



PROVIDING SOLUTIONS THROUGH ORIGINAL RESEARCH

NUTRITION

- The use of a modified feeding system for controlled delivery of feed during lactation resulted in a reduction in feed disappearance (1 kg/d) over a 21-d lactation. **Manual feeding resulted in a significant level of feed waste**, especially in week 1 post-farrowing.
- Use of the modified feeding system or the electronic sow feeder in lactation was estimated to result in over **\$8/sow/lactation in feed savings**.
- **Heat treatment of oat and wheat straw tended to increase the calculated net energy values for straw**. Processing increased the net energy of oat and wheat straw by approximately 20 and 6%-unit, respectively.
- Acid preservation of high-moisture grain caused significantly more corrosion for galvanized steel compared to carbon steel. Propionic acid appears to be more corrosive compared to MaxiCid.
- High moisture wheat was preserved more effectively by propionic acid compared to MaxiCid (phosphoric acid-based).
- **Feed efficiency was improved with propionic acid** supplementation compared with pigs fed diets without supplemental acid and was comparable regardless of mode of addition (via wheat preservation or diet supplementation).
- Ensiling high-moisture wheat, but not barley, with lactic-acid bacteria and incorporating into dry diets is an effective way of improving growth performance of weanling pigs.
- The negative effects of deoxynivalenol and the positive effects of spray-dried animal plasma do not appear to be due solely to their effect on feed intake in nursery pigs.
- The replacement of soybean meal with **fermented soybean meal does not improve performance** when weaned pigs are housed in a high-health, non-stressful environment.

ETHOLOGY

- In nursery density studies at PSC group sizes of 10 and 40 pigs per pen were compared. Group size did not affect piglet growth, but behaviours differed. **Pigs in large groups spent more time lying laterally and less time sitting and overlying than those in small groups**.
- Trials conducted on commercial farms showed **significant effects were found on ADG and feed efficiency**, with lower space allowances causing reduced gains.
- Significant effects were found on pig behaviour at both PSC and commercial sites, with pigs spending more time sitting at low space allowances. In addition, pigs at low space allowances ate more meals per day, but meals were of shorter duration.
- The behaviour of pigs changes significantly during the nursery period. Initially (in week 1) overlying is common, but less overlying is observed in weeks 3 and 5. Time spent standing and feeding were greater in week 3 compared to weeks 1 or 5. Visits to the drinker and time spent drinking increased progressively over time, with more of these behaviours in week 5 than in weeks 1 or 3.
- Dominant and subordinate sows both show interest in enrichments. However **dominant sows spent more time contacting the enrichment** or >1M from it, while subordinate sows spent more time lying in the enrichment area. The results suggest that dominant sows may have greater access to enrichment.
- A plant-based extract was evaluated for effects on aggression in market pigs following mixing. **Pigs that received the extract** in water had reduced lesion scores on days 2 and 3 following mixing, **indicating reduced or milder aggression in treated pigs**. Treated pigs also had a shorter duration of threat behaviours during the two days following mixing. These results on a small sample size suggest that the compound may be effective at reducing the amount or severity of aggression in unfamiliar pigs at mixing.
- When sows were mixed into groups at weaning - after insemination and 5 weeks post-insemination - a lower number of stillborns was found in sows grouped at weaning compared to those mixed at 5 weeks, and the number of stillborns in the mixing after insemination was intermediate.

ENGINEERING

- In-barn assessment of the horizontal air flow ventilation system (design configuration selected from computer simulations) has shown **this design was more effective in air displacement and heat removal from the animal-occupied zone (AOZ) compared to the room with the conventional ventilation system** (Control) during both summer and winter conditions.
- The horizontal ventilation system design (for group sow housing) provided better air quality than the unmodified ventilation design. Lower CO₂ levels were observed in both summer and winter periods in addition air velocities at the animal occupied zone were relatively more uniform compared to the Control room during these periods.
- During the heating season, the horizontal ventilation system displayed a 14% and 13% reduction in natural gas and electricity consumption respectively. During cooling season, a 12.6% reduction in electricity consumption was observed in the horizontal ventilation room. **This translates into, on average, \$1.60/pig savings at current energy prices.**
- Sow growth performance and physiological response were not adversely impacted within the horizontal flow ventilation system (within a gestation room). In terms of behavior and welfare, **enrichment use was greater in the horizontally ventilated room – implying better sow comfort.**
- Adoption of a horizontal ventilation system, in a gestation room, could lead to as much as a 12% reduction in total heating and electricity costs. This reduction in utility cost can readily offset the capital and operating costs for installing this system. **This translates into, on average, \$0.70/pig savings at current energy prices.**
- In controlled-environment chambers sows fed with a high heat-increment diet tended to maintain relatively lower temperatures (11.9°C on average) than those fed a standard gestation diet (12.7°C). In addition the exposure of sows, fed with a high heat-increment diet, to relatively colder temperatures had no significant effect on their performance and physiological response.
- Allowing sows to control the room temperature (with supplemental heat) through an operant mechanism in combination with high-heat increment diets have shown that sows housed in groups could **tolerate temperature as low as 8°C without adversely impacting their growth performance** and physiological response.
- Allowing group housed sows to control their own environmental temperature resulted in a 75% and 11% respective reduction in natural gas and electrical consumption throughout the heating season. **Lower natural gas and electrical use would translate into a savings of \$3.10/hog though out the heating period** relative room with temperature pre-set at 16.5°C.
- Lower CO₂ levels were observed in the room with operant mechanism (Sow-controlled) compared to the room with pre-set temperature setting during the heating season. This indicates air quality is improved in sow (temperature) controlled rooms.
- No significant behavioral differences were observed between the sows in the sow temperature-controlled room and the pre-set room, which implies **sow welfare was not adversely impacted by relatively colder temperatures in the gestation room.**
- Cost analysis indicates the adoption of an operant mechanism, allowing group-housed sows to control their own environmental temperature, and feeding them a high heat-increment diet could lead to as much as a **59% reduction in total heating and electricity costs.**
- Effective simultaneous removal of ammonia (NH₃) and hydrogen sulphide (H₂S) can be achieved using titanium dioxide TiO₂ and zinc oxide ZnO nanoparticles together in an adsorption column. Equilibrium adsorption capacity for both NH₃ and H₂S increases with increase in feed concentration. Equilibrium adsorption capacity for H₂S increases with an increase in temperature, while there is no significant effect on adsorption capacity for ammonia due to an increase in temperature.
- The addition of titanium dioxide (TiO₂) nanoparticles to activated carbon (AC) was proven to be effective in enhancing the adsorption capacity of the adsorbent for ammonia (NH₃), increasing the equilibrium adsorption capacity from 2.48 mg NH₃ g⁻¹ to 7.07 mg NH₃ g⁻¹. Characterization of the adsorbent confirmed the formation of anatase TiO₂ on the carbon surface leading to a reduction of its pore size and surface area down to 820 (m² g⁻¹) and 0.73 (cm³ g⁻¹), respectively. While the synthesized adsorbent had slightly lower adsorption capacity compared to commercial TiO₂ nanoparticles (7.73 and 7.07 mg NH₃ g⁻¹, respectively) this adsorbent is still considered superior as it gave almost the same NH₃ adsorption capacity using only a quarter of TiO₂ weight compared to commercial TiO₂.



Saskatchewan
Ministry of
Agriculture

For more Information, please contact
Prairie Swine Centre

Box 21057, 2105 8th Street East
Saskatoon, Saskatchewan CANADA S7H 5N9
Phone: (306) 373-9922 - Fax: (306) 955-2510
www.prairieswine.com

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