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Biological Performance of Dry- and Liquid Feeding in Piglet Rearing

In 16 trial runs in piglet rearing, 1945 timemates have so far been reared using a mixture of 50% liquid feed dispensed with the aid of the so-called „babymix feeder" and 50% mash dispensed by conventional tube feeders. The dispensing of warmed-up feed at a fixed frequency leads to a stabilization of weight increase and a reduction of weight increase scattering within the first 21 days after weaning as compared with reference animals which were fed dry feed. However, the observed advance in performance largely evens out in the second rearing phase unless the dry matter content of the feed is optimally adjusted.

The difficulty of the transition from nursing piglet- to rearing piglet feeding varies among weaned piglets. Depending on the health status of the animals, this may cause large weight increase scattering, which ranges from 35 to 70% according to data collected by the author. In addition to preparation feeding, the waiting period until the beginning of feed intake after weaning also depends on different factors, such as age, sex, and body weight, i.e. the piglet itself [1, 2]. Light piglets start to eat sooner than heavy ones, and females begin eating earlier than males. Depending on the nutrient content, the acceptance of thick-mashy and liquid feed is higher than that of dry feed [3], which reportedly also offers intestinal-physiological advantages [4]. The simultaneous warming-up of the feed can exert a positive influence on weight increase, losses, or the occurrence of diarrhoea in piglets [5, 6]. Feeding technology influences biological performance in piglet rearing because it determines feeding frequency and possible feed consistency. Liquid feeding is being discussed as a technical development for piglet rearing today because it realizes some of the described connections in addition to advantages in labour management and is thus intended to facilitate the transition from easily digestible sow's milk to the cereal-based feed common in practice. Fundamental differences between dry- and liquid feeding in piglet rearing will be described below.

Realization of the Trials and Technology Used

Due to the dimensioning of its components (mixing container, pipes), the „baby mix feeder" is technically speaking a starter feed dispenser and an adaptation of Förster's milk feeder for calves to the conditions of piglet rearing. The feed (dry matter content: up to 30%), which has been warmed up to body temperature and has a liquid consistency, is dispensed into a long trough with sensor control at a fixed feeding frequency. This technology combines all elements of liquid feeding for baby piglets (feed consistency, frequency of feed dispensing, warmed-up feed) with good possibilities of feed hygiene due to pen-individual quantities of mixed feed and short pipes having small diameters, which are rinsed at regular intervals with water and compressed air.

As part of the practical test of the „baby mix feeder", a total of 16 trial runs in piglet rearing were carried out on the experimental farm Köllitsch from January 2002 until November 2004. A total of 1945 timemates (three complete groups of weaned piglets from a herd managed in a three-week rhythm) were examined, of which 988 piglets were fed liquid feed, while dry feed was dispensed to 957 piglets simultaneously in a compartment outfitted for this purpose. One half of a rearing compartment featuring automatic mash dispensers (Funki company, separate feed- and water bowl) and eight group pens with 20 piglets per pen (0.4 m^2 per piglet) was equipped with the baby mix feeder. In the period immediately after weaning (up to three weeks afterwards), identical dry feed was dispensed in 2 m long plastic troughs in addition to ad-libitum feeding with automatic mash dispensers. The composition of the feed used was identical in the trial- and reference groups.

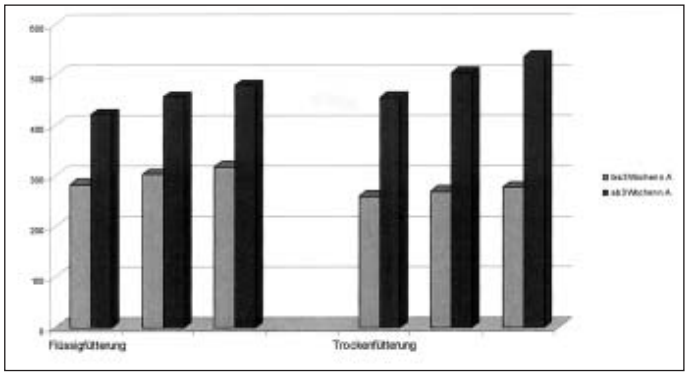

Fig. 1: Importance of the weaning weight (5.5, 7.5, and 9.5 kg live mass) for the weight increase level under the conditions of different feeding techniques

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Keywords

Piglet rearing, dry feeding, liquid feeding

Literatur

Literature references can be called up on the internet under LT 05307: http://www.landwirtschaftsverlag.com/landtech/local/literatur.htm.

Liquid feed was dispensed in blocks with two afterfeedings 20 and 50 minutes after the main feeding. The maximum feed quantity dispensed was 50% of the quantity provided by the feed curve. Both in the trial- and the reference groups, the dispensed feed quantity was at an „ad-libitum level". Different trough lengths (75 cm, 125 cm, 150 cm, and 175 cm) as well as variants in the dry matter content (24.5% to 29.6%) were considered in the calculations.

In these calculations, a statistical model was used to allow for corrections in the individual stalling-up weight and effects related to the individual trial runs.

For organizational reasons, the end of the trials varied between the 35th and the 42nd trial day.

Table 2: Comparison of the performance of dry and liquid feeding

Dependent Variable	liquid/dry	mean value	SE
Weight increase (kg) on the 21st trial day (16 periods)	Baby mix feeder	14,5 a**	0,9
	mash dispenser + long trough	13,7 b**	0,9
Daily weight increase (g) until the 21st trial day (16 periods)	Baby mix feeder	281 a**	3,1
	mash dispenser + long trough	241 b**	3,2
Variation coefficient of the DWI 21% (16 periods)	Baby mix feeder	35	0,3
	mash dispenser + long trough	43	0,3
Weight at the end of the trial kg (35.-42.Ht) (15 periods)	Baby mix feeder	24,2	0,1
	mash dispenser	24,5	0,1
DWI from the 21st trial day until the end of the trial g	Baby mix feeder	418 a**	7,9
	mash dispenser	484 b**	7,9
DWI from the beginning of the trial until the end (six weeks of liquid feeding; 11 periods) g	Baby mix feeder	375 a**	3,3
	mash dispenser	392 b**	3,2
DWI during the entire rearing period at 27.5% DM (4 periods)	Baby mix feeder	394 a*	6,8
	mash dispenser	375 b*	6,8
DWI during the entire rearing period at varying DM 24.5 to 29.5% (6 periods)	Baby mix feeder	361 a*	4,9
	mash dispenser	391 b*	4,9
VC of DWI until the end in % with a change from solid to liquid (3 periods)	Baby mix feeder w.o. change	22	0,2
	Baby mix feeder w. change	26	0,4
	mash dispenser	23	0,2
Quantity of feed required until the end of the trial (16 periods)	Baby mix feeder	1,73	0,05
	mash dispenser	2,03	0,05

[a]In model: stalling-up weight kg = 8.44 of the co-variants shown have been evaluated
**non-identical letters differ by a level of first kind error of ≤ 1%
*non-identical letters differ by a level of first kind error of ≤ 5%

Results and Discussion

Given the same feed composition, the described feeding principle of the baby mix feeder led to a significant improvement in weight increase performance of 40 g per day as compared with exclusive dry feeding within the first 21 days after weaning. This effect is caused by the given feeding frequency as well as the consistency and temperature of the feed and corresponds to other interval feeding systems which offer mashy [7] or liquid feed [8]. A possible influence caused by the animal-/feeding place ratio was excluded in the present study.

The authors of reference [5] also see the greatest advantage of liquid diets in the first two weeks after weaning or when fermented feed is used. The possibility of ad-libitum feeding, which requires a close animal-/feeding place ratio, is particularly relevant to performance [9]. However, low animal-/feeding place ratios are no guarantee for large weight increases [10] even though they play an important role at least in the period after weaning. When the animal-/feeding place ratio was increased from 1:1 to 1:2, variation in weight increase grew from 31.1% to 34.7%. Relative to the entire rearing period, weight increase was more stable if troughs were longer. At a trough length in excess of 1.50 m, slightly growing problems of trough hygiene were observed.

The proven decrease in weight increase variation of approximately 8% within the rearing group shows that the transition from nursing piglet feeding is made easier for the piglets. However, it is not the rather weak piglets, but the strong animals well fed with milk instead that profit from this feeding principle.

When dry feed is dispensed by an automatic feeder at a large animal-/feeding place ratio, in particular the light piglets also start to eat sooner [2] or gain more weight in the period after weaning [7]. This effect may be caused by the enzymatic preparation of piglets differently supplied with sow¥s milk and supplementary feed. Liquid feeding results in a larger difference in weight increase performance between heavy and light piglets in the period after weaning (+13% liquid; +6% dry). Later, it is slightly smaller (+21% liquid; +29% dry). Given an only slightly different weight increase level in the first half of the rearing period under the conditions of dry feeding, the heavy piglets gained significantly more weight than the small piglets in the second half of the rearing period as compared with liquid feeding. As a result, liquid feeding exhibits a slightly more favourable scattering of weight increase. Hence, this technique is predestined not only for the initial feeding of small, underweight piglets. Given the same level of weight increase, the quantity of feed required per kg of weight increase in relation to the entire trial period is larger in the case of dry feeding because feed losses caused by the trough design [9] were more significant.

Since the results in the second half of the rearing period were too weak, the absolute performance level of the entire rearing period is not satisfactory. It must be taken into account, however, that some rearing periods were completed before the 42nd trial day. Performance in the second half of the rearing period seems to limit the feed intake capability of the piglets. In nine rearing periods during which the optimal dry matter content of 27.5% was exclusively chosen, piglets which were fed liquid and dry feed achieved the same performance in the second half of the rearing period with a daily weight increase of approximately 500 g per day. Thus, the performance advantage achieved in the first half of the rearing period persisted until the end. If the piglets which had received liquid starter feed were switched to dry feed after three weeks, this led to significantly better weight increase during the entire rearing period (approximately 20 g) even though weight increase scattering was slightly larger. The variation in the dry matter content from 24.5% to 29.5% rather caused disadvantages because practical observations showed that the piglets preferred the liquid phase in particular after weaning and that a higher dry matter content reduced feed intake. In the second half of the rearing period, there is a certain danger that the nutrient density required for young animals, whose stomach capacity is limited, is not reached if the dry matter content is lower. Over the average of the 7 rearing periods during which suboptimal dry matter contents were offered as variants, determined mean weight increase in the second half of the rearing period was 100 g lower.

Table 1: Components of the different kinds of feed (4 samples per variant) used during the trial (dry matter content: 88%)

Examined Feed	Crude Protein %	Lysine %	Energy MJ ME	Sugar %	Rfe %	RFa %	Starch %	Ca %	P %
Starter									
Standard	17,9	1,18	13,4	7,8	6,0	5,0	36,3	0,76	0,52
FA 2 Hof	20,2	1,24	13,0	7,2	3,8	7,3	36,0	0,71	0,49