INFLUENCE OF HIGHER ENERGY LEVEL IN THE COMPOUND FEED ON SOW BODY WEIGHT DEVELOPMENT AND MILK YIELD+

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High reproductive capacity of sows requires administration of adequate protein and energy levels, especially in the final gestation third and during lactation (**Angelova and Tenchev, 2008**; **Houde et al.,** 2009). Feed intake and utilization often fail to satisfy sow's requirements hence leading to deterioration of body condition during the reproduction cycle. This results in mobilization of internal protein and energy reserves and often in early culling (**Aherne et al.,** 1999). An array of authors (**Babinsky et al.,** 1992; **Halas and Babinsky,** 2001; **Theil et al.,** 2004; **Beyer et al.,** 2007; **Smits et al.,** 2008, 2013; **Kanev et al.,** 2005) have investigated the effect of increased levels of energy in the compound feeds for lactating sows on their weight loss and its influence on the reproduction traits.

The objective of the study was to test the influence of higher energy level in the compound feed on sow body development and milk yield (detected through piglets' growth rate).

MATERIAL AND METHODS

During lactation period, two scientific experiments were carried out to test the influence of higher energy level in the diet on sow body weight development and milk yield (detected through piglets' growth rate). The First Experiment comprised 8 primiparous sows allotted into two groups of 4 animals. The Second Experiment comprised 10 primiparous sows also allotted into two groups. The sows from the two experiments were allotted by the analog method – observing number, live weight, and lineage. Each of the two experiments was under the following scheme: group I, control – fed standard feed; and group II, experimental – standard feed supplemented with 8% Nutracore.

Nutracore is protected fat, forage raw material and quality source of energy. It is a calcium salt of long-chained fatty acids. It contains palm oil fatty acids, calcium, and water. Its supplementation to the diet ensures high energy level, in the same time suppressing fermentation processes in the stomach. Nutracore improves the energy level in the compound feed, in this way it enhances the energy value of the diet of the experimental groups by 14.65% in First Experiment and by 13.12% in Second, as compared to the respective control groups.

The compound feeds for first and Second Experiment respectively are presented in Tables 1 and 2.

During the lactation period the sows were kept and fed in elevated farrowing pens with creeping area for the piglets. Their feeding was twice a day and the water was available *ad libitum*.

Table 1. **Composition and nutritional value of 1 kg feed (First Experiment)**

Components	Group I	Group II
Maize, kg	10.000	10.000
Wheat, kg	53.500	41.000
Barley, kg	10.000	10.000
Wheat bran, kg	15.000	15.000
Sunflower cake, kg	8.500	13.000
Premix, kg	0.200	0.200
Lysine, kg	0.30	0.30
Chalk, kg	1.300	1.300
Dicalcium phosphate, kg	1.000	1.000
Salt, kg	0.200	0.200
Nutracore, kg	-	8.000
Overall:	100.000	100.000
Nutrients in 1 kg feed:		
Metabolizable energy, MJ	12.01	13.77
Crude protein, g	146.5	145.9
Raw fibers, g	49.8	55.4
Lysine, g	6.7	6.9
Methionine + Cysteine, g	4.6	4.6
Threonine, g	4.0	4.1
Tryptophan, g	1.6	1.6
Calcium, g	8.3	8.5
Phosphorus, g	7.4	7.6

Table 2. **Composition and nutritional value of 1 kg feed (Second Experiment)**

Components	Group I	Group II
Wheat, kg	50.000	50.000
Barley, kg	15.000	15.000
Wheat bran, kg	15.000	7.000
Nutracore, kg	-	8.000
Protein bioconcentrate meal, kg	20.000	20.000
Total:	100.000	100.000
Nutrients in 1 kg feed:		
Metabolizable energy, MJ	12.27	13.88
Crude protein, g	163.9	152.6
Raw fibers, g	54.4	48.2
Lysine, g	7.7	7.3
Methionine + Cysteine, g	6.1	5.6
Calcium, g	9.6	9.4
Phosphorus, g	6.8	5.9

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Table 3. **Feed intake, live weight, and backfat thickness of sows (First Experiment)**

Indicator	Group I – 12.01 MJ/kg *n*=3			Group II – 13.77 MJ/kg *n*=4		
	$\bar{x}$	*C*	*E*	$\bar{x}$	*C*	*E*
Feed intake per lactation, kg	5.013	3.21	1.85	4.970	2.15	1.07
ME intake per lactation, MJ	60.21 **x**	3.21	1.85	68.96 **y**	2.19	1.09
Sow live weight before farrowing, kg	172.000 **Δ**	15.73	9.08	179.000	26.89	13.45
Backfat before farrowing, x_2, mm	19.667	5.87	3.39	24.250	28.25	14.12
Backfat after weaning, x_2, mm	18.333	16.66	9.62	18.250	18.10	9.05
Lean meat before farrowing, %	52.233	4.75	2.74	49.500	10.60	5.30
Sow live weight at weaning, kg	126.000 **θ**	4.20	2.43	125.500	13.05	6.53
Lean meat after weaning, %	50.100	7.96	4.60	52.675	5.95	2.97

Significance of differences between groups (in rows) denoted with different symbols: **x,y** – $P \leq 0.05$
Significance of differences within groups (in columns) denoted with different symbols: **Δ,θ** – $P \leq 0.05$

Table 4. **Live weight of suckling piglets (First Experiment)**

Indicator	Group I – 12.01 MJ/kg			Group II – 13.77 MJ/kg			t-test
	$\bar{x}$	*C*	*E*	$\bar{x}$	*C*	*E*	
Litter birth weight, kg	13.700	4.56	2.63	11.775	11.84	5.92	
Birth live weight of piglets, kg	1.370	4.56	2.63	1.297	18.83	9.42	
Live weight of piglets at 21-st day, kg	4.742	2.23	1.29	5.412	8.89	4.45	x
Live weight of piglets at weaning, kg	11.480	23.59	13.62	11.036	13.26	6.63	

Significance of differences between groups: x – $P \leq 0.05$

Table 5. **Feed intake, live weight, and backfat thickness of sows (Second Experiment)**

Indicator	Group I – 12.01 MJ/kg *n*=5			Group II – 13.77 MJ/kg *n*=5			t-test
	$\bar{x}$	*C*	*E*	$\bar{x}$	*C*	*E*	
Feed intake per lactation, kg	5.106	2.33	1.04	5.167	6.05	2.71	
ME intake per lactation, MJ	62.51	2.47	1.11	71.72	6.05	2.71	x
Sow live weight before farrowing, kg	141.400	7.85	3.51	140.800	5.21	2.33	
Backfat before farrowing, x_2, mm	21.200	20.67	9.24	19.200	26.40	11.81	
Backfat after weaning, x_2, mm	47.620	9.17	4.10	52.900	6.32	2.83	
Lean meat before farrowing, %	134.800	10.00	4.47	140.200	14.98	6.70	
Sow live weight at weaning, kg	18.200	19.96	8.93	13.800	20.11	8.99	
Lean meat after weaning, %	49.700	11.04	4.94	55.200	5.51	2.47	

Significance of differences between groups: x – $P \leq 0.05$

Table 6. **Live weight of suckling piglets (Second Experiment)**

Indicator	Group I – 12.01 MJ/kg *n*=5			Group II – 13.77 MJ/kg *n*=5		
	$\bar{x}$	*C*	*E*	$\bar{x}$	*C*	*E*
Litter birth weight, kg	11.780	32.54	14.55	10.660	34.37	15.37
Birth live weight of piglets, kg	1.289	16.63	7.44	1.404	16.04	7.18
Live weight of piglets at 21-st day, kg	4.664	23.93	10.70	5.162	20.24	9.05
Live weight of piglets at weaning, kg	7.046	23.73	10.61	7.223	12.90	5.77

No significance of differences between groups

DISCUSSION AND RESULTS

Feed intake and the changes in sows live weight are presented in Tables 3, 4, 5 and 6. The analysis of the results indicates that the control and the experimental group consumed practically identical quantities. The intake of metabolizable energy was by 14.53 and 14.73% higher in the experimental groups of First (Table 3) and Second Experiment (Table 5) respectively, compared to the control groups. The higher consumption of energy had favourable effect on the dynamics of live weight in the Second Experiment only. Live weight of the sows from the First Experiment is considerably lower at weaning (126.00 kg for the control and 125.5 kg for the experimental group), compared to that before farrowing (172.00 kg and 179.00 kg respectively). The difference of 46 kg between pre parturition and post weaning is significant at $P \leq 0.05$. There are no noticeable live weight changes within the experimental group of Second Experiment (140.800 kg and 140.200 kg), while in the control sows there is a change by roughly 5% (from 141.400 kg before farrowing to 134.800 kg after weaning). Consequently, the elevation of the energy level of the feed by supplementing it with Nutracore has served as a protection against degradation of the protein and energy reserves of the maternal organism. The different effect of Nutracore in the two separate experiments is presumably due to the different lactation length – 50 days in First Experiment and 35 days in Second.

The mean live weight of the 21-day piglets (representing the milk yield of the sows) was higher in the dams receiving higher energy with the diet – by 14.13% ($P \leq 0.05$) in First Experiment and by 10.68% in Second, compared to the sows from the control groups (Tables 4 and 6). In the traits backfat thickness at check point x_2 and lean meat percentage before farrowing and after weaning no significant differences between groups have been found. The animals from the First Experiment supplemented with extra energy tended to decrease their backfat by approximately 25% (from 24.25% before farrowing to 18.25% after weaning). After weaning the sows in the experimental group of Second Experiment had by 28% thinner backfat in comparison to that before parturition (from 19.2% to 13.8%). These results are reasonable, in view of the catabolic processes (galactopoiesis) and the tissue degradation that take place in the sow's organism during the nursery period (**Angelova and Tenchev,** 2008).

Compared to the values before farrowing, the higher percentage of lean meat post weaning in both experiments belongs to the sows with supplemented energy to their diets.

With the implementation of the trial testing the effect of Nutracore supplementation (higher energy level) to the compound feed, the protein and energy body reserves were protected from degradation in the maternal organism. The mean live weight of the piglets at the 21-st day was higher in the litters of the sows receiving more energetic diet, which is in keeping with the results of **Nelssen et al.** (1985) establishing increased live weight of 14-day and weaning piglets with the elevation of the diet energy of primiparous sows from 10 to 12 and to 14 Mcal per capita per day. According to **Clowes et al.** (2003), maintaining high levels of protein and energy reserves during productive life leads to deteriorated reproduction capacity of sows. Our results are consistent with the study of **Park et al.** (2008), finding that the higher energy level of the diet of the sows results in lesser losses of their own live weight and backfat and in higher growth rate of their piglets.

In conclusion administration of higher energy level in the compound feeds (from 12.01-12.27 to 13.77-13.88 MJ) for lactating Danube White sows improves their milk yield, expressed by the live weight of their piglets at the 21-st day.

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INFLUENCE OF HIGHER ENERGY LEVEL IN THE COMPOUND FEED ON SOW BODY WEIGHT DEVELOPMENT AND MILK YIELD[+]

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SUMMARY

The objective of the study was to test the influence of higher energy level in the compound feed on sow body development and milk yield (detected through piglets” growth rate).

During lactation period, two scientific experiments were carried out at Agricultural institute – Shumen.

The First Experiment comprised 8 primiparous sows allotted into two groups of 4 animals. The Second Experiment comprised 10 primiparous sows also allotted into two groups. The sows from the two experiments were allotted by the analog method – observing number, live weight, and lineage. Each of the two experiments was under the following scheme: group I, control– fed standard feed; and group II, experimental – standard feed supplemented with 8% Nutracore. Nutracore is protected fat, forage raw material and quality source of energy. It is a calcium salt of long-chained fatty acids. It contains palm oil fatty acids, calcium, and water.

In conclusion administration of higher energy level in the compound feeds (from 12.01-12.27 to 13.77-13.88 MJ) for lactating Danube White sows improves their milk yield, expressed by the live weight of their piglets at the 21-st day.

Key words: *energy level, sow body, milk yield*

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