

EFFECT OF HERBAL EXTRACT ON GROWTH PARAMETERS OF WEANED PIGLETS

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Abstract

The objective of the study was to evaluate the effect of *Quillaja saponaria* extract on growth ability and growth parameters in piglets after weaning. Forty newly weaned piglets (28 days of age) were divided into a negative control group (C) and experimental group (QS) - ten gilts and ten barrows in every group. The preparation containing extracts from *Quillaja saponaria* was added to experimental diet (commercial feed mixture + 125 g/t). Piglets were weighed at the beginning, in the middle and at the end of the experiment. Live weight of piglets and average daily weight gain were higher in QS group during the whole experiment but result was not found statistically significant ($P > 0,05$). The feed consumption was also monitored in the experiment. Piglets in QS group had higher feed consumption but they achieved better feed conversion (feed consumption/kg of weight gain).

Key Words: *Quillaja saponaria*, growth parameters, piglet

Saponins are natural detergents found in many plants. They have detergent or surfactant properties by reason that they contain both water-soluble and fat-soluble components. They consist of a fat-soluble nucleus, having either a steroid or triterpenoid structure, with one or more side chains of water-soluble carbohydrates. Saponins may influence the absorption of minerals and vitamins, they affect immune system, they have immunostimulatory effect (Cheeke, 2000). They also affect growth, feed intake and reproduction in animals, they have an antioxidant function (Francis et al., 2002). In animal nutrition, the addition of saponins can suppress intestinal and ruminal ammonia production. The ammonia-reducing effect is attributed to an inhibition of proteolytic microorganisms (Westendarp, 2005).

Certain desert plants are especially rich in saponins. *Quillaja saponaria* is a tree that grows in arid areas of Chile. The wood and bark are used as a source of saponins. *Quillaja* saponins have been used for many years as veterinary vaccine adjuvants (Cheeke, 2000). Currently, *Quillaja* saponins are used as a dietary additives for livestock, especially for ammonia and odor control (Killeen et al., 1998).

Material and methods

The purpose of this study was to evaluate the effect of *Quillaja saponaria* extract on growth ability and growth parameters in piglets after weaning. Forty newly weaned piglets (28 days of age) were divided into a negative control group (C) and experimental group (QS) - ten gilts and ten barrows in every group. All piglets were fed ad libitum with the same commercial feed mixture for weaned piglets and they had free access to water. The preparation containing extracts from *Quillaja saponaria* was added to diet for experimental group (125 g/t).

Piglets were weighed at the beginning of the experiment (LW1, day 0), in the middle (LW2, day 11) and at the end of the experiment (LW3, day 21). The average daily weight gains for the first (ADG1), second part (ADG2) of the experiment and for whole experiment (ADG3) were calculated. The amount of consumed feed was registered in C and QS group. The average daily feed intake per piglet and the feed conversion were calculated. The statistical evaluation was performed using the computer program QCExpert. Data were presented as the mean, standard deviation (SD) of each group and the significance levels.

Results and discussion

The growth ability of weaned piglets was investigated during the experiment (Table 1). The piglets were weighed at the beginning of the experiment (LW1, day 0). The LW1 was 7.04 ± 0.64 kg in C group and 7.08 ± 0.76 kg in QS group. The animals were also weighed in the middle of the experiment-LW2 (7.35 ± 1.03 kg in C group, 7.83 ± 0.85 kg in QS group) and at the end of the experiment-LW3 (9.54 ± 2.10 kg in C group, 10.48 ± 1.49 kg in QS group). The average final weight was higher in QS group, difference between the average final live weights of both groups was 1.30 kg but these weight difference was not statistically significant ($P > 0,05$). The trend of live weight increase is illustrated in Figure 1. Piglets in QS group had a higher average daily gain in both the first (ADG1) and the second (ADG2) period of the experiment and during the whole trial (ADG3). Turner et al. (2002) did not find differences in average daily gain among dietary treatments (different *Quillaja saponaria* extract level in feed mixture) in the experiment with weaned piglets infected with *Salmonella typhimurinum*. The similar result was found by Ilsey et al. (2003).

They studied the ability of the plant extracts from *Quillaja saponaria*, *Yucca schidigera* and their combination to stimulate piglet performance. These extracts were fed to lactating sows., There was no effect on piglet performance during the first 14 days of the trial, between day 15 and 21 *Quillaja* treatment caused lower live weight of piglets compared with control group.

The feed consumption in C and QS group was monitored in our experiment during the whole trial and during the first and second period. Subsequently, the feed conversion was calculated (Table 2). The consumption of

feed mixture was higher in QS group but feed conversion was better because of a higher weight gain. There was a wide difference between groups in the feed conversion during the first period of the experiment (4.68 kg/kg in C group compared with 2.10 kg/kg in QS group). The reason was in the loss of weight in C group as a reaction on weaning stress. The feed conversion calculated for the whole experiment was lower in QS group (1.73 kg/kg of weight gain) contrast to C group (1.94 kg/kg of weight gain). Similarly, Ilsey et al. (2005) found better feed conversion ratio in piglets treated with *Quillaja* extract.

Table 1. Growth parameters of piglets after weaning in control (C) and experimental (QS) group

	Group C mean ± sd	Group QS mean ± sd	Statistical significance
LW1	7.04 ± 0.64	7.08 ± 0.76	-
LW2	7.35 ± 1.03	7.83 ± 0.85	-
LW3	9.54 ± 2.10	10.48 ± 1.49	-
ADG 1	25.83 ± 89.26	71.05 ± 71.76	-
ADG 2	219.00 ± 118.85	264.74 ± 97.79	-
ADG 3	113.64 ± 98.94	159.09 ± 71.77	-

- P>0.05; * P<0.05; **P<0.01; ***P<0.001

LW1- live weight, day 0 LW2 - live weight, day 11 LW3 - live weight, day 21

ADG1 - average daily weight gain, day 0-11 ADG2 - average daily weight gain, day 12-21

ADG3 - average daily weight gain, day 0-21

Figure 1. Average live weight of piglets in control (C) and experimental (QS) group—day 0, 11 and 21

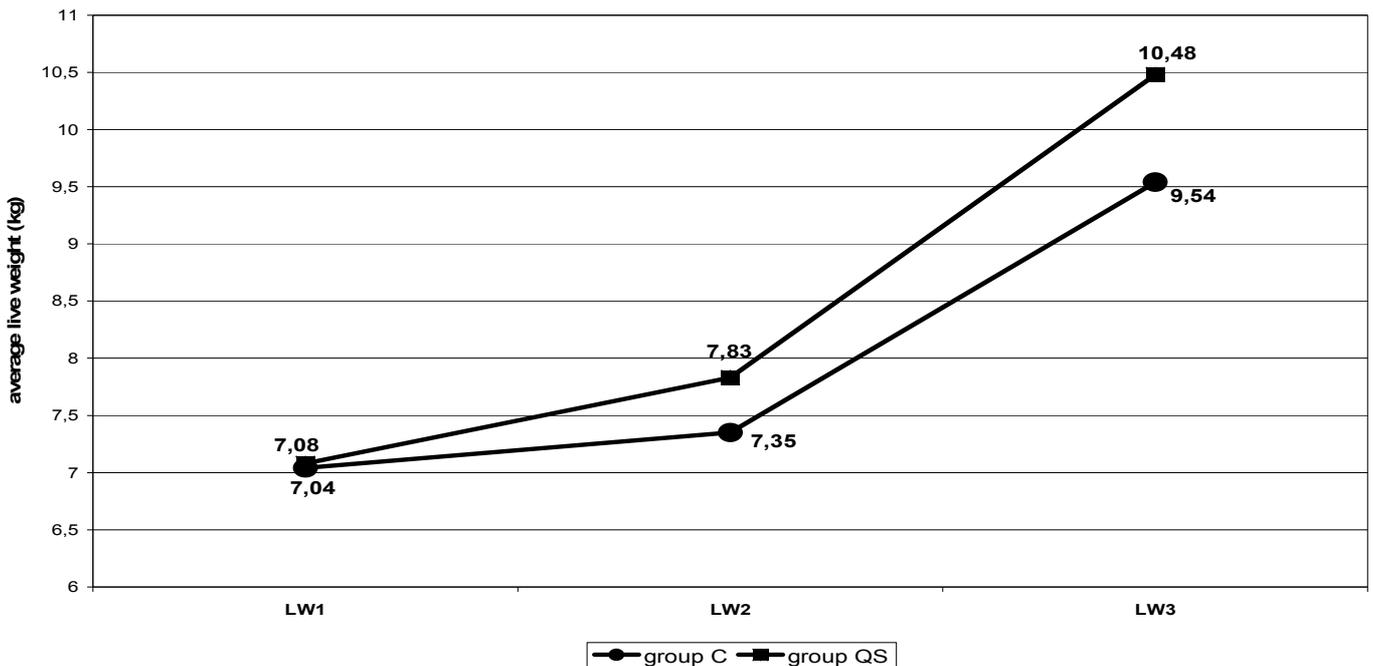


Table 2. The feed consumption and feed conversion in control (C) and experimental (QS) group

	Group C	Group QS
Period I.		
Feed consumption kg/day/piglet	0.12	0.15
Feed conversion kg/kg	4.68	2.10
Period II.		
Feed consumption kg/day/piglet	0.38	0.47
Feed conversion kg/kg	1.55	1.61
Whole experiment		
Feed consumption kg/day/piglet	0.23	0.29
Feed conversion kg/kg	1.94	1.73

Conclusion

The supplementation of *Quillaja saponaria* extract to feed mixture for weaned piglets affects their growth ability. *Quillaja* saponins can reduce the stress after weaning and improve feed conversion.

References

- Cheeke PR. 2000. Actual and potential applications of *Yucca schidigera* and *Quillaja saponaria* saponins in human and animal nutrition. *J. Anim. Sci.* 2000. 77:1-10
- Francis G, Kerem Z, Makkar HPS, Becker K. 2002. The biological action of saponins in animal systems: a review. *Brit. J. Nutr.* 88:587-605.
- Ilsley SE, Miller HM, Greathead HMR, Kamel C. 2003. Plant extracts as supplements for lactating sows: effects on piglet performance, sow food intake and diet digestibility. *Anim. Sci.* 77:247-254
- Ilsley SE, Miller HM, Kamel C. 2005. Effects of dietary quillaja saponin and curcumin on the performance and immune status of weaned piglets. *J. Anim. Sci.* 83:82-88
- Killeen GF, Madigan CA, Connolly CR, Walsh GA, Clark C, Hynes MJ, Timmins BF, James P, Headon DR, Power F. 1998. Antimicrobial saponins of *Yucca schidigera* and the implications of their in vitro properties for their in vivo impact. *J. Agric. Food Chem.* 46:3178-3186
- Turner JL, Dritz SS, Higgins JJ, Herkelman KL, Minton JE. 2002. Effects of a *Quillaja saponaria* extract on growth performance and immune function of weanling pigs challenged with *Salmonella typhimurium*. *J. Anim. Sci.* 80:1939-1946
- Westendarp H. 2005. Saponins in nutrition of swine, poultry and ruminants. *Deutsche Tierärztliche Wochenschrift.* 112:65-70

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