KRMIVA

NEW ASPECTS IN AMINO ACID NUTRITION OF TURKEYS

NOVI POGLEDI NA HRANIDBU PURANA AMINOKISELINAMA

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SUMMARY

The economic and the physiological / nutrional evaluation of the data on the three amino acids to see lead to different recommendations for the optimum amino acid content in the diets. The results clearly show that modern high yielding turkey toms have a high requirement for amino acids that is substantiallly higher than the current NRC recommendations.

Key words: aminoacids, methionine, cystine, lysine, threonine, turkey toms, recommendations

Recent research indicate that the growth performance potential of high yielding turkeys has increased substantially over recent years.

For example for BUT Big 6 in 1982 at 22 wk of age a weight of 14.5 to 16 kg was reported, which is substantially lower than the targeted 20 to 23 kg for males today. Under these aspects the question arises, if the nutrient requirement data we use, are matching todays birds requirement.

It is well known that met+cys and lysine are the first limiting amino acids in poultry and turkey diets. However, there have been indications that threonine is the third-limiting amino acid after Met+Cys and lysine especially in cereal-based diets for turkeys (Lehmann et al. 1997). In addition, threonine may be 3rd limiting in low-protein grain-based diets, in corn soybean/canola diets

In an effort to fill the apparent gap in sound data for the current genetics of commercial turkeys, dose-response studies were conducted to investigate growth performance and carcass quality responses of male turkeys to graded dietary amino acid levels.

METHIONINE AND CYSTINE

In trials recently conducted at the Warmia and Mazuri University in Olstyn the methionine requirement in two growth periods from day 36 to 63 (P III) and from day 92 to 119 (P -V) was evaluated on male BUT-6 turkeys. Starting with a basal diet low in methionine five supplementation steps were used to cover the response area until maximal growth (Jankowski et al., 2004).

The rations based on wheat, corn , soybean meal and peas were fed ad libitum in the experimental periods. In period 3 (P-III) the energy content was 12.4 MJ ME/kg feed and the methionine content in the basal diet amounted to 0,33%, M+C 0.75%, and Lysine content was 1.59%; Threonine, trypthophan and arginine were 63, 18 and 105 % of the Lysine level. The phase 5 (P-V) data was for energy 12,5 MJ ME/kg feed, Met 0.28%, M+C 0,63%, Lys 1,27 % with Thr, Trp and Arg in relation to 68, 17 and 106. All nutrient contents were controlled by feed analysis.

While in Phase P-III there was a clear dose response to the methionine supplementation, in Phase P-V this could not be seen. Results may be influenced by environmentally high temperatures, therefore it was decided to repeat this part of the trial. Results of the Third phase agree very well with the data of Schutte et al (1988) who found a minimum of 1,05 % M+C (0,82 g/MJME) the diet for optimal growth at 5-8 weeks of age.

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Table 1. Performance of the animals in phase III
Tablica 1. Performansa životinja u razdoblju III

Trait - Obilježje	Phase III, day 36-63 - Razdoblje III, 36.-63 .dan					
	I	II	III	IV	V	VI
Content methionin - Sadržaj metionina	0,33	0,37	0,41	0,46	0,51	0,57
Live weight - day 63, kg - Živa vaga - 63. dan, kg	4,594 ^{D}	4,761 ^{BCc}	4,813 ^{AC}	4,862 ^{Abc}	4,892 ^{A}	4,924 ^{Aa}
Gain, kg - Prirast, kg	3,274 ^{B}	3,407 ^{Cb}	3,479 ^{AC}	3,539 ^{AC}	3,568 ^{ACa}	3,620 ^{A}
Feed utilisation, kg/1 kg - Iskorištenje hrane, kg/1 kg	2,047	2,003	2,025	2,001	2,032	2,037

LYSINE REQUIREMENT

Concerning the response to dietary lysine supply, four trials were conducted at the University of Halle, Germany, between 1995 and 1999 on male BUT Big 6-turkeys over various age periods. The studies reported by Hoehler et al. (2000) and Lemme et al. (2001) deal with the periods of 5 to 8 and 13 to 16 weeks of age, whereas Lehmann et al. (1996) worked on the periods of 9 to 12 and 17 to 20 weeks of age. In each trial period six levels of dietary lysine supply were tested. Weight gain and feed conversion rate improved in every treatment, and the responses to lysine supply could fit very well exponential regression functions.

The results of all experiments showed that exponential regression curves fitted very well to the data points and dose response relationship followed clearly the law of diminishing returns. Performance data confirm that the basal diets of each experiment were deficient in lysine and increasing lysine content improved weight gain as well as feed conversion.

If optimum weight gain is defined as the performance at 95% of the asymptotic response, the corresponding dietary lysine contents were calculated to be 1.50%, 1.37%, and 1.24% for the phases P-I, P-II, and P-III, respectively. The corresponding figures for feed conversion ratio were lower and could be determined as 1.37%, 1.18%, and 0.94% dietary lysine.

Carcass evaluation of birds at 20 weeks of age showed a strong increase in breast meat yield with increased dietary lysine levels suggesting that maximum breast meat yield was not achieved with 0.96% dietary lysine (Figure 1). However, the proportion of drumsticks and wings in the carcass was not affected by lysine level, and proportion of the thighs even tended to decrease with higher dietary lysine content.

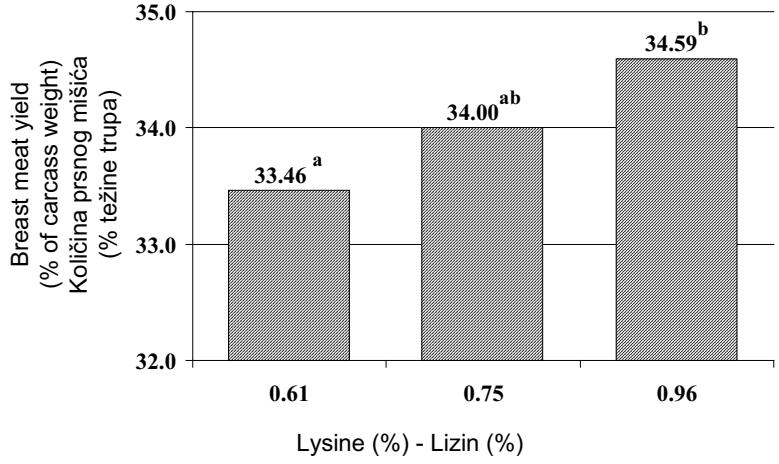


Figure 1. Breast meat yield in male BUT Big 6 turkeys 20 weeks of age fed different levels of dietary lysine (according to Lehmann *et al.* (1996))

Slika 1. Prinos mesa prsa purana BUT Big 6 u dobi od 20 tjedana hranjenih različitim razinama dijetalnog lizina (prema Lehmann i sur. 1996)

ECONOMIC EFFECTS OF DIFFERENT LYSINE LEVELS

It should be noticed that these figures do not necessarily represent the most profitable amino acid concentration. However, the exponential regression equations could be easily combined with economic criteria such as feed cost and income over feed cost in order to determine most profitable dietary lysine levels.

The model used for the calculation of the economic implications on marginal changes in dietary nutrient supply is based on the first derivative of the performance response curve, which gives the information on the marginal change in performance from the respective last dietary increment of the nutrient.

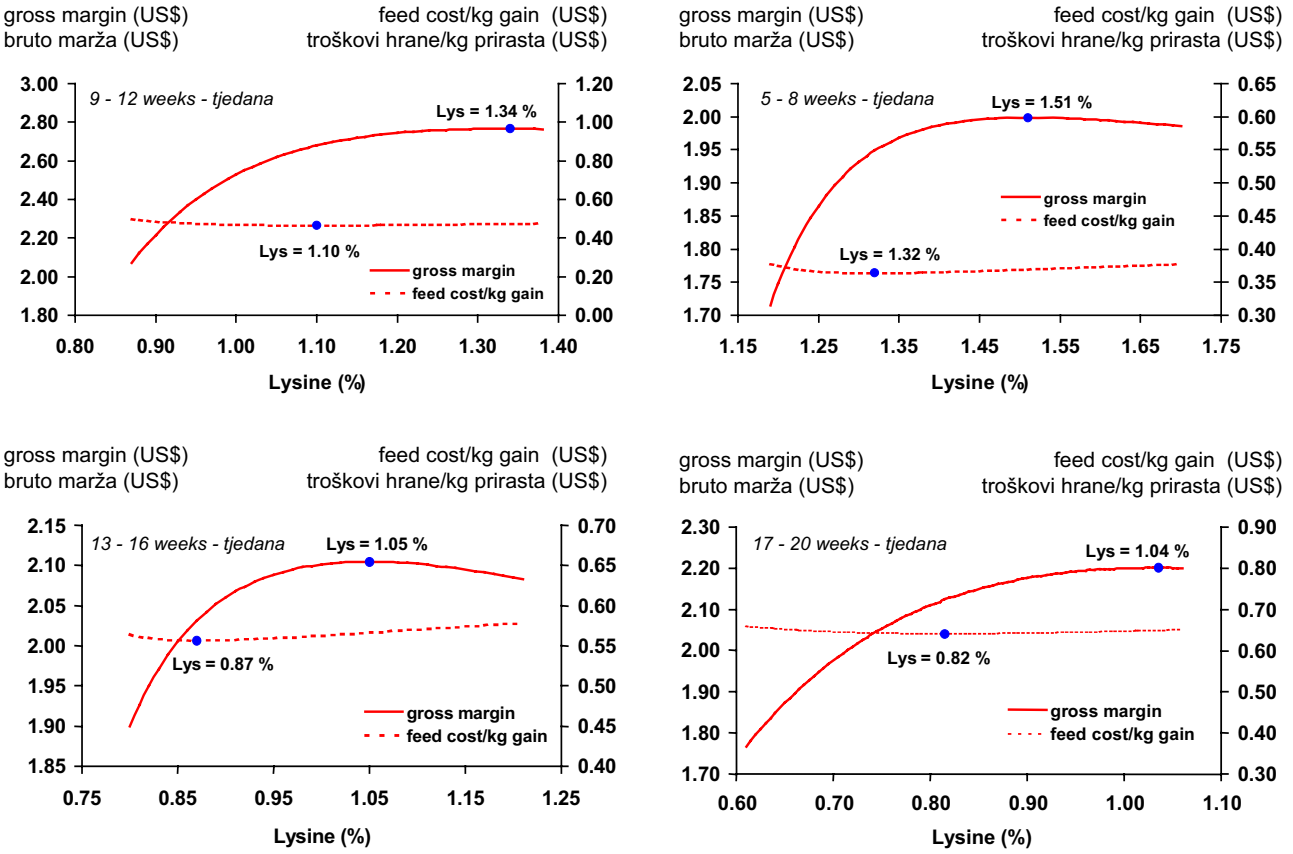
For economic calculations feed cost, practical diets were formulated for each phase with the optimum lysine levels (Lemme et al., 2002).

The highest gross margin in every phase was found at higher lysine levels than the minimum feed costs.

In summary the calculated results demonstrate that optimum growth rates are the most relevant factor to maximise gross margin. It is therefore recommended to adjust lysine levels in the feed for male turkeys which support maximum growth rate, especially in the younger birds.

Figure 2. Calculated effects of increasing lysine supply on feed cost/kg gain and gross margin in different growth phases on male turkeys

Slika 2. Izračunati učinci povećane opskrbe lizinom na troškove za hranu/kg prirasta i bruto maržu u raznim razdobljima rasta purana



THREONINE REQUIREMENT

After a close look at lysine, mostly the second limiting amino acid in turkey diets, a further look at another amino acid of relevance, threonine, also seems necessary.

Turkeys fed 0.64 % threonine in the finisher diet yielded a considerably higher breast meat portion than birds on the deficient and intermediate dietary threonine levels. The increase in breast meat portion was the result of a better development of the *Pectoralis Major*. The portion of *Pectoralis Minor* was not affected by the dietary threonine level

Table 2. Recommendation for optimum amino acid contents in diets for male turkeys

Tablica 3. Preporuka za optimalan sadržaj amino-kiselina u obrocima za purane

Periode (weeks) Razdoblje (tjedana)	Met + Cys Met + Cis	Lysine Lizin	Threonine Treonin
1 to 4	0,86-0,93		0,77- 0,85
5 to 8	0.79 - 0.93	1.09 - 1.20	
9 to 12		0.93 - 1.08	0.60 - 0.71
13 to 16		0.71 - 0.94	
17 to 20		> 0,71	> 0,48

Experimental data on the response of turkeys to dietary threonine is sparse. Therefore, a study was conducted to investigate the threonine requirement of BUT Big 6 turkey toms during the starter, grower and finisher period from 1 to 4, 9 to 12, and 17 to 20 weeks of age. Responses of weight gain, feed conversion, and carcass quality to increasing dietary threonine levels were investigated.

From 1 to 4 weeks of age (57 g to 1.1 kg live weight), a dietary threonine level of about 0.95 % (0.81 g/MJ ME) was found to be adequate to obtain optimum growth and feed conversion. From 9 to 12 weeks of age (4.0 to 8.6 kg live weight), there was no significant response to dietary threonine beyond the basal level of 0.69 % (0.54 g/MJ ME). From 17 to 20 weeks of age (13.1 to 18.7 kg live weight), a threonine level of about 0.64 % (0.47 g/MJ ME) was not sufficient to achieve maximum performance (Lehmann et al., 1997).

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SAŽETAK

Gospodarska i fiziološka/hranidbena procjena podataka za tri amino-kiseline dovodi do različitih preporuka za optimalni sadržaj aminokiselina u obrocima. Rezultati očito pokazuju da današnji visoko prinosni purani imaju velike potrebe za aminokiselinama, znatno veće od najnovijih preporuka NRC-a.

Ključne riječi: aminokiseline, metionin, cistin, lizin, treonin, preporuke, purani