type of skin are that the skin looks radiant and has few complaints. Oily skin, in the type of oily skin, sebaceous glands with profuse sweating. This type of skin has facial characteristics that quickly develop acne.

There are several steps that can be taken in maintaining facial skin, including using treatments such as creams and face masks or the like. Starting from economical to fantastic facial treatments, it is taken to maintain facial skin. The use of chemicals and other external substances can have a detrimental effect on the face. Therefore, you must be careful when using chemicals as facial treatments. The effects that will occur on the face of stings vary from dry skin, the face looks dull, acne to skin cancer [12].

The most common facial skin problem and very disturbing appearance is acne which is usually the emergence of many small spots to large spots containing pus that cause scars. Department of Dermatology and Venereology, Faculty of Medicine, University of Indonesia/RSUPN dr. Cipto Mangunkusumo- Jakarta at the age of growing up, acne is a problem. In Indonesia, about 83% - 100% aged 16-17 years experience acne. The percentage of acne in women is about 12% and in men 3%.

Acne is a skin problem experienced by adolescents with a very large percentage of women compared to men between the ages of 20 and older [3]. Several factors can trigger acne, including oily facial skin, an untreated face, stress, food allergies, or bacterial infections. One of them is Propionibacterium acnes.

Propionibacterium acnes is a bacteria found on the skin and is gram positive, and does not require oxygen to live. These bacteria have a function as a factor that causes acne, by producing lipase that breaks down into lipid acids in skin fats that cause swelling. Swelling can make bacteria multiply thereby exacerbating inflammatory lesions through stimulation of proinflammatory cytokines [11].

An attempt in the treatment of acne is to kill or prevent the growth of bacteria that cause acne through antibacterial substances. Treatment can be taken, namely through the use of comedolitic substances such as benzoyl peroxide and the use of antibiotics. However, long-term use of this substance can result in prolonged contact dermatitis [4].

Contact dermatitis is an inflammatory response in the form of redness, swelling, pus, and complaints of itching caused by a material or substances that are in direct contact with the skin [2]. To avoid these side effects, an alternative that can be used to treat acne is therapy using herbs. The use of plants for the active substance of herbal medicines is very commonly used, this is due to the low side effects. It is supported that the active compounds in medicinal plants have the potential to be a source of antibacterial [21].

A type of plant that has the potential for antibacterial substances is cayenne pepper (Capsicum frutescen L). This statement is supported by the presence of a substance contained in the leaves of cayenne pepper, one of which is flavonoids, which are substances that act as antibacterial activity [6]. The flavonoid content in the cayenne pepper leaf extract is 1.25 mol/g [22]. Overall flavonoids in all types of cayenne pepper and obtained high flavonoid levels from all types of

cayenne pepper, namely in Capsicum frutescens flavonoid content of 0.551 mol Q/g [16].

With the development of increasingly advanced technology, the cayenne pepper leaves began to be innovated into a preparation in the form of a gel or spray that is used to treat acne. The reason the researchers wanted to research spray gel preparations was because most of the research on cayenne pepper leaves had been researched in the form of extracts as an antibacterial for acne treatment. In addition, the spray gel preparation is easy to use on the face without touching the facial skin, thus preventing bacteria on the hands from sticking to the facial skin which can aggravate acne, spreading on the skin very quickly, having a cold or cool sensation, making the skin feel moist, easily absorbs in the skin therefore has a healing effect. Gel products are also very good for use on acne. This is because the gel has a lot of water content. which can dehydrate the skin so that serious swelling caused by the accumulation of lipids in the facial pores is reduced [ardina]. In connection with this background, the researchers wanted to examine the antibacterial activity of the cayenne pepper leaf extract spray against the bacteria Propionibacterium acnes that causes acne.

RESEARCH METHODS

The type and design used in this research is a type of laboratory experimental research, with a quantitative descriptive approach. The research design used is a completely randomized design.

The data collection techniques used in this study are the tools used in the research are Autoclave, Incubator, Laminar Air Flow Cabinet (LAFC), Refrigerator (Sharp), Oven (Memmert), Ose, Bunsen, Petri dish, Micropipette, Shaker incubator, Tube Micropipette, glassware. Materials used are cayenne pepper leaf extract spray, pure culture of Propionibacterium acnes, erythromycin disc paper (positive control), aquadest (negative control), NA media, NB media, distilled water, tissue, sterile Handskun, lighters , Spiritus, Blank disc, Cotton, Label, Aluminum paper. The cayenne pepper sample was carried out in Pinontoyonga Village, Atinggola District, North Gorontalo Regency, Gorontalo Province.

Research preparation begins with preparing the tools and materials to be used, extracting a sample of cayenne pepper (Capsicum frutescens L) about 500 grams using a 96% ethanol extractor solution by allowing it to stand for 3 x 24 hours at room temperature. Then evaporate the sample using a rotary evaporator at a temperature of 60oC until a thick extract of cayenne pepper leaves is obtained

The sample was then tested for phytochemical screening: Saponin examination, the test extract was added to the reagent tube, the addition of 10 mL of distilled water followed by heating, then shaking the strongest until the specified time. Foam formation for up to 10 minutes is 1-10 cm when additional 2 N HCl is added, the foam has not disappeared.

Examination of flavonoids, extract 1 ml placed in a glass tube, then add 10% NaOH to taste and shaken. If there is a significant yellow, red or brown color change, it indicates the presence of flavonoids.

Inspection of tannins, extracts as needed, added 96% ethanol until the solvent is evenly distributed in the extract. Next, slowly add 1% FeCl3 liquid drops. Positive data is shown when the formation of green or bluish black color.

Next, make a spray gel preparation. Weigh the materials to be used. Then first enter the carbopol dispersed in cold distilled water and add the heated aquadest, then grind until the carbopol is

completely dispersed (mixture 1). After that, dissolve methyl paraben in propylene glycol and then add the active compound (mixture 2). Next, mixture 1 is slowly added to combination 2, then the remaining aquadest is added with stirring until homogeneous

Until the stability test of the preparation which includes:

Organoleptic test, carried out in seeing the appearance of the preparation using the senses of sight, smell, and touch (color, aroma, texture) other changes that will be formed after processing [17].

Homogeneity test, carried out by means of smearing the preparation in all its formulas, the glass surface of the preparations seen from the distribution of particles is formed by observing the undissolved particles. In all observation formulas, it is repeated up to three repetitions [17].

pH test, measuring the pH using a pH measuring instrument that has been calibrated in a buffered liquid of pH 4.7 and 10. This test is carried out in observing the stability of the preparation, whether or not the product is used for external use or not (4.5-7) to ensure the product is safe and not to irritate the skin [17]

Viscosity test, the sample was prepared in a glass beaker, then the same spindle was matched in each formula, then the speed was adjusted to 30 rpm by immersion in the preparation until the equipment showed the viscosity of the preparation. The viscosity value (cPs) shown in the viscometer apparatus includes the viscosity value of the preparation. Viscosity measurements were carried out in 3 repetitions [13].

Spray formation test and weight per spray, the spray sample in a plastic sheet has been calculated by weight and given a number in the specified spray distance then measuring dry time using and weighing. The test of all distances was carried out in a triple manner, in that test the propyl of the spray pattern was considered, the size of the spray form, with the amount of product delivered per spray in the appropriate size [23].

Preparation of Stability Check, the product is placed in cold temperature (4±2°C) for up to 2 x 24 hours and then placed in a hot temperature (40±2°C) for up to 2 x 24 hours. The test was carried out up to 3 times which reviewed the formation of physical changes in the spray gel preparation from the beginning to the end covering all of these tests [23]

The last test is an antibacterial test, the first way is to load the test media:

Preparation of Nutrient Agar (NA), weighing the NA according to the provisions on the packaging and 7 petri dishes, 7 x 15 20/1000 obtained NA in the amount of 2.1 g then dissolved in 105 ml of distilled water and then put into an erlenmeyer and covered with cotton and aluminum foil. Then homogenized with the help of a bath to boil. After that, sterilize in an autoclave for 15 minutes at a temperature of 121oC. The sterile sample was poured into a glass cup aseptically and cultured at room temperature

Making Nutrient Broth (NB), weighing the NB based on the provisions on the packaging, 25 ml x 8/1000 obtained 0.2 g of NB then dissolved in 25 ml of distilled water then put it in an erlenmeyer then covered with cotton and alfol, then homogenized using the help of a bath until it boils. Once homogeneous, put it in an autoclave to be sterilized.

After that, make a bacterial suspension using the steps of transferring 1 ml of bacteria on NB media and then starting the bacteria for 1 x 24 hours. Enter 0.5 ml of Propionibacterium acnes bacterial suspension using a micro pipette, then pour the heated NA into a glass cup that has been filled with the bacterial suspension as much as 20 ml and spread

evenly by shaking the petri dish slowly. Next, let the suspension sit until it is well absorbed. Then dip the disc (blank disc) into three concentrations of cayenne pepper leaf extract spray preparation, positive control using erythromycin disc paper, and negative control using blank disc paper soaked in aquadest. After that, it is inserted into the NA using sterile tweezers. Then it was incubated for 24 hours at 37oC and the clear area was measured [18].

Table 1. Classification of the results of inhibition of bacterial life [7]:

Technique	Strong	Currently	Weak
Diffusion Disc (mm)	>21	17-20	<16

Source: Data processing, 2021

The data analysis technique used in this study is bivariate data analysis with the Anova statistical test. Where this type of data analysis is to test the significance of the differences in several samples from more than two groups, a variation analysis test is carried out. A series through addition is added to the table of variance analysis. In determining whether the Fcount is genuine or not, certain prices can be compared in the Ftable prices with degrees of freedom. 5%.

RESEARCH RESULT

Table 2. Yield Measurement Results

Sample	Simplicia Weight	Extract Weight	marinade
Cayenne pepper (Capsicum frutescens L) leaves	500 g	50 g	15,151%

Source: Data processing, 2021

Table 3. Phytochemical Screening Results

Compound	Reagent (ml)	Results
Flavonoids	NaOH (1 ml)	Forming a yellow color
Tannins	FeCl3 (3 drops)	Forms a dark green color
Saponins	HCl	Does not form foam

Table 4. Results of the Preparation of Organoleptic Tests

Treatment	Smell	Color	Texture
P1	Special chili leaf extract	Blackish green	Slightly runny
P2	Special chili leaf extract	Blackish green	Slightly thick
P3	Special chili leaf extract	Blackish green	Slightly thick
P4	Special chili leaf extract	Blackish green	Slightly thick

Source: Data processing, 2021

Note: Each treatment has a difference of 2 days each. The longer the spray storage, the thicker the results obtained

Table 5. Results of Physical Test Preparations

Test	P1	P2	P3	P4
Homo-geneity	Homo-geneous	Homo-geneous	Homo-geneous	Homo-geneous
Spread-ability	Spread out	Spread out	Spread out	Spread out

Source: Data processing, 2021

Description: Spray gel preparations

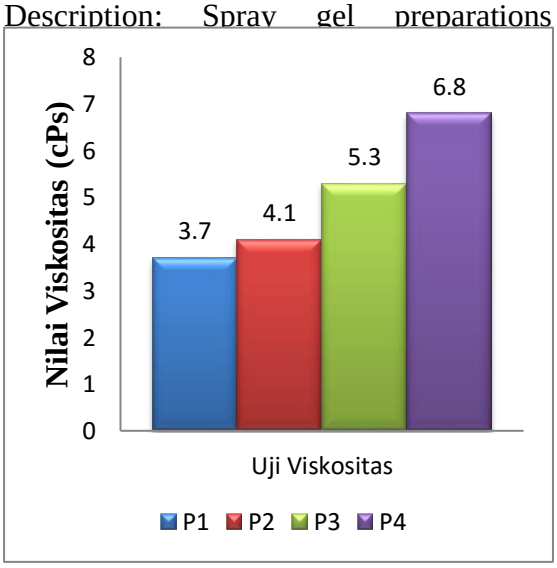

Figure 1. Viscosity Test

Description: The greater the viscosity value, the thicker the spray gel preparation.

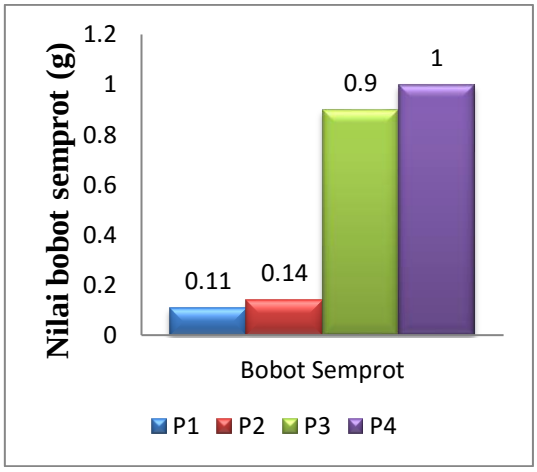

Figure 2. Test Pattern/Spray Weight

Note: The longer the storage time the heavier the weight produced by the spray preparation. This test is related to viscosity, because the longer the storage, the thicker the preparation produced.

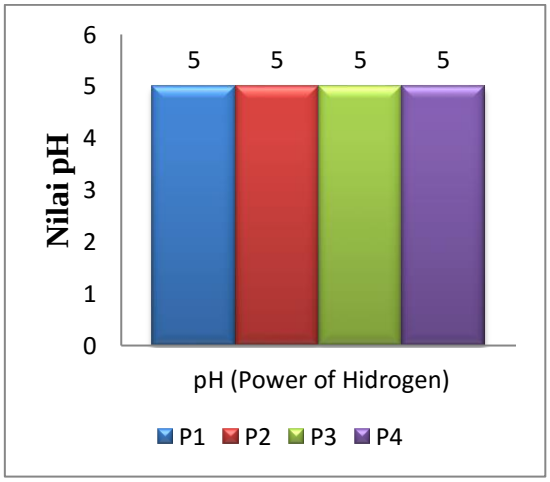

Figure 3. pH test

Note: The pH produced in each treatment is stable at pH 5 where this pH value is included in the conditions used for skin pH.

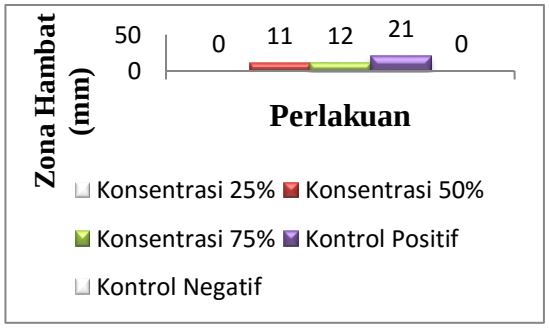

Figure 4. Inhibition Zone Test

DISCUSSION

Chili Cayenne pepper is one of the most common plants found in every area. Cayenne pepper has various regional names, including in the Java area, they call japlak lombok, mengkreng, cengis, ceplik, and cempling. In Sundanese, cayenne pepper is called cengek. Besides the people of Nias and Gayo, they also call pepper limi and pentek. This plant is a horticultural plant not only has a high selling value, it also has fruit with various colors, flavors, and nutrients.

This plant is a plant with fruit used for cooking spices and compounds contained in cayenne pepper plants can be used in the field of medicine. Cayenne pepper contains nutrients, namely various vitamins and primary metabolites, while the substances contained in cayenne pepper are ca capsaicin, carotenoids, resins, and oil. Cayenne pepper leaves contain saponins, tannins, alkaloids, glycosides, steroids including flavonoid compounds and glycons [26].

Based on the phytochemical examination test, it was found that the cayenne pepper leaf extract was positive for flavonoids and tannins. Tannin compounds are active substances belonging to polyphenols that function as antioxidants [28]. In the field of medicine, tannins are useful as a diarrhea medicine, coagulant, and cure hemorrhoids. The usefulness of antioxidants from tannins can normalize cholesterol levels [25]. Flavonoids are polyphenol derivatives, found in many plants and foods, and have various biological properties and therapeutics, including antioxidant, anti-cancer, anti-inflammatory, and antibacterial properties.

Antibacterial is a compound that can inhibit the life or death of bacteria by inhibiting the metabolism of harmful microbes. The causes that affect antibacterial compounds are pH, temperature stability of certain substances,

the number of bacteria contained, the length of incubation as well as the metabolic activity of bacteria.

Based on the results of phytochemical screening, the leaves of the cayenne pepper plant have the potential to be developed as an antibacterial. The ethanol extract of cayenne pepper leaves has antimicrobial activity against bacteria that cause acne [4]. The content of flavonoids in cayenne pepper leaves as an antibacterial [29].

This research uses cayenne pepper leaves that have gone through the extraction process by the maceration method with the extract yield of 50 g so as to get the yield of 15.151%. After that, the research continued on the manufacture of the preparation in the form of a spray gel which was divided into three concentrations of extract, each of which was 25%, 50% and 75%. The preparation is said to be stable if it passes several parameters being tested. The parameters tested on the spray gel preparation were starting from the organoleptic test to the examination of the spray pattern/weight per spray.

Organoleptic test is a test of physical parameters in which this preparation produces a characteristic odor of the extract, a blackish green color and a liquid texture until it is slightly thick after storage. Homogeneity examination is an examination used to see the particle distribution of the preparation. The preparation is said to be homogeneous if there are no coarse grains that can be palpated by the hand [20]. The results of this test get the results of a homogeneous spray gel preparation or there is no coarse material/particles evenly distributed in the preparation.

Based on pH measurements, the results of the spray gel preparation are pH 5, which means that this preparation meets the pH standards of facial skin. The spray gel pH test is said to have met the standard if it has a pH between 4.5–6.5 [9]. This test aims to avoid facial skin problems such as irritation and dry skin. Measurement of viscosity in spray preparations is carried out to measure the level of viscosity of the preparation which can affect the spraying of the preparation through the spray applicator.

Inspection of the spraying pattern is carried out to see the size of the spray produced and the amount of product delivered at the time of spraying [harlis]. The results of this test get a spray pattern per spray weight that is evenly distributed. This test is said to be good if it sprays out uniformly and in the form of small particles [13]. The test treatment obtained uniform results in each treatment. The test results of each parameter can be seen in table 4.2.3 - table 4.2.4.

Examination of the antibacterial activity of the spray gel product of cayenne pepper leaf extract. The process of testing this inhibition zone uses the disc diffusion method. This method is used in this examination because it has the advantage that it is simple to carry out and can be used to observe the sensitivity of various bacteria to bacteria with predetermined levels and intensely used in antibiotic sensitivity tests [19].

Inhibition zones obtained with different treatments of extract levels were carried out in two repetitions (duplo) on each petri dish. The results of observations and measurements of the inhibition zone in each petri dish were found to be 21 mm in positive control of erythromycin disc paper and at a concentration of 25% cayenne pepper leaf extract spray gel, there was no inhibition zone around the disc paper or bacteria could still grow and live. on the concentration of this spray gel preparation of cayenne pepper leaf extract.

At 50% concentration there is an inhibition zone with an average inhibition area of 11 mm and a concentration of 75%

an average inhibition area of 12 mm. The zone of inhibition formed in the spray gel preparation being tested is called the partial inhibition zone. This is because it can be seen that the life of several bacterial associations in the zone of inhibition is formed.

Judging by the inhibition zone table according to [7], the spray gel preparations of cayenne pepper leaf extract with concentrations of 50% and 75% had a very weak inhibition zone, ranging from 11 mm-12 mm. This can be influenced by the percentage of flavonoid levels in the leaves of cayenne pepper. Other triggers that can affect the formation of inhibition zones are bacterial sensitivity, the effect of the active substances on the media as well as the incubation temperature [15]. This inhibition zone is the same as the previous study, where in the study the 25% concentration did not have an inhibition zone, at the 50% concentration it had an average inhibition area of 10.87 mm, 75% was 15.25 mm. The best spray gel preparation based on the measurement of the inhibition zone was at a concentration of 75%.

The inhibitory power in the spray gel preparation of cayenne pepper leaf extract was caused by the presence of flavonoid compounds. The way flavonoids work as an antibacterial can make protein breakdown increase the permeability of the cell wall of microorganisms. The effect between the active compound and bacteria causes changes in the arrangement of protein cells, resulting in clumping due to changes in the charge balance in protein molecules. As a result of denaturation and coagulation the structure of the bacterial cell wall changes, and increases cell permeability, resulting in slow and damaged cell life [8].

The results of the inhibition zone were obtained and then the research hypothesis was proven by statistically analyzing the data using the SPSS application. This data analysis uses the One Way Anova method. Before being tested using the One Way Anova method, the first data was pre-tested using homogeneity and normality tests. This test will determine the statistical method to be used later. This study obtained homogeneous data results with a significance value of 0.742 and also normal with a significance value of 0.676. The data is said to be normal and homogeneous if it is significant > 0.05. Because the data in the prerequisite test are normal and homogeneous, the method used in statistical data analysis is to use the One Way Anova parametric test. The results of these tests produce a significance value of > 0.05, which is 0.945,

CONCLUSION

From the results found in the study, it can be concluded that the spray gel product of cayenne pepper leaf extract (Capsicum frutescens L.) has the potential to have antibacterial activity against acne bacteria. This is evident from the presence of an inhibitory zone around the paper disc. A good concentration of spray gel preparation is at a concentration of 75% with an average resistance response of 12 mm compared to spray gel with a concentration of 50% with an average resistance response of 11 mm. Proving that the greater the extract content used, the greater the inhibitory response that will be generated.

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