

## THE EFFECT OF FEED RESTRICTION IN MEDIUM-TYPE MEAT TURKEY POULTS

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Four groups of the experiment consisted of 288 turkey poults of medium, broiler type XK 2. The group included three replications (boxes) with 24 turkey poults with balanced percentage of sexes, that is in total 72 turkey poults housed on litter. The trial was conducted in four periods - the first: up to four weeks of age, the second: up to nine weeks, the third: up to 12 weeks, the fourth: up to 20 weeks of age. Group II in the first period was administered the feed mixture consisting of 23.6% crude protein instead of the mixture consisting of 27.9% crude protein which was administered to turkey poults in the other groups. Group III was given a daily feed ratio reduced to 20 g from the days 8 to 21 per turkey and day and group IV from the days 8 to 17 to 15 g of feed mixture per turkey and day. Restriction of crude protein in group II and quantitatively early feed restriction in groups III and IV did not significantly affect the final weight of turkey hens and turkey toms at the age of 84 days. Neither in 20 week-old turkey toms the differences in live weight were significant between groups. Higher average live weight by 430 g was achieved in group III. Feed consumption fell particularly in groups III and IV, especially in turkey-cocks of higher age. Dressing percentage did not change significantly. In turkeys, too, the feed restriction may be economically advantageous.

turkey poults; feed restriction; restriction of crude protein; growth and feed consumption; meat efficiency

### INTRODUCTION

Higher percentage of pectoral part in dressed body of turkey hens, higher percentage of bones and relative fall in femoral part can be achieved by selection for high live weight. These disproportions in changes in growth of different parts of the body result in defects of limbs and skeleton. Higher intensity of growth is also associated with body fat content. Fat percentage in slaughter poultry can be sometimes reduced by feed restriction at early age. Early feed restriction may have some other advantages. Among them

are: drop in feed consumption, lower mortality rate or greater balance in live weight. The aim of the study was to evaluate the effect of type of restriction on manifestation of growth compensation and dressing percentage of turkey poults.

Fořt and Košař (1984) were dealing with growth compensation of turkey poults, energy and crude protein restriction. They concentrated on long-time feed restriction, in crude protein from 4 to 13 to 20 weeks of age, in energy from 12 to 20 weeks of age. Turkey toms balanced live weight to 20 weeks of age, except strong restriction of crude protein (14.2%).

In trials performed by Plavnik and Hurwitz (1988) early restriction had no effect on fat content in turkey poults' bodies. While Ferket and

Seil (1989) found a higher percentage of fat, Oju et al. (1988), on the contrary, found less fat. In literature there are greater disproportions in results of carcass dissection or in mortality rate of turkey poults after early feed restriction than in growth and feed consumption (Hester et al., 1990; Summers et al., 1985; Ferket, Seil, 1990 and others).

## MATERIAL AND METHODS

Sexed turkey toms of medium type XK 2 in total number of 288 were placed in 12 littered boxes (each box comprised 12 turkey hens and 12 turkey toms). Three boxes formed one group. Turkey hens were fattened to 12 weeks and turkey toms to 20 weeks of age. In groups I and II turkey poults were fed *ad libitum*. Amount of feed in groups III and IV was set up as 65% and 50% of uptake at *ad libitum* feeding at seven days of age. Composition of feed mixtures, biofactors supplement and mineral feed additives is given in Tabs. I to III. In the period of feed restriction the turkey poults were fed from tube feeders; 4 cm of feeding space per turkey poult.

I. Composition of feed mixtures in percentage

Component/Nutrient	Age of turkey poults				
	1st-4th week		5th-9th week	10th-12th week	13th-20th week
	KRIK	KR1NL	KR2	KR3	KR4
Fish meal	9.4	5	4.5	1.5	-
Meat-bone meal	3.8	2	3	-	1.2
Yeasts	5.24	3	2	1	0.8
Blood meal	-	-	-	0.4	0.32
Ground blood	-	-	-	1.6	1.28
Soybean meal	33.56	32	25.5	21.5	13.4
Corn	25	34	25	35	40
Wheat	19	20	36	34	39
DB KR1/KR2/KR3	1	1	1	1	1
MKP 2 SP	3	3	3	4	3
Dry matter	92.96	93.52	93.62	93.58	93.76
Crude protein	27.94	23.57	23.23	20.34	17.53
Fat	3.11	2.83	2.87	2.78	3.09
Fiber	2.83	2.51	3.01	2.74	2.97
Ashes	7.06	5.74	6.28	5.93	4.86
Ca	1.46	1.24	1.26	1.27	0.90
P	0.80	0.80	0.82	0.86	0.76
ME (MJ/kg)	11.4	11.5	11.6	11.7	12.0

II. Composition of biofactor supplement

Component		KR1	KR2	KR3
Vitamin A	(i.u.)	1 600 000	1 600 000	1 000 000
Vitamin D3	(i.u.)	320 000	320 000	200 000
Vitamin B2	(i.u.)	500	600	-
Vitamin B12	(i.u.)	2	2	-
Vitamin E	(mg)	3 000	4 000	4 000
Vitamin K3	(mg)	200	200	-
Niacin	(mg)	6 000	4 500	-
Methionine	(mg)	-	50 000	-
Calcium panthothenate	(mg)	1 500	1 500	-
Choline-chloride	(mg)	7 500	-	10 000
Nitrovin	(mg)	1 200	-	-
Neox	(mg)	20 000	20 000	-
Dimetridazol	(mg)	15 000	-	-
Manganese carbonate	(mg)	-	-	2 000
Stenaval	(mg)	50 000	-	-
Vehiculum		ad 1 kg	ad 1 kg	ad 1 kg



### III. Composition of mineral supplement MKP 2 SP

Component	%
Mineral supplement MD II	10
Fodder limestone	28
Dicalcium phosphate	42
Feeding salt	5
Wheat flour	15

The starting temperature of 36 °C was falling gradually from 35 °C at the end of the first week of age by 3 °C weekly to 20 °C. The lights were kept on throughout the whole experiment. In the first week the intensity of light was high.

The growth of turkey poults was followed by individual weighing in week intervals, feed consumption was finding in groups also weekly. Four 12-week old turkey toms and four turkey hens, and five 20-week old turkey toms from the group were used for carcass analysis. Weight and muscle proportion do not include the skin.

### Description of the trial

Group	Number of animals	Characteristics
I	72 (3 x 24)	control-feeding <i>ad libitum</i> by feed mixtures: KR1K, KR2, KR3, KR4
II	72	day 1 to 28 – <i>ad libitum</i> feed mixture KR1NL with low content of crude protein (23.5%), from day 29 – KR2, from day 64 – KR3 and from day 85 – KR4 <i>ad libitum</i>
III	72	day 1 to 7 – KR1K <i>ad libitum</i> , day 8 to 21 – 20 g KR1K per bird and day, day 22 to 28 – KR1K <i>ad libitum</i> , from day 29 the same like in group II
IV	72	day 1 to 7 – KR1K <i>ad libitum</i> , day 8 to 17 – 15 g KR1K per bird and day, day 18 to 28 – KR1K <i>ad libitum</i> , from day 29 the same like group II

### RESULTS AND DISCUSSION

Turkey poults in group II fed by mixture consisting of low-crude protein diet had significantly lower weight gains already in the first week of age. Similarly, the growth has been retarded by quantitative feed restriction between day 8 to 21 of age in group III or from day 8 to 17 in group IV. Significantly lower weight was kept to 42nd day of age. At the end of common fattening of turkey toms and hens at 84 days of age, turkey toms of groups II and IV had slightly lower weight compared with the control group. Turkey hens in group IV had a weight even slightly higher (Tabs. IV to VI). Acceleration of growth appeared after finishing feed restriction in all their types what is in keeping with the data of Oju et al. (1988), Plavnik, Hurwitz (1990) and Ferket, Sell (1990). Turkey hens of group IV entirely balanced live weight with the turkey hens of the control group already at 10 weeks of age. In females the growth accelerated after finished

### IV. Average live weight of turkey poults of both sexes in g

Age (days)	Group			
	I	II	III	IV
1	49.6	48.7	48.4	48.9
28	656 a	561 b	505 c	564 b
63	2 947	2 807	2 787	2 818
84	4 336	4 177	4 158	4 206

a, b, c, d –  $P = 0.05$

### V. Live weight of turkey toms in g

Age (days)	Group			
	I	II	III	IV
1	50.5	49.1	49.2	49.6
28	707 aA	596 bcA	538 b	618 cA
63	3 256 A	3 060 A	3 126 A	3 141 A
84	4 829 A	4 623 A	4 658 A	4 680 A
120	9 033	9 197	9 461	9 089

a, b, c –  $P \leq 0.05$

A, B –  $P \leq 0.05$  between turkey toms and hens in the group

VI. Live weight of turkey hens in g

Age (days)	Group			
	I	II	III	IV
1	48.5	48.0	47.6	48.3
28	593 aB	510 bB	472 B	512 bB
63	2 545 B	2 447 B	2 448 B	2 512 B
84	3 686 B	3 556 B	3 625 B	3 770 B

a, b -  $P \leq 0.05$

A, B -  $P \leq 0.05$  between turkey toms and hens in the group

restriction of crude protein so that at 5 weeks of age there was no significant difference in average weight between groups I and II.

Turkey poults with crude-protein restriction had a high intake of feed in the first days of fattening what was probably associated with covering of the demand for amino acids for growth. In the period of growth compensation, on the contrary, the feed consumption per bird and day and 1 kg of weight gain was reduced considerably. In qualitative restriction (groups III and IV) feed consumption per bird and day and 1 kg of weight gain was lower than in deleted turkey poults in all periods of fattening, except the third period in group III (Tab. VII). Also Ferket and Sell (1990) refer to better utilization of feed in turkey poults with feed restriction.

Dressing percentage of turkey poults (Tab. VIII to X) was affected significantly adversely by restriction. Carcass analysis done at 12 weeks of age showed that experimental turkey hens had higher dressing percentage com-

VII. Average feed consumption per 1 kg of weight gain in kg

Week	Group			
	I	II	III	IV
1-4	1.98	2.44	1.93	1.87
5-9	2.13	2.10	2.00	2.10
10-12	2.95	2.83	3.00	2.87
13-20	4.43	4.50	4.27	4.10
1-12	2.36	2.38	2.31	2.32
1-20	3.03	3.06	2.86	2.85

VIII. Carcass analysis of turkey hens at the age of 12 weeks

Indicator	Group			
	I	II	III	IV
Live weight before slaughtering (g)	3 718 B	3 620 B	3 620 B	3 688 B
Weight of dressed body (g)	2 610 B	2 581 B	2 574 B	2 659 B
Weight of abdominal fat (g)	31	18	25	25
Weight of pectoral muscles without skin (g)	628 B	685	685	714
Weight of femoral muscles without skin (g)	562 B	540 B	555 B	552 B
Dressing percentage (%)	77.2	78.5	77.9	78.7
Percentage of abdominal fat from live weight (g)	0.82	0.49	0.70	0.69
Percentage of pectoral muscles from live weight (%)	18.3	18.9	18.9	20.2
Percentage of femoral muscles from live weight (%)	15.1	14.9	15.3	15.0

A, B -  $P \leq 0.05$  between turkey toms and hens in the group

IX. Carcass analysis of turkey toms at the age of 12 weeks

Indicator	Group			
	I	II	III	IV
Live weight before slaughtering (g)	4 980 A	4 582 A	4 712 A	4 715 A
Weight of dressed body (g)	3 645 A	3 254 A	3 281 A	3 326 A
Weight of abdominal fat (g)	39	22	17	22
Weight of pectoral muscles without skin (g)	970 aA	837 ab	776 b	911 ab
Weight of femoral muscles without skin (g)	822 A	715 A	732 A	742 A
Dressing percentage (%)	80.0	77.9	77.4	77.8
Percentage of abdominal fat from live weight (g)	0.81	0.49	0.37	0.46
Percentage of pectoral muscles from live weight (%)	19.5	18.3	16.5	19.3
Percentage of femoral muscles from live weight (%)	16.5	15.6	15.5	15.7

a, b -  $P \leq 0.05$

A, B -  $P \leq 0.05$  between turkey toms and hens in the group



X. Carcass analysis of turkey toms at the age of 20 weeks

Indicator	Group			
	I	II	III	IV
Live weight before slaughtering (g)	9 660	9 260	9 100	9 100
Weight of dressed body (g)	7 120 a	6 700 ab	6 600 b	6 520 b
Weight of abdominal fat (g)	109	47	88	60
Weight of pectoral muscles without skin (g)	1 977	1 856	1 812	1 894
Weight of femoral muscles without skin (g)	1 688	1 676	1 632	1 624
Dressing percentage (%)	79.7	78.9	78.9	77.7
Percentage of abdominal fat from live weight (g)	1.12	0.52	0.96	0.66
Percentage of pectoral muscles from live weight (%)	20.4	20.1	19.9	20.8
Percentage of femoral muscles from live weight (%)	17.5	18.1	17.9	17.8

a, b -  $P \leq 0.05$

pared to the control turkey hens. On the contrary, in turkey toms dressing percentage in experimental groups was lower. At 20 weeks of age differences in dressing percentage in experimental and control male turkeys were slight. It is obvious from the presented results that dressing percentage is in close correlation with growth and is left behind the full balance of live weight what has been found out also in poult (S k ř i v a n , T ů m o v á , 1991). The same applies to percentage of pectoral muscles, where were similar relations like in dressing percentage. The percentage of pectoral muscles in 20-week old turkey toms in experimental groups got to the level of the control group. The same changes in representation of pectoral muscles reported F e r k e t and S e l l (1990) who found out a lower percentage of pectoral muscles after early crude protein and energy restriction. Feed restriction did not influence the percentage of femoral muscles at 12 weeks of age, though 20-week old turkey toms were distinguished by greater muscularity of legs.

Changes in growth of muscles are probably associated with changes in metabolism due to feed restriction when in the course of restriction synthesis of proteins is considerably reduced (M c N u r l a n e t a l . , 1980) which the most affects the muscles (F e r k e t , S e l l , 1990).

Most authors agree that early feed restriction in turkey poults has no effect on amount of deposited fat or that percentage of fat rises after feed restriction. We found out in our experiment less abdominal fat in most deleted turkey

poult at 12 to 20 weeks of age. Higher degree of acceleration of growth after restriction is obviously associated with higher deposition of fat.

The mortality rate of turkey poults (Tab. XI) in groups II to IV was not higher, on the contrary, identical or lower than in the control group what is in keeping with conclusions of the study made by P l a v n i k and H u r w i t z (1991) and in discrepancy with prevailing part of similarly-oriented works.

XI. Mortality rate of turkey poults (in birds)

Group	Age of turkey poults in weeks					
	1-4	5-9	10-12	13-20	1-12	1-20
I	2	1	1	1	4	5
II	3	0	1	1	4	5
III	0	1	2	1	3	4
IV	0	0	1	2	1	3

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### **Efekt restrikce krmiva u masných krůřat středního typu.**

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Byly srovnávány dva typy restrikce a úrovně kvantitativní restrikce v působení na kompenzaci růstu a jatečnou užitkovost krůřat a krocůřat středního typu XK 2. Ve čtyřech skupinách pokusu bylo celkem 288 krůřat středního, brojlerového typu XK 2. Skupina zahrnovala tři opakování (boxy) s 24 krůřaty s vyrovnaným poměrem pohlaví; celkem 72 krůřat umístěných na podestýlce. Pokus probíhal ve čtyřech obdobích – první do 4 týdnů věku, druhé do 9 týdnů, třetí do 12 týdnů a čtvrté do 20 týdnů věku. Skupina II dostávala v prvním období krmnou směs s 23,6 % dusíkatých látek místo směsi s 27,9 % dusíkatých látek, kterou měla krůřata v ostatních skupinách. Skupině III byla omezena denní dávka krmiva od 8. do 21. dne na 20 g na kus a den a skupině IV od 8. do 17. dne na 15 g směsi na kus a den. Teplota, světelný režim, krmný a napájecí prostor odpovídaly běžným požadavkům. Krůřata se vykrmovaly do 12 týdnů a krocůřata do 20 týdnů věku. Složení krmných směsí je uvedeno v tab. I.

Růst krůřat byl sledován individuálním vážením v týdenních intervalech, spotřeba krmiva byla zjišťována skupinově rovněž po týdnech. K jatečnému rozboru byli použiti čtyři 12týdenní krocůřata a čtyři krůřata a pět 20týdenních krocůřat. Hmotnost a podíl svalstva se v tab. VIII až X uvádí bez kůže.

Restrikce dusíkatých látek ve skupině II nebo kvantitativní restrikce ve skupinách III a IV retardovaly růst po dobu restrikce, avšak vyvolaly akceleraci růstu po restrikci.

Na konci společného výkrmu krocůřata a krůřata v 84 dnech věku měli krocůřata II. až IV. skupiny již pouze nepatrně nižší hmotnost než v kontrolní skupině, krůřata ve skupině IV měly hmotnost dokonce poněkud vyšší (tab. V a VI). U krocůřat ze skupiny II došlo po skončení restrikce dusíkatých látek k takovému zvýšení růstu, že již po týdnu, tj. v pěti týdnech věku, nebyl zjištěn významný rozdíl v průměrné hmotnosti proti kontrolní skupině.

Krůřata s restrikcí dusíkatých látek měla vysoký příjem krmiva v prvních týdnech výkrmu, což je pravděpodobně spojeno se snahou uspokojit potřebu hlavních aminokyselin. V období kompenzace růstu se naopak spotřeba krmiva značně snížila. Při kvantitativní restrikci (skupina III a IV) byla spotřeba krmiva na kus a den i na 1 kg

přírůřtku nižší u restrinkovaných krůřat ve všech obdobích výkrmu s výjimkou třetího období u skupiny III (tab. VII).

Jatečná užitkovost krůřat (tab. VIII až X) nebyla restrikcí výrazněji ovlivněna. Pokusné krůřata měly ve 12 týdnech věku vyšší jatečnou výtěžnost než krůřata kontrolní, naproti tomu krocůřata stejného věku měli jatečnou výtěžnost nižší. Ve 20 týdnech byly difference v jatečné výtěžnosti nepatrné. Je zřejmé, že jatečná užitkovost úzce souvisí s růstem a opožděje se za plným vyrovnáním živé hmotnosti, což jsme zjistili i u krocůřat (Skřivan, Tůmová, 1991).

Podíl prsního svalstva se dostal u 20týdenních krocůřat pokusných skupin na úroveň skupiny kontrolní. Restrikce neovlivnila podíl stehenního svalstva ve 12 týdnech věku, avšak ve 20 týdnech bylo u krocůřat zjištěno lepší osvalení nohou.

Úhyn krůřat (tab. XI) ve skupinách II až IV nebyl vyšší, ale stejný nebo nižší než v kontrolní skupině, což je ve shodě se závěry autorů Plavnik a Hurwitz (1991), i když většina autorů podobně zaměřených prací zjistila opačné tendence.

Ekonomická výhodnost rané restrikce závisí na jejím správném výběru a síle.

krůřata; restrikce krmiva; restrikce dusíkatých látek; růst; spotřeba krmiva; masná užitkovost

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