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A study on four feeding strategies of 100% organic origin for piglets concerning performance, health status, losses and economy in organic agriculture

FRIEDRICH WEIßMANN, RALF BUSSEMAS, ANNA FALK

Thuenen-Institute of Organic Farming, Westerau, Germany,
www.oel-vti.de, friedrich.weissmann@vti.bund.de

Abstract

Organic agriculture is defined as a low-external-input-system but piglets' necessity for high quality diets seems to contradict low-external-input feeding strategies. Hence, a total of 361 piglets was tested from day 14 – 63 post natum concerning performance, health status, losses and diet costs by means of four feeding strategies of 100% organic origin: (i) high-external-input diet, (ii) medium-external-input diet, (iii) low-external-input diet, each with grass-clover-silage as roughage source, and (iv) above mentioned low-external-input diet with straw replacing grass-clover-silage. The high-external-input-diet achieved the significantly highest live weight gain; all other strategies were similar at a lower level. There were no differences in health status and loss rates between the four strategies. Low-input-strategies were economical at best in producing a standardized 20 kg piglet. A verification of the results is necessary with a higher number of piglets for a final recommendation.

Key words: piglets, 100% organic feeding, performance, health, losses, economy

Introduction

Organic agriculture is characterized as a low-external-input-system (Conway 1987). Hence, livestock's nutrient supply should be of predominantly farm-own production and of complete organic origin (Weißmann 2011). But this approach seems to be problematically for piglets due to their high nutrient requirement and simultaneous lack of organic feed with high protein quality (Zollitsch 2007). It is the aim of the following study to test a 100% organic low-external-input feeding strategy without lowering piglets' performance and health status.

Material and methodology

The four feeding strategies consisted of (**i**) a high-external-input diet (HID), (**ii**) a medium-external-input diet (MID), (**iii**) a low-external-input diet (LID), each with grass-clover-silage as roughage source, and (**iv**) LID with straw replacing grass-clover-silage (Table 1). Concentrates and roughage were offered *ad libitum* in the form of a one-phase diet during the whole trial period. The amount of concentrates was recorded as offered to (not consumed by!) the piglets; the amount of roughage had not been recorded. Piglets were of modern hybrid genetic origin. The trial with a total of 361 piglets started 14 days *post natum* and ended at day 63 *p. n.* with a suckling period of 49 days. Data recording included live weight development (weekly weighing), health status (documentation of diseases), losses (documentation) and diet costs (monetized amount of offered concentrates). The data of growth performance were statistically analyzed with the analysis of variance procedure GLM of SAS Version 9.2 using fixed effects (i. a. the four feeding strategies, piglets' sex, sow parity factor) and co-variables (i. a. piglets' live weight at trial onset, litter size at birth and at trial onset). The LSQ-Means were statistically compared using the Tukey-Kramer-Test at 5% significance level.

Table 1. Characterization of the concentrates and grass-clover-silage

	HID*	MID*	LID*	GCS*
Diet costs (€ / 100 kg)	120.-	57.-	47.-	- -
Diet composition (%)				
Triticale	- -	27.5	30.0	- -
Winter barley	28.0	20.0	27.0	- -
Field peas	- -	20.0	20.0	- -
Lupines, blue	- -	10.0	- -	- -
Field beans	22,2[1]	- -	10.0	- -
Soy beans[2]	17.4	- -	- -	- -
Wheat flakes	22.0	- -	- -	- -
Soy cake	- -	14.3	4.8	- -
Rape cake	- -	- -	5.0	- -
Whey, dried powder	- -	5.0	- -	- -
Skim milk powder	6.0	- -	- -	- -
Sunflower oil	1.0	0.5	0.5	- -
Minerals[3]	3.4	2.7	2.7	- -
Diet ingredients (% of original substance)				
Dry matter	89.0	86.4	85.2	25.2
Crude protein	19.5	18.4	15.5	5.2
Lysine	1.09	0.94	0.81	0.18
Feed energy (MJ Metabolizable Energy / kg)	13.9	12.9	12.7	2.1

* HID (High-external-Input Diet), MID (Medium-external-Input Diet),
LID (Low-external-Input Diet), GCS (grass-clover-silage)
[1] extruded, [2] toasted, [3] including premix

Results

Table 2 shows the results concerning growth performance, health status, losses, and the amount and the costs of the offered concentrates.

The high-external-input feeding strategy (HID) caused the significantly highest daily weight gain in the suckling period (+14%) and in the whole trial period (+15%) compared to the average of the medium- and the low-external-input feeding strategies which were statistically similar at a lower level. After weaning, HID advantage was only numerical. Piglets' health status was good and not affected by the four feeding strategies. Only a maximum of 3.3% of the piglets (HID group) had been treated. Animal losses were on a low level and also unaffected by the four feeding strategies. Diet costs for a standard-20kg-piglet increased by factor 1.3, 1.4, and 3.1 for group 3, 2 and 1 respectively, compared to group 4 piglets.

Discussion

The high-external-input diet (HID) has the smallest amount of farm grown diet components and the highest amount of technologically processed diet components of farm-external origin, the opposite way around to the low-external-input diet (LID) (Table 1). Hence, HID feeding strategy is not fully consistent with organic agriculture which is defined as a low-external-input-system. On the other hand the question has to be answered whether and how it is possible to fulfill the high feed quality demand of piglets within a more or less extensive agricultural system. The results (Table 2) show that even a LID feeding strategy with straw as roughage source seems to be able to generate sound piglets of proper growth performance and good health status without negative effects on animal losses but with positive effects on economy. However a verification of the results is necessary (mainly by use of higher number of piglets and differing seasons) before communicating a final suggestion. This will be realized in the EC-wide Core-Organic-II project ICOPP (Improved Contribution of local feed to support 100% Organic feed supply to Pigs and Poultry).

Table 2. Growth performance, health status, losses and diet costs of piglets according to four different feeding strategies

Feeding strategy	1	2	3	4
Type of concentrates	HID*	MID*	LID*	LID*
Roughage source	- grass–clover–silage -			straw
Animals at onset of trial [n]	90	91	83	97
Growth performance				
Live weight (LSQ-Means ± SE)** at the …				
… onset of trial [kg]	4.8 ± 0.11	4.8 ± 0.11	4.4 ± 0.12	4.5 ± 0.11
… day of weaning [kg]	17.0^{a} ± 0.24	15.5^{b} ± 0.24	14.8^{b} ± 0.25	14.9^{b} ± 0.24
… end of trial [kg]	23.2^{a} ± 0.33	20.9^{b} ± 0.34	20.9^{b} ± 0.36	20.0^{b} ± 0.33
Daily weight gain (LSQ-Means ± SE)** in the …				
… suckling period [g]	356^{a} ± 6.6	318^{b} ± 6.6	318^{b} ± 7.0	302^{b} ± 6.6
… rearing period [g]	454 ± 14.3	396 ± 14.6	398 ± 15.7	380 ± 14.3
… trial period [g]	381^{a} ± 6.8	335^{b} ± 6.9	340^{b} ± 7.4	321^{b} ± 6.7
Health status				
Treated piglets [n]	3	2	1	2
… related to …				
… cough [n]	0	0	0	1
… diarrhea [n]	1	1	1	
… lesions [n]	1	0	0	1
… other reasons [n]	1	1	0	0
Losses				
Died piglets [n]	1	3	0	2
… caused by …				
… crushing [n]	0	1	0	1
… debility [n]	0	1	0	0
… other reasons [n]	1	1	0	1
Diet costs				
Amount of concentrates per …				
… group [t]	2.225	1.827	1.992	1,674
… piglet [kg]	25	21	24	18
Costs of concentrates per …				
… piglet	30.00 €	11.97 €	11.28 €	8.46 €
… 20-kg-piglet	25.86 €	11.45 €	10.79 €	8.46 €

* For abbreviations compare Table 1

** LSQ-means with different letters within a row differ significantly ($p < 0.05$)

Suggestions to tackle the future challenges of organic animal husbandry

The present paper should be understood as a mosaic stone in the ambition to implement sustainable low-external-input livestock production systems for generating high product quality, high process quality, and economic success.

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Johann Heinrich von Thünen-Institut
Federal Research Institute for Rural Areas, Forestry and Fisheries,

Johann Heinrich von Thünen-Institut
Bundesforschungsinstitut für Ländliche Räume, Wald und Fischerei (vTI)

Bundesallee 50, D-38116 Braunschweig, Germany

landbauforschung@vti.bund.de
www.vti.bund.de

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