

International Conference on Biodiversity for Life: SUSTAINABLE DEVELOPMENT OF INDONESIA BIODIVERSITY

by Imran Tobing

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October 21, 2019

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Imran SL. Tobing

Fitriah Basalamah

Astri Zulfa

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Jakarta, October 21st, 2019



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**Imran S.L Tobing
Fitriah Basalamah
Astri Zulfa**

Reviewer

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Dr. Sri Endarti Rahayu, MSi,**

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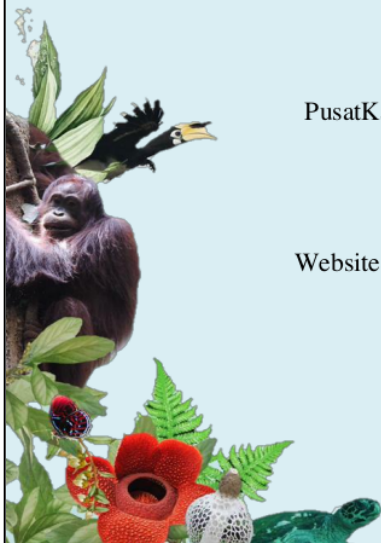
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FOREWORD COMMITTEE

Praise be to God Almighty for the blessings of his grace, and that we were given opportunity to be able to complete a smoothly and well for International Conference on Biodiversity for Life. We prepared this event in a series of activities to welcome the 70th Anniversary of the Universitas Nasional.

"*Sustainable Development of Indonesia Biodiversity*", were selected as the theme of this conference for raising our awareness that our country has a very abundant biodiversity than any other countries in the world, so it will be understandable that how we should preserve our natural richness wisely and utilize sustainably.

The booklet is aiming to make conference participants easier to find information related to this activity, such as the registration, schedule of events and abstracts from the speakers.

We are aware that there are still many deficiencies that we need to correct in conducting the conference, as well as in the compilation of the booklet. Thus, we expect criticism and suggestions from all of you so that we can do better in carrying out similar things in the future.

Finally, we say thank you to all those who have supported the International Conference running smoothly.

Jakarta, October 2019
Organizing Committee



WELCOMING SPEECH

Assalamu'alaikum Warahmatullahi Wabarakaatuh,

Your Excellency, Mr. Prof. Dr. Iskandar Fitri, ST. MT. (Vice Rector for Academic - UNAS)

Your Excellency, Mr. Prof. Dr. Dedy Darnaedi (Keynote Speaker, UNAS);

Your Excellency, Mrs. Prof. Dr. Ernawati Sinaga, MS. Apt. (Invited Speaker, UNAS)

Your Excellency, Mr. Prof. Dr. rer.nat. Imam Widhiono MZ, MSc. (Invited Speaker from UNSOED, Purwokerto)

Your Excellency, Mr. Dr. Rob Stuebing (Invited Speaker from PT. REA Kaltim Plantations)

Your Excellency, Mr. Dr. Bernart Ripoll Capilla (Invited Speaker from Borneo Nature Foundation)

Your Excellency, Mr. Dr. Godwin Limberg (Invited Speaker from PT. Daemeter Consulting)

Dear Lecturers, researchers, biodiversity observers, and students; both as a speaker and conference participant,

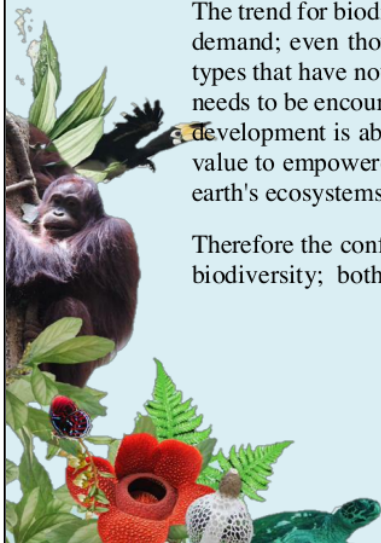
Welcome to Jakarta (for participants from outside Jakarta); welcome to the Universitas Nasional; welcome to the International Conference on "*Biodiversity for Life*" with the title "*Sustainable Development of Indonesia Biodiversity*".

The conference is part of series activities in celebrating the 70th Anniversary of the Universitas Nasional and also the Faculty of Biology.

Indonesia is a mega-diversity country; this natural richness is a gift that must be utilized as a basic capital of development for the maximum welfare for all Indonesian people. Biodiversity wealth will never run out if it's managed in sustainable way because biodiversity is renewable.

The trend for biodiversity utilization is still limited into several types following to market demand; even though Indonesia's biodiversity is very rich with the potential of various types that have not even been revealed yet. Research on Indonesia's biodiversity richness needs to be encouraged to uncover the potential of Indonesia's biodiversity. Furthermore, development is absolutely must be carried out so that Indonesia's biodiversity has added value to empowered people's life, while at the same time maintaining the balance of the earth's ecosystems.

Therefore the conference is designed to summarize the results of research on Indonesian biodiversity; both to assess ecological conditions, reveal the potential and various



biodiversity developments that have been carried out by researchers. The results of the research are planning to be published in a seminar proceeding are expected to be part of the research contributions in an effort to uncover various alternative models of Indonesian biodiversity utilization to maintain the earth life balance.

This conference will feature a keynote speaker ", namely Mr. Prof. Dr. Dedy Darnaedi, whom very familiar to all of us. He is also an alumni of Faculty of Biology-UNAS. One of the main fields of interest is Plant Biosystemics. His presentation at this conference is about "*Diversity and the Beauty of Tropical Ferns: A new paradigm in managing Indonesia Biodiversity*"

Next; will also feature five "invited speakers" from academics, NGOs and the private sector, which are:

- Prof. Dr. Ernawati Sinaga (Vice Rector for Research, Community Services and Cooperation - UNAS)
- Mr. Prof. Dr. rer.nat. Imam Widhiono MZ, MSc. (Dean of the Faculty of Biology, Soedirman University, Purwokerto)
- Mr. Dr. Robert Butler Stuebing M.A. (Technical Advisor, REA Holdings/PT. REA Kaltim)
- Mr. Dr. Bernart Ripoll Capilla (Co-Director of Borneo Nature Foundation)
- Mr. Dr. Godwin Limberg (Regional Manager of PT. Daemeter Consulting)

With additional 38 speakers and researchers, both from local and international.

Be fully attention to the papers that will be presented at this conference. Thank you for your willingness to participate in this conference; We hope our concern for Indonesia's biodiversity increases; so that it can be more utilized as a basic effort to maintain the Earth's ecosystem balance.

Finally; on behalf of the entire committee, we do apologize for all the limitations and deficiencies in planning, welcoming and holding this conference.

Much appreciated and thanks for the hard work of all organizers of the conference, the sponsors (Borneo Nature Foundation and Yayasan Palung), as well as other parties that I cannot mention all. Hopefully your help will be a blessing for all of us.

Congratulation for the conference; be sure to have knowledge sharing and experience. Hopefully it will be useful for science development and for decision makers, to better synergize the interests amongst all components of the ecosystem for earth life balance.

Wassalamu'alaikum Warahmatullahi Wabarakaatuh.

Jakarta, 21 October 2019

Chief of the Organizing Committee



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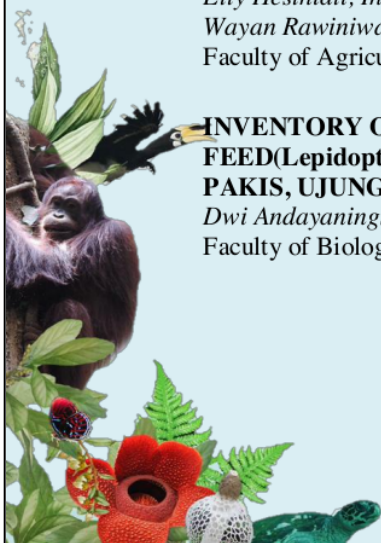
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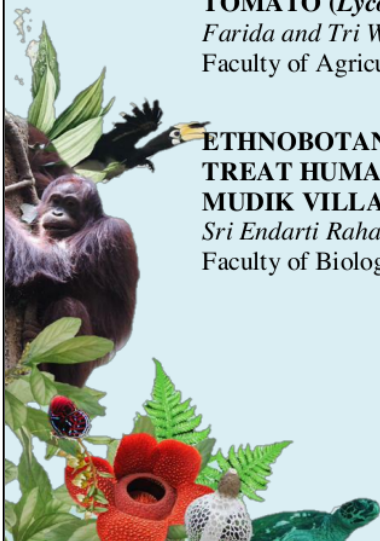
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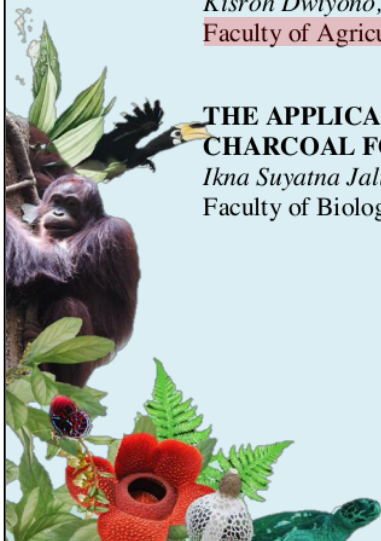
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DARUSALAM

Astri Zulfa^{1,2}, Sri Suci Utami Atmoko², Dadang Kusmana¹, Asmara Nabila
Ramadhanty²

1) Master Program of Biology, Faculty of Mathematics and Natural Sciences University of
Indonesia.

2) Faculty of Biology, Universitas Nasional, Jakarta

Correspondence email: zulfa.unas@gmail.com

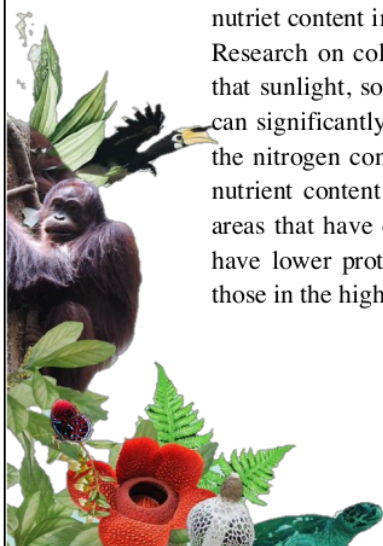
Abstract

Orangutans eat a wide variety of dietary, while orangutans prefer to consume ripe fruit and when fruit is scarce they feed on leaves, inner-bark, flowers and other vegetation. However, we know little about the nutrition of foods consumed by Sumatran orangutans. We used proximate nutritional analyses to examine the nutritional composition of foods consumed by Sumatran orangutans in the area Ketambe Research Station, Sumatra. We found that total non-structural carbohydrates and total energy of non-fallback foods were higher relative to fallback foods, but lipids, protein, and neutral detergent fiber were higher for fallback foods. There is significantly different on water, protein, neutral detergent fiber and total non-structural between fallback foods and non-fallback foods. There was no significant trend that fallback foods contained more starch than non-fallback foods.

Keywords: orangutan foods, proximate analysis, energy, starch.

I. INTRODUCTION

Factors that influence the nutrient content in diet are vary widely according to Richard (1985). The nutrient content in the plant-based diet is influenced by the concentration of soil chemicals (nutrient supply), climate, and temperature; while the nutrient content in animal-based diet is influenced by the condition of the animal's body. Research on colobus diet which was conducted by Chapman et al. (2003) has shown that sunlight, soil chemical composition, plant phenology, and local microbial activity can significantly affect the nutrient content because high sunlight intensity can increase the nitrogen content in leaves. Furthermore, Hohmann et al. (2010) have conducted a nutrient content analysis in primate diets of the genus *Pan* in both high and lowland areas that have diverse rainfall. The diet samples which were obtained from lowlands have lower protein content and higher Total Nonstructural Carbohydrate (TNC) than those in the highlands.



Research on the nutrient content in the orangutan diet has been widely carried out in Kalimantan. Research on the nutrient content in fruits which are eaten by orangutans at Mount Palung National Park has shown higher TNC content than other nutrient components (Knott, 1998). van Schaik and Knott (2001) have done a nutrient content observation in *Neesia* sp. which is eaten oftenly by orangutan in Mount Palung. Fruit seeds of *Neesia* sp. contains 12.4% protein, 46% lipid, 9.9% Neutral Detergent Fruit (NDF), 31.7% TNC, and 590 kcal/ 100 g energy. Meanwhile, *Neesia* sp. pulp which are not eaten by orangutans contains 9.1% protein, 77.7% lipid, 7.4% NDF, 5.8% TNC, and 759 kcal/ 100 g energy. Hamilton and Galdikas (1994) examined the nutrient content in orangutan diets at Tanjung Putting National Park. There are two types of flowers which are eaten by orangutan i.e. *Dillenia* sp. and *Xanthophyllum* sp. both have higher Available Crude Protein (ACP) than the other diet categories (18.1% and 16.6%). The analysis results toward the mature leaves that were not eaten have shown that its water content, protein, and ACP are lower than the young leaves that were eaten by orangutan. Furthermore, the nutrient content analysis also showed that in general, the fruit contains low crude protein and ACP.

Analysis was carried out using the proximate analysis method to determine the nutrient content in the animal diet. This analysis can show the chemical composition in various forms based on the usefulness i.e. water, ash, crude fiber, lipid, and protein (Tillman et al., 1991; Prawirokusumo, 1994). This analysis method was also used by Knott (1999) at Mount Palung and Harrison (2009) at Sebangau. In addition, the NDF, TNC, and energy contents that can be generated from each component between the diet categories are also calculated.

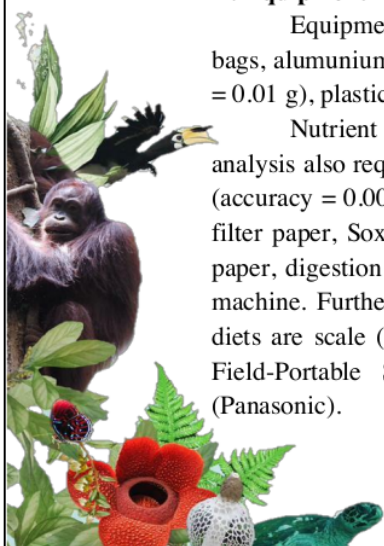
Nutrient component that is more specific in animal diet and important to know as an energy source is starch (Harlan, 2006). Starch is a substance that must initially be converted into simpler molecules so that it can be used as an energy source. Starch is a carbohydrate derivative in polysaccharides; glucose polymer with alpha-1,4 and alpha-1,6 bonds; widely discovered in plant cells. Starch is small granules which has various sizes and shapes in each type of plant. The structure of the starch grains can be seen through a spectrophotometer which shows different colors for each type of plant (de Man, 1989).

II. RESEARCH METHODS

A. Equipment

Equipments that used to collect orangutan diet samples in the field are plastic bags, aluminium bowls, cutter blades, Hook oven, oil stove, electronic scales (accuracy = 0.01 g), plastic cliips, paper labels, calipers, and a calculator.

Nutrient content examination in orangutan diet samples by using the proximate analysis also requires some equipments i.e. blender, homogenizer, mortar grinder, scara (accuracy = 0.0001 g), porcelain cup, aluminium cup, oven, 600°C furnace, desiccator, filter paper, Soxhlet System HT 6 machine, extraction cup, sleeve, measuring cup, oil paper, digestion tube, Digester 2020 and Kjeltac Auto Sampler System 1035 analyzer machine. Furthermore, equipments that required to check starch content in orangutan diets are scale (accuracy = 0.01 g), test tube, water bath, Vortex, pipette, centrifuge, Field-Portable Spectrophotometer (Ocean Optics; Dunedin, Florida) and laptop (Panasonic).



B. Material

Materials that used to collect orangutan diet samples in the field are tissue paper, kerosene, silica gel, and the diet samples themselves. Sample that will be used to perform both nutrient and starch analysis is approximately 30 g in weight and has been dried from each part of the diets that are eaten by the orangutan. Furthermore, other additional materials that will be needed to carry out a proximate analysis in orangutan diet samples are 40 mL petroleum benzene, 2 K₂SO₄ tablets, 12 mL concentrated

H₂SO₄, 0.1 N HCl, 44% NaOH, 10 g boric acid, 10 mL bromine cresol green, 7 mL red methyl, 1000 mL aquadestilata, 50 mL NDF reagent, and 0.5 g Na₂SO₄. Also, chemicals from The Megazyme "Total Starch Assay Procedure" (K-TSTS 01/05; Wicklow, Ireland) Total Starch Kit are required to do the starch content analysis.

C. Procedures

Nutrient content examination in orangutan diet was carried out at the Nutrition Testing Laboratory, Biology Research Center-LIPI Cibinong. Meanwhile, the starch content examination was carried out at the Chemistry Laboratory, Universitas Nasional Jakarta.

a. Collection of Orangutan Diet Samples in the Field

Orangutan diet samples were obtained while following the orangutan. In addition, samples can also be taken directly from the orangutan eating tree. Fruit samples were collected based on ripe, half-ripe, and unripe categories. Dry Sample method (Knott, 1999) is the method used to dry the diet samples and the process is as follows:

- Each diet sample should be recorded based on the name and the collected amount, particularly the overall diet weight i.e. the whole fruit or the whole flower.
- Each diet sample is separated in parts, for example in fruit: husk, seeds, and pulp are separated. Then, each part that has been separated is weighed and recorded as wet weight.
- Each sample is placed in an aluminium bowl and labeled. Then, put it inside an oven with a temperature of 40-50°C for 3-5 days.
- When the sample is completely dry and the weight is constant, the sample is weighed again as in each part as dry weight.
- The water content in the field from fresh samples is calculated by using this formula:

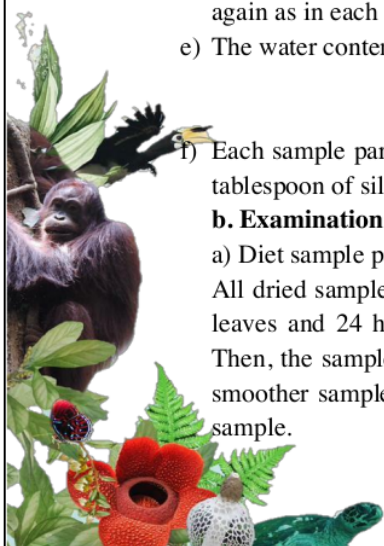
$$\text{Water content} = \frac{\text{wet weight} - \text{dry weight}}{\text{wet weight}} \times 100 \%$$

- Each sample part is inserted separately in a plastic clip and labeled. Then, includes one tablespoon of silica gel that has been wrapped.

b. Examination of Nutrient Content in Diet Samples

a) Diet sample preparation

All dried samples were placed in an oven at 60°C to remove the dampness; 3 hours for leaves and 24 hours for fruits. Sample was mashed using a blender or homogenizer. Then, the sample was grinded in a mortar grinder for a few minutes in order to obtain smoother sample. The sample was filtered with a 60 mesh sieve so we have a powder sample.



b) Water, ash, lipid and protein content valuation base on SNI 01-2891-1992
d) NDF content was valuation

e) Total energy calculation in diet sample

Energy produced from the diet sample was calculated based on the Harrison (2009) method. This method used a derivative fraction i.e. 4 kcal/g (17 kJ/g) protein, 4 kcal/g TNC (16 kJ/g), and 9 kcal/g (37 kJ/g) lipid.

f) Starch content valuation

Starch content analysis can be performed by The Megazyme (2008) procedure. There are two stages working principle in this procedure. First, the starch will be dissolved and hydrolyzed. Then, the dextrin compound from starch was hydrolyzed into glucose using amyloglucosidase. This procedure will generate dissolved sample so that the starch small granules can be measured by the spectrophotometer. Starch content was calculated based on the absorbance value of the spectrophotometer measurement.

D. Data Analysis

Both proximate and NDF analysis results were inputted in Microsoft Excel. Then, the energy content of each sample was calculated based on the formula from Harrison (2009). The absorbance values from the starch content analysis were also included in Microsoft Excel. Starch content calculations were carried out using MegaCalc from The Megazyme (2008) based on the absorbance values obtained. Each diet sample was divided into two categories i.e. primary diet and alternative diet.

Subsequently, the data that have been compiled in Microsoft Excel were analyzed using non-parametric statistical tests to compare the nutrient content differences in each diet category. This non-parametric statistical test used was the Mann-Whitney U that can test the null hypothesis which the sample was drawn from the same population with a significance number of $P < 0.05$ or $P < 0.01$ (Siegel, 1997). Data analysis was performed by using SPSS for Windows.

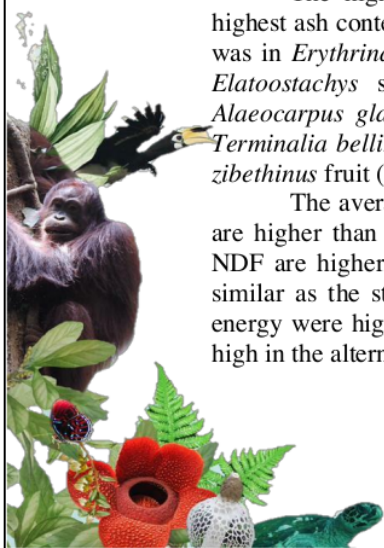
III. RESULT AND DISCUSSION

A. Proximate Analysis

Diet samples that have been collected are 77 samples which consist various categories i.e. fruit, seeds, flowers, young leaves, bark, and stem. Fruit is categorized as the primary diet, while seeds, flowers, young leaves, bark, and stem are categorized as the alternative diets (Figure 1.).

The highest water content was discovered in *Ficus* sp. fruit (13.53%), the highest ash content was in *Photia oxyphyllus* fruit (13.03%), the highest protein content was in *Erythrina subumbrans* young leaves (39.18%), the highest lipid content was in *Elatoostachys* sp. fruit (46.80%), the highest NDF content was discovered in *Alaocarpus glaber* fruit (76.41%), and the highest TNC content was discovered in *Terminalia bellirica* (85.76%), while the highest total energy was discovered in *Durio zibethinus* fruit (140.49 kcal).

The average of water content, ash, TNC, and total energy from the primary diet are higher than the alternative diets, while the average of lipid content, protein, and NDF are higher in the alternative diets (Tabel 1.). These results are quite close and similar as the study in Tuanan, where the average of water content, TNC, and total energy were high in the primary diet, while ash, protein, lipid, and NDF content were high in the alternative diets (Zulfa et al., 2010).



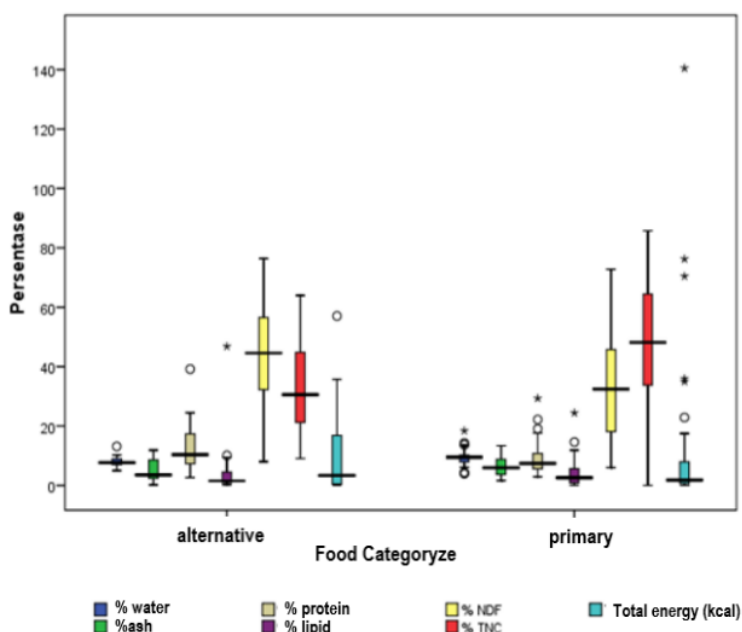


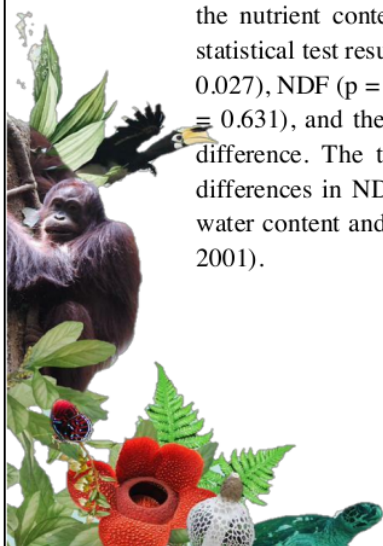
Figure 1. Proximate analysis result towards the orangutan primary and alternative diets.

The primary diet is a source of essential nutrients needed, while the alternative diets are a source of complementary nutrients. Fruit is the primary diet source that contains complete nutrients, but to fulfill other nutritional needs, orangutan must also consume the alternative diets, such as seeds, leaves, or vegetation. Meanwhile, to fulfill their carbohydrate and energy need, it is enough to eat fruit.

Table 1. The average of nutrient content percentage in orangutan diets

	N	Water	Ash	Protein	Lipid	NDF	TNC	Total Energy (kcal)
Primary diet	50	9,21	6,38	8,72	3,97	33,17	43,77	10,69
Alternative diet	27	7,96	5,24	12,81	4,49	43,86	33,60	10,46

The non-parametric Mann-Whitney U statistical test was performed to compare the difference in nutrient content between the primary diet and the alternative diet to compare the nutrient content difference between the primary diet and the alternative diet. The statistical test results showed that the differences in water content ($p = 0.006$), protein ($p = 0.027$), NDF ($p = 0.016$), and TNC ($p = 0.003$), while the ash content ($p = 0.066$), lipid ($p = 0.631$), and the total energy ($p = 0.790$) which determine that there is no significant difference. The test results are quite similar to those in Tuanan, which showed the differences in NDF and TNC content (Zulfa et al. 2010). Fruit generally contains high water content and TNC, while seeds generally contain lots protein and NDF (Almatsier, 2001).



2. Starch Analysis

Starch analysis was carried out on 51 diet samples which consist various categories i.e. fruit, seeds, flowers, young leaves, mature leaves, bark, stem, and tuber. As in the proximate analysis, the starch analysis is also divided into two categories, such as the primary diet category (N = 19) like fruit and the alternative diet category (N = 32) like seeds, flowers, young leaves, mature leaves, bark, stem, and pith. The highest starch content was discovered in *Antiaris toxicaria* bark (1.60 g/ l), while the lowest start content was discovered in *Loides* sp. flowers (0.17 g/ l).

The average value of starch content in the alternative diet was higher than the primary diet i.e. 0.53 g/L for the alternative diet and 0.44 g/L for the primary diet (Figure 2.). The high starch value in the alternative diet makes these diets difficult to digest, so they are rarely eaten (Hohmann et al. 2010). These results are consistent with the research from Cunningham et al. (2010) which states that orangutan chooses fruit as primary diet with low starch content. According to Almtsier (2001), alternative diets, particularly grains and tubers are the high source of starch.

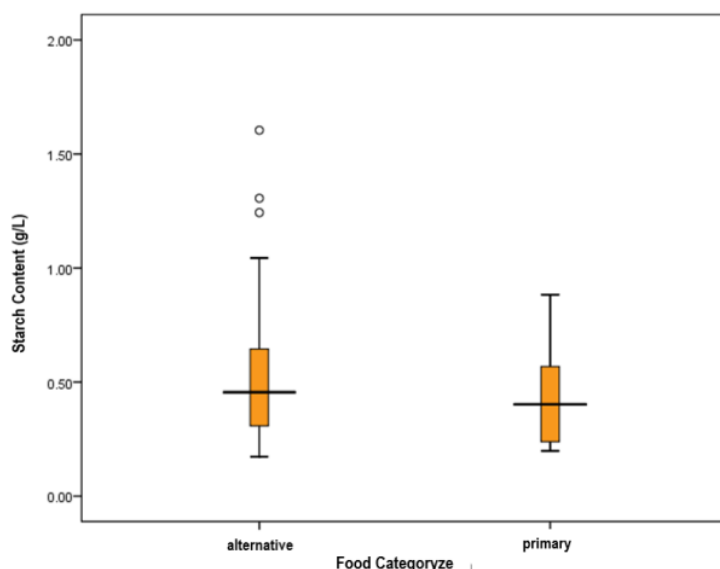
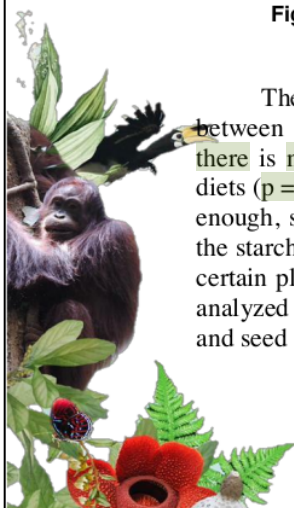


Figure 2. Starch content analysis result (g/L) towards the orang utan primary and alternative diets.

The Mann-Whitney U non-parametric statistical test compared the starch content between the primary and the alternative diets. The statistical tests results showed that there is no significant difference in starch content between the primary and alternative diets ($p = 0.436$). The difference in the average starch content in alternative diet is not big enough, so it cannot show the difference in starch content. According to Harlan (2006) the starch content in plants is influenced by several factors, including storage of starch in certain plant parts and the level of maturity. The results showed that the orangutan diets analyzed to value the starch content were ripe, half-ripe, and unripe. Many of the fruit and seed samples analyzed had a mature level of maturity.



IV. CONCLUSION

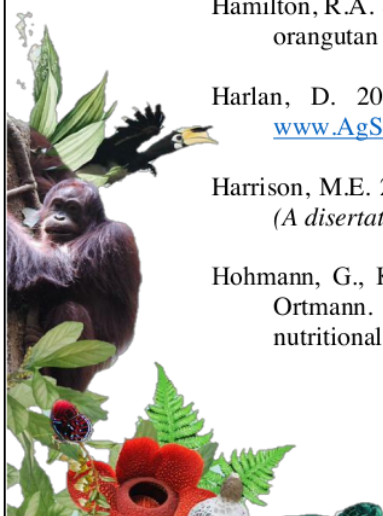
1. Water content, ash, TNC, and total average energy are high in the primary diet, while the lipid content, protein, and the average NDF are high in the alternative diet. There are also the water content, protein, NDF and TNC differences between the diets.
2. Starch content in the alternative diet has higher average number than the primary diet, but the difference seems insignificant between the diet categories.

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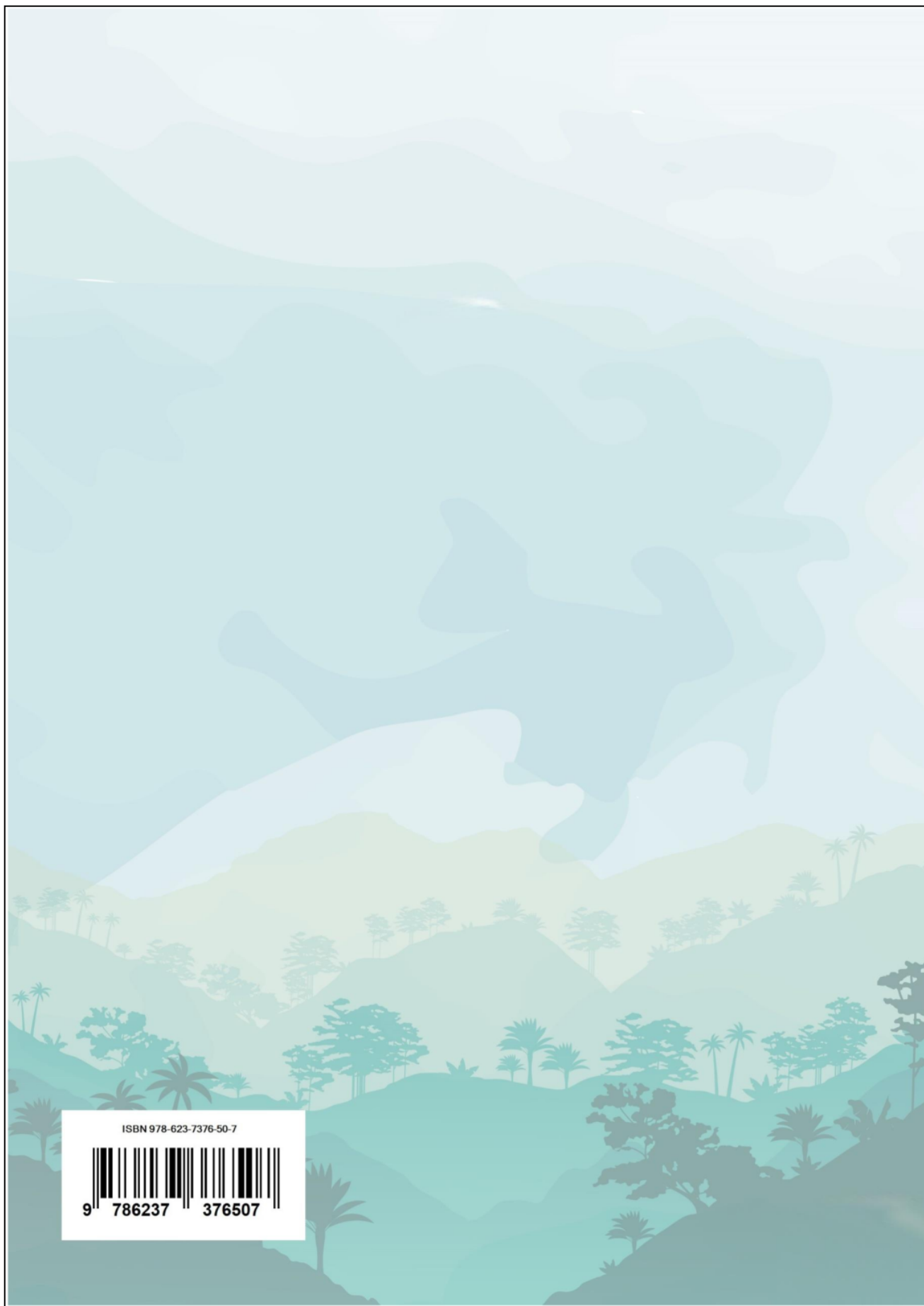
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