

# The Effect of BIOACTIVE on the Health and Growth Performance of Pigs.

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All animal experimentation has been undertaken as per Animal Ethics Approval Number SAS/272/00/MSMA.

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## Summary of the effect of BioActive on growth performance of pigs.

- Lactating sows fed BioActive, ate more, and lost less weight during lactation.
- Pigs feed diets containing BioActive had less scours during the sucker phase and weaner phase than those not fed BioActive.
- There was a significant improvement in piglet growth performance when lactating sow and creep diets contained BioActive.
- Weaner feed to gain was improved by 7% with the addition of BioActive to weaner feeds.
- Grower and finisher pigs fed BioActive had a *feed to gain* ratio that was 14% better than the control

Summary of recommendations: BioActive may have a role in maintaining the image of the Australian Pig Industry as "Clean and Green". But to do this some basic research is needed.

- Strongly recommend that the feeding study be replicated.
- Need to know the "science" behind BioActive.

## Introduction

BioActive Animal Food Additive is an oxygen activated chalk powder which has a combination of Homeopathic Frequency Information accumulated or loaded into it. With this Homeopathic Information, BioActive operates as a "biological conditioner" and is designed to influence and improve the natural bacterial process that occur in the digestive system and the overall health of the animal.

Research conducted overseas has indicated that BioActive improves feed digestibility, improves the immune system, reduces methane, ammonia and nitrous oxide production, and that animals fed on feeds containing BioActive are calmer and quieter than those fed standard diets.

The aim of this study was to investigate the effect of BioActive on growing pig performance. The specific performance indicators used were:

- (i) Health status.
- (ii) Ease of handling.
- (iii) Average daily weight gain.
- (iv) Feed intake.
- (v) Feed to gain ratio.
- (vi) Backfat depth.
- (vii) Carcass quality

The study was undertaken at the University of Queensland Gatton piggery, and the QDPI piggery at Wacol.

*Hypothesis: (i) The use of BioActive will improve feed efficiency, growth rate and health status of sucker, weaner and grower pigs, and (ii) milk production from lactating sows will be increased.*

## Materials and Methods

### Animals and Housing:

**Gatton Piggery:** Twenty sows and litters were used in the study. At 10 days post farrowing sows were randomly assigned to one of two dietary treatments, so that 10 sows were assigned to each treatment (see below for feeding details). The sows were then moved to the farrowing shed and randomly allocated to a farrowing pen. Following allocation, the sows were condition scored.

Within 24 hours of farrowing piglets were fostered between sows within a treatment group (no mixing between dietary treatments) so that each sow had 10 piglets. The "new" litter was then weighed, the number of males and females recorded, pigs were ear notched or tattooed, teeth were clipped and an iron injection given.

At 24 days of age the piglets were individually weighed and weaned. The male and female pigs were then separated and allocated to a weaner pen (within treatment) by sex and weight. Approximately 25 pigs were allocated to a pen.

At the end of the weaner stage (9 weeks of age) the pigs were individually weighed.

**Piglet health:** Pigs were monitored for signs of scouring or general ill health through lactation and weaning. Treatment was given if necessary after consultation with a veterinarian.

**Grow-out Facility:** At 9 weeks of age the pigs were transported to the grow-out facility at Wacol, Qld. On arrival at Wacol the pigs were re-weighed, given an individual body tattoo, and then allocated by weight to a pen (10 pigs/pen) within sex and treatment. The pigs remained in these pens for the remainder of the growing period (approximately 11 weeks). The pigs were individually weighed weekly, and on the morning of slaughter.

**Slaughter:** Pigs were transported to Darling Downs Bacon (approximately 120 km by road from the grow out facility) within treatment group. At slaughter carcass weight, backfat depth and eye muscle area was recorded. Herd health monitoring was undertaken by a veterinarian at slaughter.

**Treatments:** Two dietary treatments were used. (i) Bioactive included in diets at 300 g/tonne. (ii) Control - no Bioactive used.

The lactating sow, creep and weaner diets were milled and mixed by Ridley Agriproductions (Toowoomba Qld). The grower gilt, grower boar, finisher gilt and

finisher boar diets were milled and mixed by Riverina Stockfeeds (Brisbane Qld). No anti-biotics were used in any of the diets. See Appendix 1 for dietary details.

**Feeding: Sows:** The sows were fed approximately 2.5kg/d from seven days prior to farrowing. Four days prior to farrowing bran was added to the feed. No or little feed was given on day of farrowing. Feed offered was then increased over the first seven days of lactation to a level, which would allow the sow to eat to appetite.

**Suckers:** Given access to creep feed from day 10 of life.

**Weaners:** Fed from 24 days of age to 56 days of age. *Ad-libitum* access. Intake recorded on a pen basis.

**Growers:** Fed from 57 days of age to 105 days of age. Single sex feeding (different diet for gilts and boars): *Ad-libitum* access. Intake recorded on a pen basis.

**Finishers:** Fed from 106 days of age to 140 days of age. Single sex feeding: *Ad-libitum* access. Intake recorded on a pen basis.

**Statistical Analysis:** Pig performance was analysed using the Proc GLM of SAS (1990). The dietary treatment means for feed intake, mortality, average daily gains, weight gain, carcass weight, backfat depth, eye muscle area were compared using the Waller-Duncan k-ratio t-test. The data were also analysed using Tukey's studentized range test. The effect of sex within treatment was also investigated. The level of significance was taken as  $P < 0.05$ .

## Results and Discussion

**Climatic Conditions:** During the lactation phase of the study the farrowing house temperature ranged from 22 °C to 38 °C, with a mean temperature of 26 °C. The mean maximum during this period was 33 °C. Although sows had access to water drippers and fans, marked feed intake depression was noted when room temperature exceeded 28 °C, even for short periods of time.

During the weaner phase climatic conditions were milder. Temperature ranged from 19 °C to 30 °C. Conditions during most of the grower finisher phase were mild. However, for approximately 2 weeks temperatures exceeded 30 °C with little night cooling on at least 5 days. However, this only had a slight impact on feed intake.

**Sows:** The sows fed BioActive ate on average 850g more feed per day than the control sows. Mean intake for the BioActive sows was 5.43 kg/d, and 4.58 kg/d for the control sows. Feed intakes in both groups were lower than expected (5.8 kg/d) due to hot climatic conditions during the lactation phase of the study. The mean condition score (CS) at farrowing was the same (2.8) for each group. At weaning the BioActive sows had a mean CS of 2.5, while the control sows had a mean of 2.1. There were no differences in backfat depth at farrowing or at weaning between the groups.

However, the BioActive fed sows lost less weight (22 kg vs. 27 kg) over lactation. The higher feed intake of the BioActive sows may explain the better ADG of their sucker pigs (see below). Sows fed BioActive appeared to be quieter and more content than the control sows.

There were no differences in days to re-mating following weaning.

**Sucker Pigs:** The total number of pigs born within the BioActive group and control group were the same at 104. As the mortality rate was the same within each group at 2.88%, a total of 101 were weaned from each group.

Dietary treatment had a significant effect ( $P < 0.05$ ) on litter weight gain and average daily gain, but not on pre-weaning mortality (Table 1). The piglets within the BioActive group grew faster over the 24-day lactation period than did the control group. Overall performance, for the measured traits were within the expected range. The incidence of piglet scours was higher in the control group. Approximately 20 % of litters in the control group scoured, while in the Bioactive group the incidence of scours was 4.8 %.

Table 1. The effect of dietary treatment on litter weight gain (kg), average daily gain (ADG; g/d), and mortality (%).

Treatment	Weight Gain (kg)	ADG (g/d)	Mortality %
Bioactive	6.98 <sup>a</sup>	291 <sup>a</sup>	2.88
Control	6.57 <sup>b</sup>	273 <sup>b</sup>	2.88

Means in a row with different superscripts are significantly different ( $P < 0.05$ )

#### Summary - Lactation:

- Sows fed BioActive ate 16% more feed.
- Sows fed BioActive loss 18% less weight than the controls.
- Piglets from sows fed BioActive grew 6% faster than controls.
- Piglets from sows fed BioActive had a lower incidence of scours than the controls (4.8% vs 20%).

#### Weaner Pigs:

**Health Status:** A total of five pigs died during the weaner phase, one from the BioActive group and four from the control group. Post mortem examination was carried out on all pigs that died. The cause of the death in the BioActive group was not determined. The three deaths that occurred in the control group were due to post weaning scours. Post weaning scours were only seen in the control group, with 15% of control weaner being treated with anti-biotics. *No antibiotics were used in the BioActive treatment.*



**Weight Gain:** Total weight gain by the end of the weaner phase was not significantly affected by treatment (Table 2). The control pigs gained on average 20 g/d more weight than the BioActive pigs during the weaner phase. However, mean pig weights at the end of this phase were similar at 18.0 and 18.1 kg respectively for the BioActive group and the control group.

**Feed Usage:** Total feed usage was slightly higher (251 kg more) for the control group.

**Feed to Gain Ratio:** One of the major determinants of profitability is feed to gain. Although the feed consumed during this phase of growth is minor in comparison to total feed usage during the grower/finisher phase, any improvement in feed to gain will improve profitability. *The feed to gain ratio was 7% lower (better) for the BioActive pigs compared to the control group.*

Table 2. The mean weight gain (kg), average daily gain (ADG; g/d), feed usage (kg), feed to gain ratio (kg:kg) and mortality (%) for weaner pigs over a 32 d period.

Treatment	Number Pigs out of Weaner Shed <sup>A</sup>	Total Weight Gain (kg)	Mean Weight Gain (kg)	ADG (g/d)	Total Feed Usage (kg)	Feed:Gain (kg:kg)	Mortality %
Bioactive	100	980	9.8	306	2904	2.96:1	1.0
Control	97	989	10.2	313	3155	3.19:1	4.0

<sup>A</sup> One BioActive pig and four control pigs died.

### Summary - Weaner Pigs:

- BioActive fed pigs grew more efficiently (7% better feed to gain ratio) than the control pigs.
- BioActive fed pigs were healthier - no scours.

### Grower and Finisher Pigs:

**Health Status:** One pig from the BioActive group was removed from the study due to injury (head caught in fence). The pig recovered but did not return to the study. No other BioActive pigs were removed or treated for ill health during the grower finisher phase. Four control pigs were removed due to ill health, and a further four were treated for ill thrift. Two of the four pigs removed due to ill health were diagnosed with Campylobacter.

**Average Daily Gain:** The pigs fed the BioActive diets had a better mean ADG (approximately 50 g/d) than the control pigs over the 82-day grower finisher period.

Although the differences were not significant ( $P > 0.05$ ), they were approaching significance ( $P = 0.06$ ) (Table 1 & Figure 1).

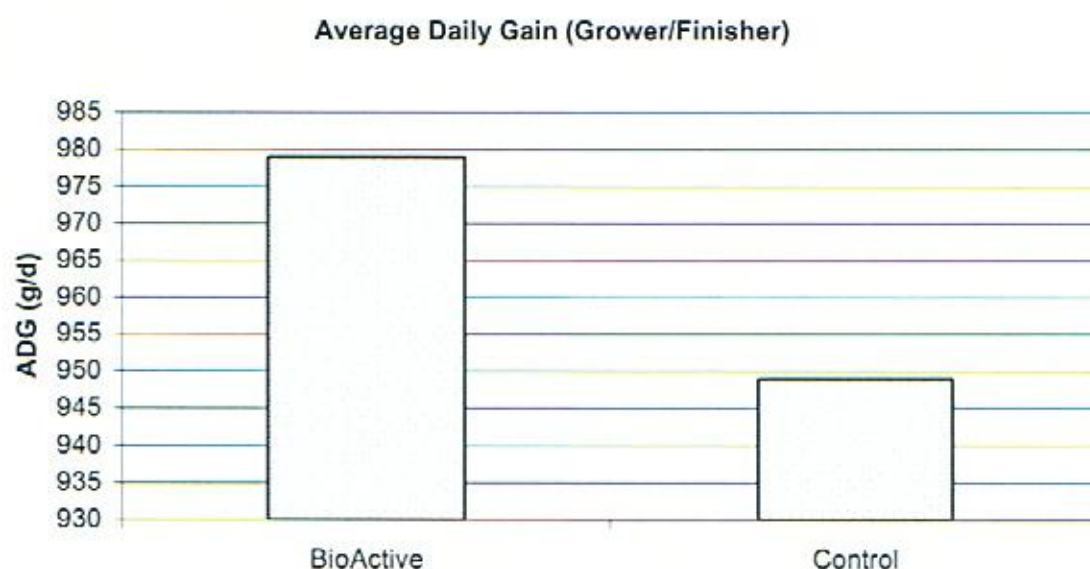
**Feed to Gain Ratio:** The pigs fed the diets containing BioActive had significantly lower ( $P = 0.006$ ) feed to gain ratio than the control pigs. *The feed to gain ratio was approximately 14% better in the BioActive fed pigs.* If this result was consistently encountered substantial savings in feed costs could be envisaged. Of course this is dependant upon the initial cost of BioActive supplementation. This is a very exciting result (Table 1 & Figure 2).

**Age at sale:** The mean age at sale was 140 days of age. There were no differences in age at sale between treatments.

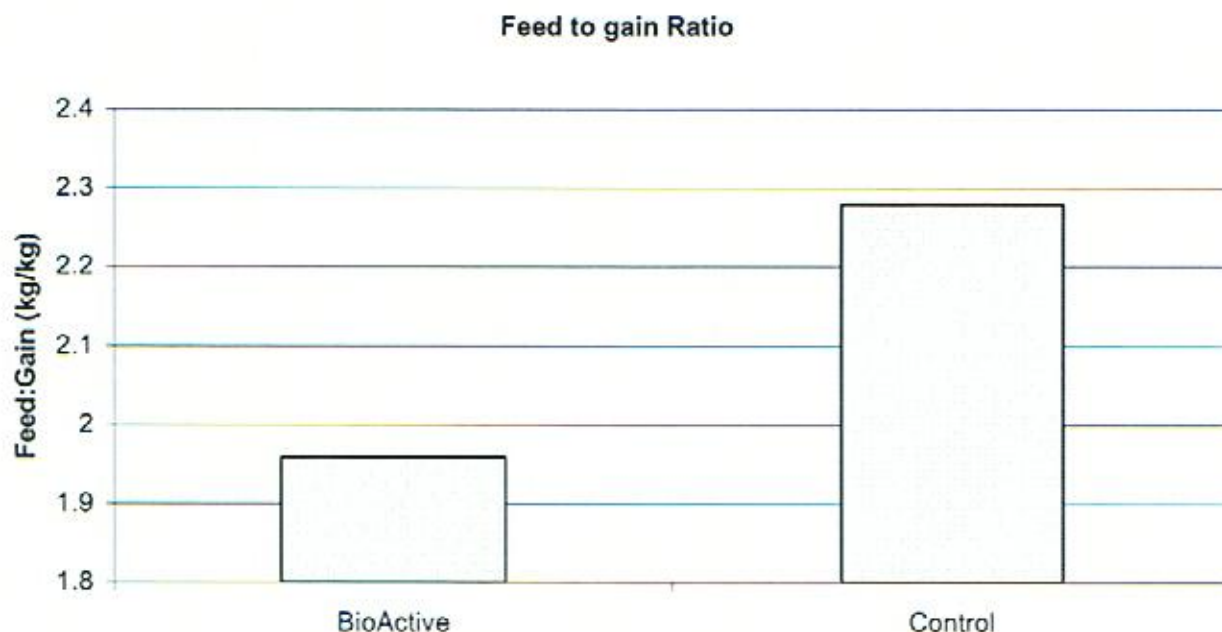
**Table 3. Mean weight gain (kg), average daily gain (ADG; g/d), feed intake (kg), feed to gain ratio (kg:kg), carcass weight (kg), and backfat depth (mm) at slaughter for male and female pigs over 82 days.**

Parameter	BioActive	Control
Number	159	156
Weight gain (kg)	80.2	77.8
ADG (g/d)	979.1	949.4
Feed Intake (kg)	156.8	177.3
Feed to Gain (kg:kg)	1.96 <sup>a</sup>	2.28 <sup>b</sup>
Carcass Weight (kg)	76.1	75.9
Backfat Depth (mm)	12.9	12.8

Means in a row with different superscripts are significantly different ( $P < 0.05$ ).



**Figure 1. Average daily gain during the grower/finisher phase.**



**Figure 2. Feed:gain ratio during the grower/finisher phase. NB. Lower is better.**

**Sex Effects:** There was a significant effect of sex on growth performance. The female pigs fed the BioActive diets had significantly better ADG ( $P = 0.04$ ) than the control females, at 973.2 g/d and 928.8 g/d respectively.

**General Observations:** It was evident throughout the grower phase that the pigs fed BioActive were quieter and easier to handle than the control pigs. The BioActive fed pigs were also cleaner.

#### Summary - Grower/Finisher Pigs:

- Pigs fed BioActive grew 50 g/d faster than the controls.
- Feed to gain efficiency was 14% better in the pigs fed BioActive.
- The health status of the BioActive pigs was substantially better than the controls.

### Conclusion

- The addition of Bioactive to the diet improved the health status of the pigs.
- There was a significant improvement in piglet growth performance when lactating sow and creep diets contained BioActive.
- Weaner feed:gain was improved slightly the addition of BioActive to weaner feeds.

- Grower and finisher pig *feed:gain was improved significantly (14%)* by the addition of BioActive to the diet.

## Recommendations

- Need to examine thoroughly the science behind the results - so as to understand the great improvement in feed to gain. Why does BioActive work?
- Strongly recommend that the feeding study be replicated. We suggest we carry out further studies to show that the results can be replicated.
- Need to know the ideal dose rate for BioActive - recommend that a dose response study be undertaken. In the current study 300<sup>1</sup>g/t was used. What is the effect if 200g/t or 800 g/t is used? Maximum inclusion levels need to be known. Is there a point where too much BioActive could cause a negative effect?
- The sex effect should be further investigated, especially an investigation of the effect on castrates. One of the problems with castrates is that they are not as good at converting feed to muscle, as are entire males. As castrate animals are required to meet export requirements the effect of BioActive on castrates should be studied.
- The effect of BioActive on meat quality (e.g. meat and fat colour, eating quality) should be investigated.
- The effect of BioActive on health status needs to be investigated. Current on farm data has shown that BioActive has a role to play in this area. If BioActive can be used to reduce the use of anti-biotics the image of Australia as a producer of "clean" pigs will be enhanced.

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• <sup>1</sup> BioActive Technologies P/L advise that their suggested optimum rate for pigs is 300 g/t and that if a dosage rate higher than this amount is to be used it should be done under consultation with BioActive Technologies P/L.

**Dietary Specifications:**

Parameter	Creep	Weaner	Grower	Finisher-Boar	Finisher-Gilt	Lac Sow
Protein (%)	21 - 24	20 - 22	18.5 - 20	16 - 18	15 - 17	18 - 19
Fibre (%)	1.0 - 2.5	2 - 4	3 - 5	3.5 - 7	3.5 - 8	4 - 6
DE (MJ/kg)	15	14.75	14	13.2	12.8	14
Av. Lys:DE (g/kg) min	0.85	0.79	0.72	0.56	0.54	0.6
Ca (%)	0.9 - 1.2	0.9 - 1.0	0.9 - 1.0	0.8 - 1.0	0.8 - 1.0	0.5 - 0.6
Av. P (%)	0.6 - 0.8	0.45 - 0.7	0.4 - 0.6	0.35 - 0.6	0.35 - 0.6	0.5 - 0.6

**Ingredients used:**

**Lactating sow:** Wheat, barley, millrun, soyabean meal, meat meal, fish meal choline chloride, salt, L-lysine, limestone, vitamin & mineral premix.

**Creep & Weaner:** Wheat, soyabean meal, blood meal, milk powder, weaner flavour, maize, tallow, soyabean full fat, fish meal, choline chloride, copper sulphate, salt, L-lysine, methionine, vitamin & mineral premix.

**Grower:** Barley, sorghum, wheat, millrun, cotton seed meal, tallow, soyabean meal, meat meal, limestone, salt, L-lysine, methionine, vitamin & mineral premix.

**Finisher-Boar & Finisher-Gilt:** Wheat, sorghum, mung bean, meat meal, sunflower meal, millrun, molasses, limestone, biophos, salt, choline chloride, L-lysine, methionine, threonine, copper sulphate, vitamin & mineral premix.

Please note: Full dietary specifications are Commercial in Confidence. Please contact the author for more details.

## APPENDIX 2.

### Drug and Treatment Costs:

Stock	BioActive <sup>1</sup>	Control
Lactating Sows	Nil	Nil
Piglets	\$18.20	\$72.80
Weaners	\$30.70	\$96.00
Grower/Finishers	Nil	\$200.00 <sup>A</sup>
<b>Total Cost (Trial)</b>	<b>\$48.90</b>	<b>\$368.80</b>
<b>Cost per 100 pigs</b>	<b>\$30.50</b>	<b>\$230.50</b>

<sup>1</sup> No anti-biotics were used in the BioActive fed pigs during the weaner or grower finisher phase.

<sup>A</sup> Does not include disposal of pigs.

## APPENDIX 3.

### Feed costs per pig over the weaner phase.

Parameter	BioActive	Control
Feed Intake (kg)	29.0	31.6
Feed Cost (cents/kg)	33.62 <sup>a</sup>	33.6
Total Feed cost	\$9.75	\$10.62
Advantage per pig	\$0.87	-
<b>Feed cost over 100 pigs</b>	<b>\$975</b>	<b>\$1062</b>

<sup>a</sup> Based on BioActive adding 0.0165 cents/kg cost to the diet.

## APPENDIX 4.

### Feed costs over the grower/finisher phase.

Parameter	BioActive	Control
Feed Intake (kg)	156.8	177.3
Feed Cost (cents/kg)	22.52 <sup>a</sup>	22.5
Total Feed cost	\$35.31	\$39.89
Advantage per pig	\$4.58	-
<b>Feed cost over 100 pigs</b>	<b>\$3531</b>	<b>\$3989</b>

<sup>a</sup> Based on BioActive adding 0.0165 cents/kg cost to the diet.

Appendix 5.

Total costs (health + feed only) per 100 Pigs

BioActive = \$ 30.50 + \$ 975 + \$ 3531 = \$4536.50

Control = \$ 230.50 + \$ 1062 + \$ 3989 = \$5281.50

Advantage of BioActive inclusion per 100 pigs = \$745