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The Characteristic and Nutrients Concentrated Leaves Of Vegetable Fern (*Diplazium esculentum* (Retz.) Swartz) Live In Different Locations

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Abstract. The vegetable fern (*Diplazium esculentum* (Retz.) Swartz) is the types of plant that have a high economic value, used as a medicine ingredient, for consumption, and a lot of benefits. The purpose of study to identify the characteristics and nutrients concentrated of the vegetable ferns.

The Research is done at the FMIPA biology lab and the testing hall for the fisheries quality of the Gorontalo Province. The research stage is Material preparation, determination, simplisia test characterization and chemical nutritional analysis. The taking of the sample was done on two places in the lowland area and the hills in Bone Bolango district of Gorontalo Province.

Based on the results of the determination obtained samples used on research are vegetable ferns (*Diplazium esculentum* (Retz.) Swartz). The results of the characteristics analysis are suspected have a macroscopic difference between Lowlands and hills. The nutrients concentrated of vegetable fern in lowlands indicate a result of 8.30% proteins, water levels 3.08%, ash content 2.11%, fats 0.51% while in hills indicate a result of 6.20% Proteins, water levels 2.70%, ash content 1.90%, fats 0.69%.

1. Background Research

Vegetable ferns are one of 20,000 species of plant species classified into the pteridophyta division and also famous as filidophyta. The pteridophyta is a kormofita plant due to its real roots, stems, and leaves. The pteridophyta rooted fibers are protected by calypti. The root cells already differentiate into cortex (epidermis), the inner skin, and a central cylinder consisted a concentric xylem and floem. The trunk already has a concentric tranaporter network. It is included in the homosphora group and is a fern type that the Southeast Asian and the islands of the Pacific Ocean people can eat the young part of it's as a vegetable [1].

This fern vegeteable usually grow on the side of rivers or in the shady, moist cliffs it's called a higrofit plant. In tropical and subtropic forests, ferns are surface plants, scattered from the seashore to the mountain slopes, some even living in the vicinity of volcanic craters. Along in the sides of river there are protected in rich organic soil. And can grow from a height of over 350 m's and 1600 m's. These ferns are also found in the mountains and other highland. This fern is mostly shrubbery, but when it grows it resembles a tree. Ferns have their own way of life, some being saprofit, epiphytes, living on the ground, or in the water. The plant also has a metagenesys like moss, but that differs from the dominant phase. The mostly dominant phase of the fern is on the sporopite phase than with the gametofit, which makes the fern a sporopite phase.

Based on the spatial and widespread of the fern life, what became UK in research is how it characterizes and content of the nutritious vegetable fern leaves (*Diplazium esculentum*) that live in the lowlands and hills.

1.1 Research Purpose

The goal of this research is to characterize of symplism the vegetable leaves fern that includes macroscopic and microscopic tests as an effort to test the truth of the material used and also, to analyze the nutritional content of vegetable leaves fern that live in different locations.



1.2 Research Benefit

The benefit of the research is to provide information on the symplism characterization of the vegetable leaf fern that includes macroscopic and microscopic tests as an effort to test the truth of the material used and also, to analyze the nutritional content of vegetable leaves fern that live in different locations.

2. Research Methodology

The research has been done in December 2018 - January 2019, at the biology lab of the faculty of mathematics and natural science for determination, University of gorontalo pharmaceuticals lab for characterization of symplism, Gorontalo State University pharmaceuticals laboratory and test hall of quality application and diversified fisheries of the Gorontalo Province for testing nutrition contents. Research has been done through several stages of preparation of materials, determination, test characterization of cymplisia and analysis of chemical nutritional content.

The preparation started from sampling in two different places in the lowlands of the east Tingkohubu village of Suwawa sub-district, Bone Bolango regency, With altitude 26 m amsl, coordinates n 0° 31' 41". 5452" e 123° 8'57.3756" And at location 377 m amsl, coordinates n 0° 20' 44". 10024" e 123° 20'32.90064" Bone Pantai Village Bone Bolango Regency Gorontalo Province.

Macroscopic checks covering the height of plants, stems of leaves, rachis pina, pinula and microscopy, use fresh simplicia. For simplicia standards parameters test and nutritional content tests using dried simplicia. Analysis of the nutritional content of the vegetable ferns uses the test as shown at the table below.

Table 1. Nutrient Content Analysis of Vegetable Fern Method

Analysis	Tools	Substance	Method
Fat Content	Fatty squash, oven, waterbath, analytic scales, extractor, oven brace, cup, desicator, analytic scales, soxhlet device	Acetone, ether, chloroform, filtered paper, samples	Soxhlet SNI 01-2354.3-2006
Water Content	Oven, Cup, Desiccator, scales, analytic	Samples	Oven SNI 01-2354.2-2006
Ash Content	Poselim cups, hot plates, cups, oven, Bunsen, desikator, furnace, abusers, the analytic scales	Samples	Dryashing SNI 2354.1-2010
Protein Content	Despieces pumpkin (250 ml), measuring cup (25 ml, 50 ml), a despieces tools, a straw with 5 ml, buret 25 ml, squash kjedhal the analticetic weight.	H2so4, catalyts, aquadest, 50% naoh, HCL, samples	<i>Kjedhal</i> SNI 01-2354.4-2006

3. Results and Discussions

3.1 Determination

The determination was exercised to ensure the truthfulness of the research material used. It has been done at the biology lab of the Gorontalo State University of mathematics and natural science. Samples used are from two different locations were taken in the 150-acre (26 m) amsl lowland area and at an altitude of 377 m AMSL.

The result of determination indicates that the plant used in this study is the true vegetable ferns (*Diplazium esculentum* (Retz.) Swartz. The (*Diplazium esculentum* (Retz.) Swartz is known in some place as the vegetable fern because it can be consumed. This plant have synonyms anisogonium esculentum presl, d. Malabaricum spreng and athyrium esculentum copel [2]. Identification key says that vegetable ferns have a characteristic: tiny leaf fern, The spore strobilike, the hovering leaf, the sporangium is formed in

two rows on the side of leaf's, the first branch without extension, Leaves are single or threaded, rhized do not rise, leaves dilate double, side of leaf jagged and rigid leaves, green leaves (picture 1)

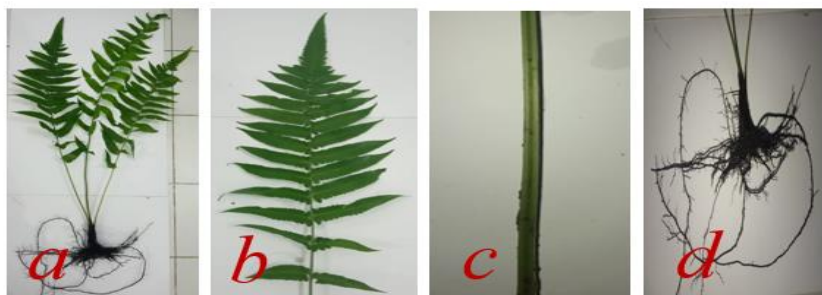


Figure 1. a) vegetable plant , b) Leaf, c) Stem, d) Root
(Personal Document)

According to Purnawati dkk. (2014), *diplazium esculentum* typically lives in open areas with direct and shady sunlight with less sun exposure and usually in the forest and wetlands. The plant has black roots and stringy thick, The trunk is yellow, round shape, and the front is grooved inside, The further up the rows are shallower. The side of leaf is jagged and dark green. The top of pina (child leaves) has a sharp tip and a green sapling. The surface of the leaves is slippery. Sporangium is arranged in the extremity of the leaf. The *diplazium esculentum* has black roots with groove stems. Leaves are dark green and thin textured. The brown-colored sporangium is located in the extremity of the leaves (Purnawati dkk 2014). According to [3], based on his taksonomatic vegetable ferns (*diplazium esculentum*) may be classified as follows:

Kingdom : Plantae
 Subkingdom : Tracheobionta
 Divisio : Pteridophyta
 Class : Filicinae
 Folk : Polypodiales
 Familia : Polypodiaceae
 Genus : *Diplazium*
 Species : *Diplazium esculentum*

3.2 The Characterization of *Simplicia*

The characterization of symptoms made up of macroscopic and microscopic tests performed on the fresh *simplicia* vegetable ferns. Macroscopic and microscopic identification are necessary for testing substance truth and And can identify the morphology or anatomy and the chemical content of a *simplicia* And can analyze the content of the *simplicia* essence [4].

The macroscopic test is to examined the characteristics of a plant or *simplicia* by magnifying glass or without using the tools to identify and identify the *simplicia* specificity Which is the form, color and fragrance of *simplicia*. Whereas microscopic examination includes the symbiotic anatomy, which has its own characteristics and a specific analysis of the structure of a symbiotic to determine the anatomy of the best part of plant, like on the roots, the leaf and the stem. Macroscopic tests can be seen at table 2 and table 3.

Table 2. Macroscopic test results of vegetable ferns at high-land

Parameter	Respondent							Average
	1	2	3	4	5	6	7	
Height of Plant (cm)	150	120	122	100,5	136,5	128,8	120	127,73

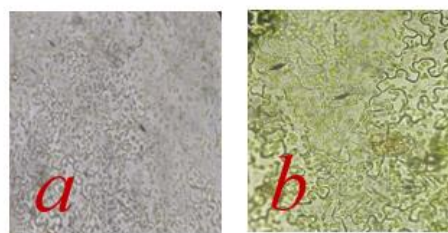
Leaf Stalks (petiole) (cm)	109	89,5	98	83,5	120	118,6	99	104,51
Rachis (cm)								
Main Leaf Origin	27	26	24,5	19	46	34,5	30	30,13
Distance between Leaf	5	6	11,5	4	5	7,4	6	7,01
Leaf (cm)	29 × 11	24,5 × 13	19,1 × 39	20,9 × 10,7	31 × 14,2	27 × 8,6	21,5 × 7,5	23,17 × 13,53
Pinna (cm)	65 × 58	60 × 45	77,3 × 39	46 × 34	75 × 60,5	76 × 59	73 × 40,2	66,66 × 47,59
Pinula (cm)	12 × 6	7 × 3,5	17 × 14	17 × 11,2	8,6 × 4,8	8,5 × 4,6	11,6 × 5	11,15 × 6,64

Table 3. Macroscopic test results of vegetable ferns at low-land

Parameter	Respondent							Average
	1	2	3	4	5	6	7	
Height of Plant (cm)	82,5	98,2	90	77	68	90	85	84,39
Leaf stalks (petiole) (cm)	59	74,7	73	63	60	75	60	66,39
Rachis (cm)								
Main leaf origin	17	21	21	14	21	16,5	20	18,64
Distance between leaves	4,2	5,3	6	5	5	4	6	5,07
Leaf (cm)	13,5 × 5	18 × 8,2	15,5 × 4	12 × 5	9,3 × 3,8	14 × 4	14 × 2,5	13,76 × 4,64
Pinna (cm)	35,2 × 27	47 × 27,2	43 × 24	38 × 21	49 × 20	47 × 27,5	42	43,03 × 20,96
Pinula (cm)	8 × 3,3	11,7 × 11	11,5 × 3	11 × 3	11 × 4,5	12 × 4,2	11 × 2	10,89 × 4,43

Macroscopic analysis results say that there is a difference between vegetable ferns in the lowland and highlands. The vegetable ferns which live in the highlands have a more measure looking from the height of the plants, the stems of the leaves, the rachis, the leaves, the pinna and the pinula. It's due to soil structure and different climate conditions.

Microscopic observations use microscopes for system and simplicia fragments to identify and characteristic of the simplicia of vegetable fern's leaf. The microscopic tests on the vegetable fern leaves in two different locations show that the cross section of the vegetable leaves has the upper epidermis, lower epidermis, sclerenkim and mesofil. (Figure 2).

**Figure 2.** (a) The Upper Epidermal, (b) The Lower Epidermal

In addition to macroscopic and microscopic observations, organolitics testing in fresh and dried simplicia plants in vegetable ferns at two location. This is for a early introduction of a simple objective that is shape, color and smell of the simplicia as a research sample. This results can be seen on the table below.

Table 4. Simplicia Organolitics

Parameter	Simplicia of Location A		Simplicia Of Location B	
	Fresh	Dried	Fresh	Dried
Shape	Specific Leaf	Rough Powder	Specific Leaf	Rough Powder
Colour	Green	Brownish Green	Green	Brownish Green
Smell	Specific Smell	Specific Smell	Specific Smell	Specific Smell

The organolitics test shown the same color and smell of fresh and dried simplicia of the vegetable fern at two different locations.

3.3 Nutrient Content

Nutrients for plants are a necessities of life for growth and breeding. Nutrients obtained from the plant will be stored in the plant's body. The plant's body is generally composed of three elements, carbon (c), hydrogen (h), and oxygen (o). These elements are that build up proteins, carbohydrates and fats. Those elements are a major componet of the building of plant cell walls.

Analysis of the nutritional properties of vegetable ferns at different locations can be seen at the following table below.

Table 5. The nutritional content of vegetable ferns at different locations

Name Of Location	Characterization	Analysis Result	Analysis Method
Location A	• Proteina	8,30 %	SNI 01-2354.4-2006
	• Water Level	3,08 %	SNI 01-2354.2-2006
	• Ash Level	2,11 %	SNI 2354.1-2010
	• Fat	0,51 %	SNI 01-2354.3-2006
Location B	• Proteina	6.20 %	SNI 01-2354.4-2006
	• Water Level	2.70 %	SNI 01-2354.2-2006
	• Ash Level	1.90 %	SNI 2354.1-2010
	• Fat	0,68 %	SNI 01-2354.3-2006

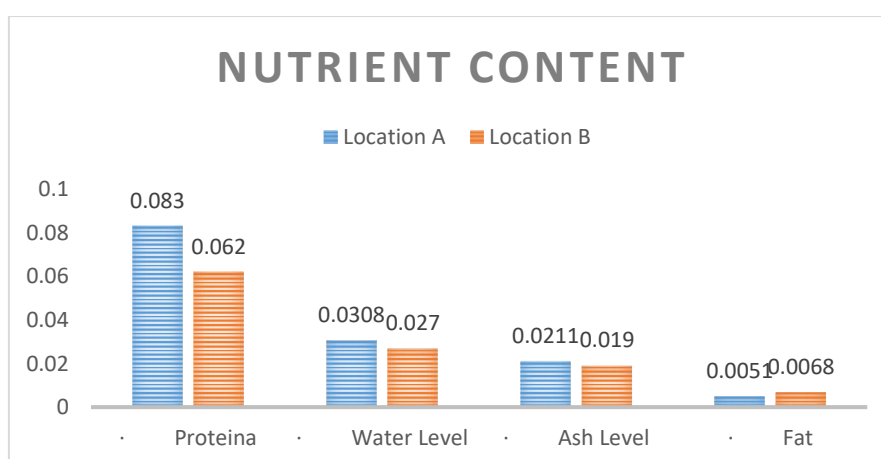


Figure 3. Diagram of The nutritional content of vegetable ferns at different locations

The analysis result of the nutrients of vegetable ferns indicate a difference in nutrition between living sites in the lowland and highland. The high levels of protein nutrients and fats in the lowland areas

Inclined to be high. This is probably because of the different characteristics of soil that are soil textures, soil and climate chemical compositions, Because the plants and the soil have an interaction.

The nutrients plants can be tracked in part from the chemical composition of the plant, Because besides most of the time an organic plant comes from CO₂, it also depends on a land nutrient shortage in the form of water and minerals.

Land characteristics are a key environment in celestial ecosystem. Soil textures, soil chemical composition and climate are major factors that determine the type of plants that can grow well at the site. Between the plant and the soil there would be an interaction process.

4. Conclusion

Samples in research based on determine result is the vegetable ferns (*diplazium esculentum* (retz). Swartz). Characterization Test is suggested to be differences of macroscopic in the lowland areas and highland. The nutritional content of vegetable fern plants in the lowlands shows that the protein content is 8.30%, water levels 3.08%, ash levels, 2.11 %, fat 0,51 %, whereas in the highland that protein content 6.20 %, water levels were 2.70%, ash levels 1.90 %, fat 0.68%.

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