STUDY ON THE ENERGY NUTRITION VALUES OF HULL-LESS BARLEY IN EXPERIMENTS WITH MUSCOVY DUCKS

ПРОУЧВАНЕ ВЪРХУ ЕНЕРГИЙНАТА ХРАНИТЕЛНОСТ НА ГОЛОЗЪРНЕСТ ЕЧЕМИК ПРИ ОПИТИ С МУСКУСНИ ПАТИЦИ

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ABSTRACT

Using adapted methods for balanced experiments with waterfowl, the apparent (AME_{n-0}) and the true (TME_{n-0}) metabolizable energy of hull-less barley have been established. Despite the lower content of crude fiber, the energy values were similar to the common barley (Hordeum sativa L.). The AME_{n-0} and the TME_{n-0} of the forage for Muscovy ducks were 12.29 MJ/kg DM and 13.28 MJ/kg DM, and the coefficients of the gross energy transformation - 68.97 and 74.52, respectively.

KEYWORDS: Metabolizable energy, hull-less barley, Muscovy ducks

РЕЗЮМЕ

Ползвайки адаптилана за водоплаващи птици методика за балансови опити, са установени видимата (AME_{n-0}) и истинската (TME_{n-0}) обменни енергии на голозърнест ечемик при Мускусни патици. Въпреки по- ниското съдържание на сурови влакнини, енергийните стойности бяха идентични с тези на обикновения ечемик (Hordeum sativa L.). AME_{n-0} и TME_{n-0} на фуража за Мускусни патици са съответно 12.29 MJ/kg ACB and 13.28 MJ/kg ACB при коефициенти на оползотворяване на брутоенергията – съответно 68.97 и 74.52.

КЛЮЧОВИ ДУМИ: Обменна енергия, Голозърнест ечемик, Мускусни патици

РАЗШИРЕНО РЕЗЮМЕ

Голозърнестият ечемик е сравнително нова култура за България. Той може да се ползва в хранително – вкусовата промишленост в България, но също така е и важен за храненето на птици, особено за водоплаващи. Целта на настоящото изследване е да се установи химичният състав и брутоенергийната стойност на 4 перспективни лении голозърнест ечемик, както и видимата и истинската обменни енергии на осреднена стокова партида от фуража при опити с Мускусни патици.

През 2003 год са проведени балансови опити с 12 едногодишни Мускусни патока с осреднена стокова партида от фуража. Ползвана е методика за балансови опити с водоплаващи птици.

Различните линии от фуража не показват съществени разлики, както в химичния си състав, така и в брутоенергийната си стойност, следователно те могат да бъдат използвани при храненето на птиците без опасност от съществени разлики в сравнение със средната хранителна стойност. Съпоставени с обикновения ечемик, по – съществени са разликите в съдържанието на сурови влакнини (в голозърнестия ечемик суровите влакнини са с около 60% по – малко) и в БЕВ (БЕВ в изследвания фураж е с 3-4% повече).

Видимата обменна енергия (ВОЕn-о) на осреднена стокова партида от голозърнест ечемик при опити с Мускуснни патици е 12.29 MJ/kg АСВ, при коефициент на оползотворяване на брутоенергията 68.97.

Истинската обменна енергия (ИОЕn-о) на осреднена стокова партида от голозърнест ечемик при опити с Мускуснни патици е 13.28 MJ/kg АСВ, при коефициент на оползотворяване на брутоенергията 74.52.

INTRODUCTION

Hull-less barley is a comparatively new crop for Bulgaria. It can be successfully used in food and flavour industry in Bulgaria but it is also important for fowl nutrition. In Bulgaria different lines of the forage are in a process of testing and consolidating.

In the combined forages for waterfowl, along with maize, much bigger amounts of other cereals could be included too [6, 8].

The advantages of hull-less barley could be found above all in the low content of crude fibers that may contribute to the better digestion of the nutrient substances and hence, to the better utilization of the forage gross energy by the birds.

The aim of the present study was to establish the chemical composition and the gross energy of 4 perspective hull-less barley lines, as well as the apparent and true metabolizable energy of a stocking lot of the forage in experiments with Muscovy ducks.

MATERIAL AND METHODS

In 2001-2002 the chemical composition and the energy value of 4 lines of hull-less barley from the collection of the Department of Genetics and Breeding, the Agricultural University – Plovdiv, were studied.

The chemical composition was established following the Veende method [5] and the gross energy value – by the microprocessor calorimeter KL 11 Mikado.

In 2003 balanced experiments with 12 one-year old Muscovy drakes were conducted with a stocking lot of the forage containing 25 % of each line. The methods of balanced experiments with waterfowl were applied [1, 4].

The apparent and the true metabolizable energy of the forage were calculated following the method of Sibbald

Table 1: Chemical composition of the different varieties of pear barley– object of the experiment

Variety	DM- %	Content in DM- %					Gross energy in DM- MJ/kg
		Crude protein	Ether extract	Crude fibber	Ash	NPE	
Pv 103	87.91	13.87	1.06	1.87	2.05	81.15	17.91
Pv 104	88.33	14.85	0.94	1.61	1.96	80.64	17.80
557A00299	87.34	14.24	1.19	1.98	1.91	80.68	17.82
557A01099	87.21	11.11	1.14	2.11	1.97	83.67	17.74
Average for the stocking lot	87.70	13.52	1.08	1.89	1.97	81.54	17.82

Table 2: Input and output of substances and energy of tube fed and feed deprived birds (n=6+6)

Indexes	Tube fed analogs	Feed deprived analogs
Dry matter input (g)	52.87± 0.10	-
Energy input – J	941668± 1737	-
Nitrogen- input(g)	1.049±0.002	-
Energy output- J	307226±17223	71452±9692
Nitrogen output (g)	1.479± 0.083	0.744± 0.101
Apparent N- retained (g)	- 0.430	

Table 3: Apparent and true metabolizable energy of pear barley in experiments with geese

Indexes	Values
Apparent metabol. energy (AME) – MJ/kg DM	12.00
AME n-0 – MJ/kg ACB/DM	12.29
True metabol. energy (TME)- MJ/kg DM	13.36
TME n-o – MJ/kg DM	13.28
Gross energy use – AMEn-o/GE	68.97
Gross energy use – TMEn-o/GE	74.52

(1986):

- AME = (EI - EO)/ FI
- AME_{n-0} = AME - (34.4 x ANR/ FI)
- TME = AME + (FEL / FI)
- TME_{n-0} = TME - (34.4 x ANR / FI) - (34.4 x FNL / FI)

Where: AME and TME – apparent and true metabolizable energy, EI – energy input by the forage, EO – energy output with the excrement of fed birds, FI – food input /g/ , ANR – apparent nitrogen retained, FEL – food-deprived analogues energy loss, FNL – food-deprived analogues nitrogen loss, $_{n-0}$ – corrected values at zero nitrogen balance.

RESULTS AND DISCUSSION

Table 1 shows the chemical composition and the gross energy values of the four forage lines, as well as the mean values of the stocking lot, the object of the experiment.

The separate forage lines did not manifest significant differences both in their chemical compositions and in gross energy contents. Consequently, they could be used for fowl nutrition without the danger of receiving significant differences from their mean nutrition value. Compared to common barley grain [2] the most significant were the differences in the crude fiber content (in hull-less barley the crude fibers were 60 % less) and non- protein extract (NPE-in the studied forage they were 3 – 4 % more). There were no significant differences in the crude protein and ether extracts, as well as in the gross energy values of the tested forages.

Table 2 shoes the input and output amounts of substances and the energy of fed and food deprived drakes.

Table 3 presents the calculated values of the apparent and the true metabolizable energy (corrected to zero nitrogen balance) and the utilization of the gross energy of the hull-less barley stocking lot.

The hull-less barley fell behind the basic energy forage for fowl nutrition and behind the hull-less oats, both, by apparent and by true metabolizable energy [1]. The differences in the true metabolizable energies were 2.4 and 2.1 MJ/kg dry matter (DM) respectively. When comparing the energy values of the hull-less and common barley in geese [1], it becomes obvious that in both species there is no significant differences in apparent as well as in true metabolizable energy.

CONCLUSIONS

The hull-less barley lines studied did not manifest significant differences in their chemical composition and gross energy value. Consequently, great differences in their nutrition value for fowl by lots could not be expected, too. The apparent metabolizable energy of a stocking lot of hull-less barley in experiments with Muscovy drakes was 12.29 MJ/kg DM, the coefficient of gross energy utilization being 68.97.

The true metabolizable energy of a stocking lot of hull-less barley in experiments with Muscovy drakes was 13.28 MJ/kg DM, the coefficient of gross energy utilization being 74.52.

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REFERENCES

[1] Penkov D., 1997, True metabolizable energy and true digestibility of the aminoacids in some forages in experiments with geese, Ph.D. Thesis, Plovdiv.

[2] Surdjiyska S., J. Ilieva, G. Valchev, L. Vladimirova, I. Tsvetanov, B. Marinov, M. Kanev,1996,Nutrition rates for pigs and fowl,TU publishing house, ISBN 954-8180-43-X

[3] Todorov N., 1997, Nutrition rates and nutrition value of the forages for cattle and bulls, Sofia, ISBN 954-642-029-8

[4] Adeola O., D. Ragland, D. King, 1997, Feeding and excreta collection technique in metabolizable energy assays for ducks. Poul. Sci. 76, 728-732

[5] AOAC, 1980, Official methods of analyses, 13th Edit. Assoc. of Offic. Analytical Chemists, Washigton, DC, 125-142

[6] Lesson S., J. Summers, 1996, Commercial Poultry Nutrition, T2 Viande de volailles, Univ. Books, Guleph, Ontario, Canada, ISBN 0-9695600-2-8

[7] Sibbald I. R., 1986, The TME System of feed evaluation, Res. Branch, Agric., Canada

[8] Storey, M. L., N. K. Allen, 1982, Apparent and true metabolizable energy foodstuffs for mature non-laying female Embden geese, Poultry Sci. 61: 739-745