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POSTER

Protein requirements of Cinta Senese pigs from 30 to 60 kg: preliminary results

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Additional keywords

Protein levels.
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SUMMARY

Knowledge of protein requirements of pigs during the first phase of life is crucial for both achieving high growth rates and avoiding nitrogen waste. Autochthonous breeds possess specific requirements in this regard and the literature is poor even for the Cinta Senese breed. Thus, the effect of different level of crude protein (CP) in Cinta Senese pigs, between 30 and 60 kg, was evaluated within the TREASURE* project. Twelve male pigs were individually reared indoor, fed with four isoenergetic diets with different levels of CP (18, 16, 14 and 12%) equally distributed among animals. The animals, with an initial average live weight of 27 kg, were fed ad libitum and slaughtered after 2 months of trial. Left side carcass was sectioned in six cuts: head, neck, loin, shoulder, ham and ribs. Each cut has been dissected into the main tissues. As regards in vita performance a slightly higher growth rates with decreasing protein levels were recorded (ADG of 0.781, 0.774, 0.755 and 0.729 kg/d respectively for 12, 14, 16 and 18% of CP), though only the two extreme levels of CP (12 vs 18%) resulted statistically different (P=0.05). Cuts weights and percentage of the main tissues were similar between diets. The diet with 12% of CP may be the optimal compromise for the growth of the Cinta Senese pigs from 30 to 60 kg of live weight.

Parole chiave aggiuntive

Livello di proteina.
Tasso di crescita.
Composizione della carcassa.
Suino Cinta Senese.

Fabbisogni proteici in suini Cinta Senese da 30 a 60 kg: risultati preliminari

SOMMARIO

La conoscenza del fabbisogno proteico dei suini durante la prima fase di vita è fondamentale sia per ottenere elevati tassi di crescita sia per evitare sprechi di azoto. Le razze autoctone possiedono specifici requisiti in questo senso e la letteratura è scarsa anche una razza come la Cinta Senese. Pertanto, l'effetto di diversi livelli di proteina grezza (CP) in maiali di Cinta Senese, tra 30 e 60 kg, è stata valutata nell'ambito del progetto TREASURE*. Dodici suini maschi sono stati allevati singolarmente al chiuso, alimentati con quattro diete isoenergetiche con diversi livelli di CP (18, 16, 14 e 12%) equamente distribuite tra gli animali. Gli animali, con un peso vivo medio iniziale di 27 kg, sono stati alimentati ad libitum e macellati dopo 2 mesi di prova. Alla macellazione la mezzena sinistra della carcassa è stata sezionata in sei tagli: testa, collo, lombo, spalla, prosciutto e costole. Ogni taglio è stato sezionato nei tessuti principali. Per quanto riguarda le prestazioni in vita è stato notato un tasso di crescita leggermente superiore al diminuire del livello della proteina (ADG di 0,781, 0,774, 0,755 e 0.729 kg / d, rispettivamente per 12, 14, 16 e 18% di CP), anche se solo i due livelli estremi di CP (12 vs 18%) hanno comportato differenze statistiche (P = 0,05). Le percentuali dei tagli commerciali e dei tessuti principali sono risultate simili tra le diete. La dieta con il 12% di CP può essere il compromesso ottimale per la crescita delle Cinta Cenese da 30 a 60 kg di peso vivo.

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INTRODUCTION

Protein excess in feeds for pigs increases feeding cost and determines higher N pollution in the environment. This excess causes higher N excretion which cannot be used for protein synthesis in tissues (Sirtori et al. 2010) especially in rustic breeds with low potential for lean growth. Excess or deficiency of protein appears to be counterproductive for both growth and feeding efficiency (Barea et al. 2006, 2007). To estimate the adequate protein level is also important to consider the genetic aspects. The optimal protein:energy ratio may well vary between breeds with different genetic potential for protein accretion (Nieto et al. 2002). The autochthonous pigs, characterised by low growth potential and high adipogenic capacity, (Franci et al. 2001)

need feeding strategies providing the appropriate concentration of dietary of protein. Cinta Senese pigs moreover is reared on extensive plots of natural pasture. This rearing system leads to adjust the diet considering the type of natural resources available for the animal usually rich in fibre and low in protein (Sirtori et al. 2014). Previous researches studied the appropriate level of dietary protein for Cinta Senese breed (Sirtori et al. 2010; Sirtori et al. 2014) at high live weights and only for in vivo performance. The aim of this study was to test the effect of various dietary protein levels on in vivo performance and carcass traits in Cinta Senese pigs between 30 and 60 kg of weight.

MATERIAL AND METHODS

Twelve male pigs were individually reared indoor in 12 boxes of 3 m^2. with troughs and drinking nipples. The animals were equally distributed among four isoenergetic diets with different levels (18, 16, 14 and 12%) of crude protein (CP). The animals, with an initial average live weight of 27 kg, were fed *ad libitum* and slaughtered after 2 months of trial. The ingredients of diets, the proximate composition determined according to official methods (AOAC, 2000), and the essential aminoacids (AAs) and metabolizable energy content, calculated as sum of the relative tabulated values in the ingredients with synthetic amino acidic integration, are reported in **Table I**. Live weight, backfat thickness and individual food consumption were recorded weekly. Fat thickness was measured (at last thoracic vertebra) with an ultrasound instrument (Aloka 500). Left side carcass was sectioned in six cuts: head, neck, loin, shoulder, ham and ribs. Each cut has been dissected into the main tissues (lean, fat and bone) and weighs of cuts and tissues were recorded.

In vivo data were analysed using the MIXED procedure (SAS, 2007) with the following model: $Y_{ij} = \mu + bX_{ij} + cY_{ij} + s_i + E_{ij}$, where μ = overall mean, X = protein percentage of diet; Y = days of trial; s =random animal effect; E = error. Continuous variables were tested up to the second degree maintaining the higher significant degree. For the carcass composition, a GLM procedure was used: $Y_{ij} = \mu + P_i + b(X_{ij}) + E_{ij}$, where P = protein percentage of diet tested as discrete factor; b = regression coefficient on slaughtered weight (X); E = error. Student's t-test was used to test the differences between the least square means. The statistical significance was established at $P<0.05$.

RESULTS

Weight gain was affected by protein level **(Table II)** with a slightly higher average growth rates recorded when protein level decrease (P=0.0004). Significant differences were showed comparing final values of slaughter weight and ADG (average daily gain) between the two extreme diets (62.3 vs 59.6 and 0.781 vs 0.729 kg/d for 12 and 18% of CP respectively; P=0.05) **(Table III)**. Increasing the protein level decreases the feed ingestion (P=0.0039) **(Table V)** whereas no differences resulted for backfat thickness (P=0.8516) and feed conversion rate (P=0.4723) (**Tables IV** and **VI**). No statistical differences were found for percentage of main cuts and main tissues (on carcass weight) (**Tables VII** and **VIII**).

Table I. Composizione della dieta (Composition of diets).

Parameter	Protein level (%)			
Ingredient (%)	12	14	16	18
Maize	73.5	68.0	62.95	57.4
Soybean meal	9.0	14.5	19.5	25.0
Bran	10.0	10.0	10.0	10.0
Vitamin-mineral premix	3.0	3.0	3.0	3.0
Vegetable oil	2.0	2.0	2.0	2.0
Bentonite	2.0	2.0	2.0	2.0
Lysine	0.45	0.45	0.45	0.50
Methionine	0.05	0.05	0.10	0.10
Analysis (%)				
Moisture	11.35	11.68	11.40	11.25
Crude Protein	12.60	14.44	16.36	18.38
Ether extract	4.83	3.69	3.87	4.12
Crude Fibre	4.00	3.90	4.39	4.26
Ash	4.41	4.57	4.81	5.23
Lysine	0.87	1.02	1.15	1.29
Methionine	0.27	0.30	0.37	0.39
Metabolisable energy(MJ/kg)	13.57	13.21	13.17	13.15

DISCUSSION

Despite these results are only preliminary the observed patterns suggest the possibility to change the level of protein for growing pigs of Cinta Senese breed

Table II. Tasso di crescita (Growth rate)

Parameter	Estimate	Standard Error	t	Pr > |t|
Intercept	5.169519	1.31605	3.93	0.0002
Protein Level	-0.308333	0.08213	-3.75	0.0004
Days of Trial	0.745322	0.01554	47.94	<0.0001

Table III. Pesi di macellazione e incremento medio giornaliero (kg) (Slaughter weight and average daily gain (kg).

Parameter	Protein level (%)				RSD
	12	14	16	18	
Slaughter weight	62.3[a]	61.3[ab]	60.8[ab]	59.6[b]	2.60
ADG	0.781[a]	0.774[ab]	0.755[ab]	0.729[b]	0.05

Table IV. Tasso di crescita del grasso sottocutaneo. (Growth backfat thickness rate).

Parameter	Estimate	Standard Error	t	Pr > |t|
Intercept	-0.3721	0.2807	-1.33	0.2145
Protein Level	0.03452	0.01839	0.19	0.8516
Days of Trial	0.02414	0.001058	22.83	<0.0001

Table V. Tasso di ingestione (Feed intake rate).

Parameter	Estimate	Standard Error	t	Pr > |t|
Intercept	3.365945	3.11738	1.08	0.2841
Protein Level	-0.478500	0.15998	-2.99	0.0039
Days of Trial	2.005866	0.16185	12.39	<0.0001
Days of Trial^2	0.008861	0.00290	3.05	0.0032

Table VI. Tasso di conversion alimentare (Feed conversion rate).

Parameter	Estimate	Standard Error	t	Pr > |t|
Intercept	1.6887	0.3963	4.26	0.0017
Protein Level	0.01877	0.02598	0.72	0.4723
Days of Trial	0.02746	0.001385	19.83	<0.0001

Table VII. Percentuale dei principali tagli commerciali (%) (Percentage of main commercial cuts (%)).

Parameter	Protein level (%)				RSD
	12	14	16	18	
Head	8.31	7.97	8.55	8.91	0.32
Neck	8.07	8.23	8.42	8.76	0.63
Shoulder	13.03	13.34	12.45	13.24	0.31
Ribs	26.43	25.19	24.74	24.65	1.18
Loin	13.79	14.38	14.00	13.10	0.71
Fresh Ham	24.99	24.71	25.74	25.84	0.69

Table VIII. Percentuale dei principali tessuti (%) (Percentage of main tissues (%)).

Parameter	Protein level (%)				RSD
	12	14	16	18	
Total lean	37.34	36.05	39.19	40.23	2.55
Total fat	46.94	47.50	43.88	42.04	3.52
Total bone	14.29	15.03	15.25	16.07	1.22

respect to the improved breeds. However, differences were found for growth and feed intake traits. Different growth among diets was probably ascribable to different feed consumption between diets. These results are in general agreement with other works showing that protein excess in growing swine impaired growth and feed efficiency (Nieto et al. 2003; Barea et al. 2006). The results point out that protein requirement for maximize growth of Cinta Senese pigs is lower than that of improved pig, as already reported in previous works on this breed (Sirtori et al. 2010 and 2014). Similar results were also recorded in Iberian pig breed, which possesses the same low potential for lean tissue development (Nieto et al. 2003; Barea et al. 2007). No differences were found between protein levels for carcass quality traits. These results confirmed the effect observed in other works where differences in carcass quality were found only with protein levels below 11% (Critser et al. 1995; Tuitoek et al. 1997). Sirtori et al. (2014) found significant differences on carcass traits only lowering the percentage of protein to 8%, showing that a level of 10% of CP was sufficient in animals from 50 kg to 150kg of live weight.

CONCLUSION

The trial provides the first indications on protein requirement of Cinta Senese pig during first phase of growth. Considering the cost of protein feed as well as the need to reduce the N pollution in the environment, the diet with 12% of CP may be the optimal compromise for the growth of the Cinta Senese pigs from 30 to 60 kg of live weight. Carcass quality traits were similar among diets indicating the 12% protein level as suitable for covering the need for body protein in *Cinta Senese* breed.

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