

The influence of nutrition on the behavior and blood glucose level of orangutans (*Pongo sp.*) in Gdańsk Zoo

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Introduction

Research in recent years have revolutionized nutrition of primates in captivity. It has been proven that feeding primates predominantly with sweet fruits can have negative impact for their health and behaviour. Nowadays, we believe that we should offer more fiber in the diet, even if animals would prefer to eat sweet fruits.

The aim of the study was to determine whether the modification of the standard orangutan diet in the Gdańsk Zoo by reducing high-starch root vegetables and fruits and increasing the amount of leafy vegetables will change the behavior and blood glucose levels of primates.



Material and methods

- **Time and place:** The research was carried in 3 stages – I- September 2018, II- January 2018, III- May 2019; in Gdańsk Zoo
- **Experimental animals:** Two Bornean orangutans (*Pongo pygmaeus*) in age of 47 – Albert (male) & Raja (female)
- **Scope of research:**
 - **Analysis of the components of the daily food ration:** Fruits, Leafy vegetables (A), Low sugar Vegetables (B), High-starch root vegetables(C) and Others
 - **Analysis of the chemical composition of the fed diets:** diets (n=4 at each research stage): dry matter, crude ash, crude protein, crude fat, crude fiber, NDF [AOAC, 1999], water-soluble carbohydrates (WSC) [PNR-64784]
 - **Testing of fasting blood glucose** using an Evercare Genius blood glucose meter - once a week before eating (8:00) and 2 hours after serving a meal (10:00)
 - **Behavioral observations:** carried out using the author's ethogram [Kopczyk 2019]; the behavior of orangutans was grouped into 4 categories: rest (1), food behavior (2); activity (3); Interactions (4)
 - **The energy value of diets** using the physiological energy equivalents of Atwater [Kuchanowicz and all., 2003];
 - **Statistical analysis:** by using Statistica software (differences between two means- Student-t test and between multiple means - Duncan's multiple range test)



Results

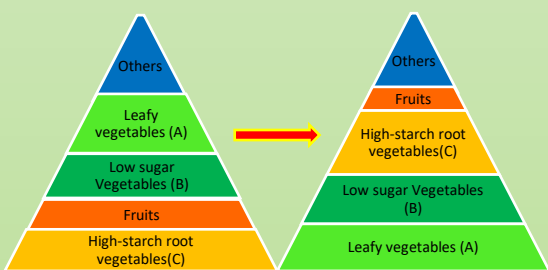


Fig. 1. Change of the diet for orangutans in Gdańsk Zoo.

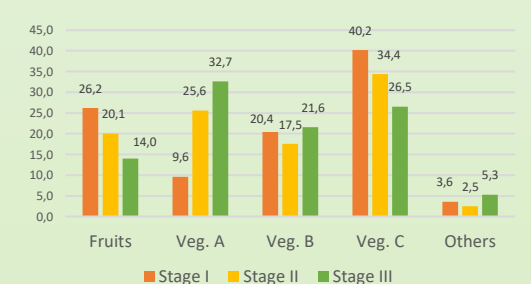


Fig. 2. Components of diets in particular stages of research (%).

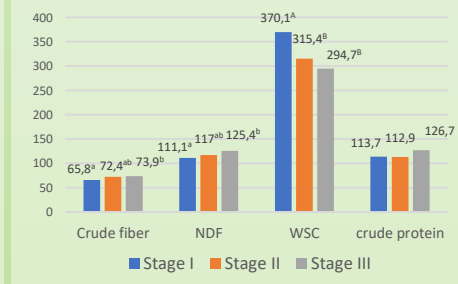


Fig. 3. Chemical composition of diets [g·kg⁻¹ DM] (ab...P≤0.05; AB...P≤0.01)

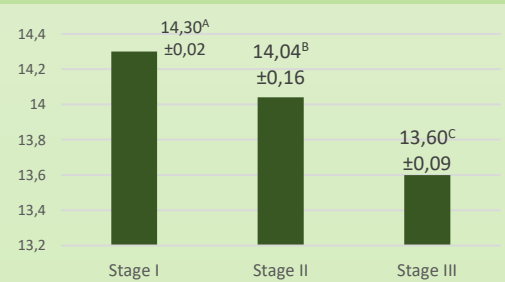


Fig. 4. Energy value of diets [MJ EM·kg⁻¹ DM] (AB...P≤0.01)

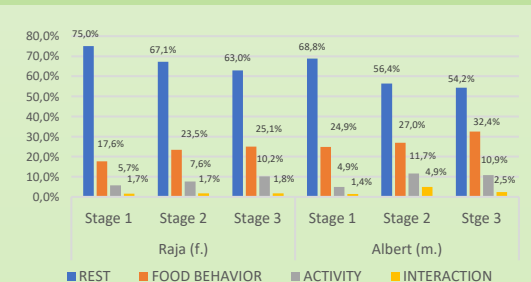


Fig. 5. Activity budget of orangutans (% of time).

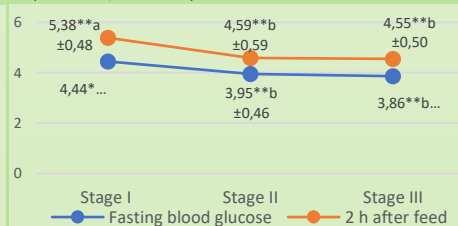


Fig. 6. Blood glucose concentrations at fasting and 2 hours after a meal [mmol·l⁻¹]
** significant differences (P≤0.01) between pre-meal and post-meal ab...significant differences (P≤0.05) between particular stages of the research

Summary

1. Limiting the content of high-starch root fruits and vegetables in favour of leafy vegetables in the component composition of diets significantly increased the content of structural carbohydrates in dry matter and lowered the concentration of sugar and metabolic energy in relation to the standard diet.
2. The final diet was the closest to the orangutan dietary recommendations.
3. Feeding the modified diets improved the body condition of the orangutans.
4. The feeding behavior of orangutans in the Gdansk Zoo depended on the type of diets fed. The modified diet stimulated Albert and Raja to be more physically active and increased their time for eating behavior.
5. Feeding modified diets significantly lowered the level of fasting and postprandial glucose in Albert (m.).

Acknowledgements

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