

THE CONTENT OF COMPOUND AND BIOACTIVE SUBSTANCE OF THE ROSELLA PETALS EXTRACT GEL TO ACCELERATE THE REMODELING PROCESS OF THE ALVEOLAR BONE

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ABSTRACT

Objective: One of the many natural plants that are used as a remedy for the body is the Rosella Flower (*Hibiscus Sabdariffa*). Rosella Flowers have been widely known to have many useful compounds such as calcium and other bioactive substances in which bone tissue.

Methods: The research using laboratory experimental method, with gel making of 10% Rosella Petals Extract which then destructed and decomposed in order to see the contents of compound and bioactive substances and its value contained in 10% Rosella Petals Extract Gel, Afterward, the gel was inserted into the socket at the time of dental implant insertion and subsequent bone remodeling process was observed within 14, 28 and 56 d intervals, then analyzed to see the levels of compound and bioactive substance.

Results: The extract content of Rosella Petals and 10% Rosella Petals Extract Gel had significant value of Protein, Vitamin C, Beta Carotene, and Calcium, as evidenced by the Rosella Petals Gel added at the time of dental implant insertion, the result obtained after examination of bone tissue formation at days 14, 28, and 56 levels of calcium increased compared with the control group that did not use addition of Rosella Petal Extract Gel.

Conclusion: 10% Rosella Petals Extract Gel contains a composition that can accelerate the remodeling process of the alveolar bone.

Keywords: Rosella petals extract gel, Bone remodeling, Calcium, Bioactive substances

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INTRODUCTION

The use of natural ingredients in the world of health tends to increase from year to year, no except in the field of dentistry. The use of natural ingredients has minimal side effects and safe for the body [1, 2]. One of the many natural plants that are used as medicine for the body is the Rosella Flower [3, 4]. The Rosella Flower has the content of Rosella is very potential to be developed as a drug-making material because of nutritional contents. The amount of calcium content in rosella is very high that is equal to 486 mg/100g) and also contains phosphorus of 273.2 mg [5]. In addition, the active ingredients of roselle petals are grossypeptin, anthocyanin, glucose hibiscin, niacin, riboflavin, beta-carotene, iron, polysaccharides, and flavonoids. High calcium can activate bone loss, while certain substances in rosella flowers are able to rejuvenate the body cells and protect the body from infection of germs and viruses. The function of calcium helps the density of bone density. Calcium in bone has two functions as an integral part of bone structure and as a storage place of calcium [3, 6]. Phytochemical screening showed that ethanol extract 96% of rosella flower petals contained flavonoid compounds, saponins and alkaloids, where it is well known that flavonoids function inhibits the growth of microorganisms because they are able to form complex compounds with proteins through hydrogen bonding. Flavonoids are antioxidant compounds that can fight free radicals. In addition to being an antioxidant, Flavonoids also have anti-viral properties, anti-inflammatory and treatment of hypertension, diabetes, rheumatism, and fever (Mungole and Chaturvendi 2011). Phenol or Polyphenols function as antibacterial by altering cell proteins and damaging the bacterial plasma membrane. Tanin works by binding to microbial adhesion, inhibits enzyme production by microbes, deprivation substrates and binds to cell walls, destroying membrane, metal ion complexation. Saponin is a naturally occurring compound contains glycosides and are like soap. Saponin inhibits growth or kills microbes by interacting with the sterol membrane. The main effect of saponins is the presence release of proteins and enzymes in cells [5, 7].

Calcium helps bone growth

Bone tissue is composed by several forms of bone cells, which are present in the liquid extracellular (matrix) of inorganic salts (most of

which are calcium and phosphorus), these organic salts give strength to bone and collagen fibers provides elastic properties in the bone. The organic matrix of bone, which consists of 95% of type I collagen and the remaining 5% were prepared by proteoglycans and some noncollagenous proteins. As for the salts organic contained in the bones of calcium phosphate 85%, 10% calcium carbonate and a small amount of calcium fluoride and magnesium fluoride [8, 9]. Bones support the body and play an important role in homeostasis minerals, in particular, phosphate and calcium. The protein in the collagen fibers that make up the bone matrix is complex. An adequate amount of protein and minerals must be available to maintain the structure normal bone. Calcium and phosphate, when combined will form hydroxyapatite crystals. This salt forms crystals whose size is 20 per 3-7 nm. Sodium and a small amount of magnesium and carbonate are also present in bone (Ganong WF 1983). In addition, hardening is bone formation by osteoblast and osteoclast activity and addition of mineral salts and compound. Calcium should be available for ossification. Osteoblasts do not make this mineral but must taking calcium from the blood and depositing it in the bone. In particular, collagen and salt fibers calcium that helps strengthen bones. In fact, collagen fibers of bone have a tensile strength (strength to withstand stretching), while calcium salts have strength great compression (power to withstand extortion). The bone healing stages are composed from: inflammation, cell proliferation, callus formation, callus rejuvenation (ossification), and formation back (remodeling) [10, 11].

From the explanation above, the authors assume that there is an effect of adduction of Rosella petal extract gel on alveolar bone formation. The purpose of this research is to see the composition and content of the bioactive compound of rosella petal extract gel which can be used as an alternative material to accelerate the growth of alveolar bone. The study aims to see the contents of the compound and bioactive substances, as well as the amount contained in the gel of Rosella petals, extract that can accelerate the remodeling process of the alveolar bone.

MATERIALS AND METHODS

This research uses the laboratory experimental method, with gel extract making 10% Rosella Petals then destructed and decomposed

to see the composition and bioactive substances and their values contained in 10% Rosella Petals Gel, as for gel made with the following composition: Extract of Rosella petals, 96% ethanol, Methyl Paraben, Cyclamate, Aquades, Hydroxyethylcellulose, carboxymethyl Cellulose, Glycerin [12]. After formation of gel, gel preparation extract of Rosella petals and then conducted an experiments at Makassar Central Laboratory Ministry of Health to see the protein content, Vitamin C, Beta Carotene, Phosphorus and

Calcium, while to see bioactive substances such as Flavonoid, Riboflavin, Saponin, and Tianine are conducted in the Laboratory of Biopharmaceutical, Faculty of Pharmacy, Unhas. Thereafter, the gel is inserted into the socket at the time of insertion of the implant teeth and further bone remodeling processes were observed in intervals of 14, 28 and 56 d, then analysis was performed to look at the calcium and phosphorus levels using a SEM (Scanning Electron Microscope) with EDS application.

RESULTS AND DISCUSSION

Table 1: Examination result of the compound extract of rosella petals

Parameter	Unit	Examination results
Protein	%	1.48
Vitamin C	ug/g	1043.0
B. Carotene	ug/g	109.88
Calcium	ug/g	300.77
Phosphor	ug/g	<0.1

Table 2: Examination result of gel extract compound rosella compound

Parameter	Unit	Examination results
Protein	%	1.69
Vitamin C	ug/g	866.98
B. Carotene	ug/g	23.73
Calcium	ug/g	30.08
Phosphor	ug/g	<0.0001

Table 3: Examination of bioactive substances flavonoids extract and rosella petals gel

Sample Name	Concentration sample	Absorbant	Total content flavonoids	Average total flavonoid levels
Rosella extract 1	5.917	0.426	0.296	0.299
Rosella extract 2	5.903	0.425	0.295	
Rosella extract 3	6.097	0.439	0.305	
Rosella gel 1	1.389	0.100	0.028	0.029
Rosella gel 2	1.458	0.105	0.029	
Rosella gel 3	1.472	0.106	0.029	

Table 4: Examination result of bioactive polyphenol extract and rosella petals gel

Sample name	Concentration sample	Absorbant	Polyphenol content	Average grade polyphenols quercetin
Rosella extract 1	14.510	1.046	1.451	1.445
Rosella extract 2	14.420	1.039	1.442	
Rosella extract 3	14.410	1.038	1.441	
Rosella gel 1	6.339	0.433	0.254	0.248
Rosella gel 2	6.099	0.415	0.244	
Rosella gel 3	6.143	0.418	0.246	

Table 5: Examination result of bioactive anthocyanin extract and rosella petals gel

Sample name	A 519,5	A 700	A (519,5-700)	A	ξ	L (Cuvet width)	MW	Vd	Wd	% anthocyanin	Average
Rosella extract pH 1. 1	0.249	0.032	0.217	0.142	26900	1	449.2	5	0.1	0.012	0.012
Rosella extract pH 1. 2	0.246	0.034	0.212	0.137						0.011	
Rosella extract pH 1. 3	0.244	0.032	0.212	0.135						0.011	
Rosella extract pH 4,5. 1	0.095	0.020	0.075								
Rosella extract pH 4,5. 2	0.096	0.021	0.075								
Rosella extract pH 4,5. 3	0.099	0.022	0.077								
Rosella Gel pH 1. 1	0.094	0.024	0.070	0.032	26900	1	449.2	5	0.5	0.001	0.001
Rosella Gel pH 1. 2	0.090	0.023	0.067	0.030						0.001	
Rosella Gel pH 1. 3	0.089	0.022	0.067	0.029						0.000	
Rosella Gel pH 4,5. 1	0.065	0.027	0.038								
Rosella Gel pH 4,5. 2	0.064	0.027	0.037								
Rosella Gel pH 4,5. 3	0.064	0.026	0.038								

Table 6: Bioactive examination result of saponin extract and rosella petals gel

Chemical content	Chemical reagents	Observation	Rosella extract
Saponin	Hot Water+HCl 2N	Formed foam	+(positive)

Table 7: Examination of animal bone samples tested after dental implant insertion by adding gel extract rosella petals Using SEM tools and EDS applications

Group	Calcium mean±SD	Phosphorus mean±SD	Ratio mean±SD	
Control	18.47±0.78 ^a	18.11±0.27 ^a	1.02±0.45 ^a	
Rosella	23.18±3.31 ^{ab}	15.70±1.80 ^{ab}	1.51±0.37 ^{ab}	
Value p	0.017	0.021	0.023	
Group	Observation	Calcium mean±SD	Phosphorus mean±SD	Ratio mean±SD
Control	14 d	17.63±0.13 ^a	18.20±0.35 ^a	0.97±0.11 ^a
	28 d	18.50±0.78 ^a	18.07±0.50 ^a	1.02±0.00 ^{ab}
	56 d	19.30±0.50 ^a	18.08±0.50 ^a	1.07±0.00 ^{ac}
Value p		0.070	0.936	0.007
Rosella	14 d	19.70±0.84 ^a	17.90±0.34 ^a	1.10±0.03 ^a
	28 d	22.95±1.19 ^{ab}	15.20±0.31 ^{ab}	1.51±0.11 ^{ab}
	56 d	26.91±0.77 ^{ac}	14.01±0.17 ^{ac}	1.92±0.08 ^{ac}
Value p		0.042	0.001	0.015

Table 8: Animal bone sample examination after dental implant insertion with gel extract of rosella petals using SEM tools and EDS applications

Days	Calcium mean±SD	Phosphorus mean±SD	Ratio mean±SD
14 D	18.66±1.29 ^a	18.05±0.33 ^a	1.03±0.78 ^a
28 D	20.72±2.66 ^{ab}	16.63±1.66 ^a	1.27±0.29 ^a
56 D	23.10±4.43 ^{ac}	16.04±2.36 ^a	1.49±0.49 ^a
Value p	0.031	0.108	0.059

After seeing the results obtained, extract levels of calyx Rosella and gel extract petals 10% rosella has the value of Protein, Vitamin C, Beta Carotene, and Calcium enough Significantly, this is evident from the gel of Rosella petals that was added at the time of dental implant insertion, which results obtained after examination of bone tissue formation on days 14, 28, and 56 calcium levels increased compared with the control group that did not do gel addition extract of Rosella petals. There is an increase in calcium levels in the bone within that time span can directly affect the alveolar bone remodeling process. In particular, fiber collagen and calcium salts that help strengthen bones. In fact, collagen fibers from bone has a large tensile strength (strength to withstand stretching), while calcium salts, has great compression power (power to withstand extortion) [11].

CONCLUSION

10% Rosella petals extract gel contain compositions that can accelerate the remodeling process of the alveolar bone.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally

CONFLICT OF INTERESTS

There are no conflict of interest in this study

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