

CAN THE PROVISION OF SILAGE AT WEANING IMPROVE SOW WELFARE AND SUBSEQUENT REPRODUCTION?

5A-122

**Final Report prepared for the
Australasian Pork Research Institute Limited
(APRIL)**

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June 2025



**Australasian
Pork Research
Institute Ltd
APRIL**

Executive Summary

Weaning is arguably the highest stress period for a sow; not only is she separated from her piglets but she is mixed with other sows in a new environment and fed a new diet, with feed intake often restricted. A strategy to lessen the negative welfare implications during this period is to provide the sow with enrichment that not only provides a distraction but also increases satiety, which has been proven to reduce aggression in gestating sows and grower/finisher pigs. Studies have shown that increased glucose and roughage prior to mating can have positive effects on reproductive outcomes. This project aimed to identify if the provision of silage to sows at weaning improved both welfare and productive outcomes.

This experiment, approved by the Primary Industries and Regions South Australia (PIRSA) Animal Ethics Committee (Project number: 26/23), was conducted at a 4,000 sow breeder unit in South Australia. A total of 1,008 sows (PIC line 1020 and Camborough 42) was selected over seven weeks (May to July 2024) and group-weaned into pens of eight sows until seven days after weaning, with a space allowance of 2.2m² per sow. Sows were allocated to one of three treatments: control (standard pen), block (pen with suspended Barastoc Swine Block), or silage (pen with daily corn silage provision). Sows were fed a wean to mate diet and had access to *ad libitum* feed and water. Fenceline boar contact was provided from day 3 after weaning, and artificial insemination was performed based on standing heat detection. Upon entry and exit of the mating shed, sows were measured for body condition and injury (P2 backfat, caliper scores, injury scores). A startle test was conducted on days one and six, with the response to a loud noise scored on a 6-point scale. Statistical analyses were performed using SPSS (v28 IBM) with appropriate models for normal, count and binary data. Significant differences were determined at $P < 0.05$ and a trend at $P < 0.1$.

On day one of the startle test, all treatments showed low startle responses with no significant differences. However, on day six after weaning, the silage treatment exhibited the lowest startle (0.35 ± 0.062 , $P < 0.05$) score followed by the block (0.84 ± 0.063), and the control treatment (1.16 ± 0.64) had the highest score. Silage-fed sows tended to lose less backfat compared to the control and block treatments (-0.4 ± 0.09 , -0.7 ± 0.09 and -0.7 ± 0.09 , respectively, $P < 0.1$), although no significant differences were observed in injury scores or exit caliper measurements. Mating performance, including wean to service interval, stale rate (bred > 7 days), conception and farrowing rates did not differ between treatments. Reproductive output at the subsequent farrowing, including gestation length, total pigs born, and pigs born alive showed no significant differences across treatments. There were no differences in the number of pigs produced per pen at subsequent farrowing.

This study shows that providing silage as an environmental enrichment during the wean to mate period had a reduced startle responses and a tendency to reduce condition loss. This suggests that silage as an enrichment source may have a positive impact on the welfare of the sow. No significant effects were observed on injury scores, mating success, or reproductive performance, suggesting that while silage offers some welfare benefits, its impact on productivity is limited. Silage may serve as an effective enrichment with further work necessary to determine its suitability as a dietary supplement, especially on farms without access to specialised diets (small volumes, storage constraints). Further research is needed to assess its feasibility as a replacement for targeted wean to mate diets.

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1. Introduction

While straw has been found to be a successful enrichment material, most commercial piggeries will be unable to implement it due to the blockages it is known to cause in effluent systems, or unwilling due to cost/availability or the biosecurity risk it poses. An effective alternative to straw is the use of silage. Jongman and Morrison (2018) provided gestating sows with either silage, straw or lucerne, and found that sows provided with silage had lower injury scores and interacted with the enrichment more than the straw or lucerne treatment groups. However, in this study silage was only provided in gestation when sows have established a stable hierarchy. A more targeted use of silage, that may have a greater impact, is in the weaning to service interval, during arguably one of the greatest stress events for a sow. Weaning involves the sudden separation of the sow from her litter, resulting in large hormonal shifts as milk production ceases and her reproductive cycle recommences. At the same time, the sow is exposed to high levels of social stress when mixed with unfamiliar sows, in a new environment and on a new feeding regime, which is often restricted. While weaning into pens has been implemented as an improvement in welfare when compared to weaning into stalls, it is still a high stress period requiring further research into methods to mitigate the negative outcomes. The inclusion of an enrichment block (Barastoc Swine Block™, Ridley Agriproducts, Pakenham, VIC) when sows are mixed in group pens after mating, has been shown to reduce sow injuries (Muller et al. 2017), as this encourages natural foraging and exploration behaviours. Feed is restricted in the gestation period with group feeding systems increasing competition over access for food resulting in aggressive behaviours if enrichment is not provided. Building on previous work, this study will look at the use of enrichment blocks to reduce aggressive behaviours due to social stress, as in this investigation access to feed is unlimited in the weaning to mate period.

Increases in fermentable carbohydrates, such as that provided by silage, have been shown to decrease energy expenditure on physical activity while increasing foraging, resulting in increased satiety and a decrease in hunger-motivated frustrated behaviours (Rijnen et al. 2003; Akerfeldt et al. 2018). The increase in dietary fermentable carbohydrates provided by silage may also offer reproductive performance advantages. Multiple studies have shown improved reproductive performance of sows when roughage is included in the diet (Wullink 1980; Young and King 1981; Danielson and Noonan 1975). Highly fermentable non starch polysaccharides (NSP) in the diet of a sow have been strongly linked to glucose stabilisation and reduced physical activity in the sow (De Leeuw et al. 2004, 2005a,b). Increases in fermentable NSP have been found to stabilise interprandial blood glucose levels, preventing declines of glucose below basal levels several hours after feeding. This form of elevated glucose availability aids in providing nutritional benefits to better support reproductive outcomes. Plush et al. (2019) increased the total number of pigs born without increasing the variability of piglet birth weight, by including dextrose in the wean to service period. Given these benefits, the effect of silage supplementation during the wean to service period on reproductive performance is worth investigating. The aim of this experiment was to determine if the provision of an enrichment block or silage in the wean to service interval increased both sow welfare and reproductive performance. We hypothesised that the provision of enrichment, irrespective of the source, would reduce sow aggression, improve sow welfare and subsequent reproductive performance.

2. Methodology

Animal management and housing

This experiment was conducted in accordance with the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (NHMRC, 2013) with approval from the Primary Industries and Regions South Australia (PIRSA) Animal Ethics Committee (Project number:26/23).

This experiment was conducted on a breeder unit in South Australia (SunPork Group, South Australia), with 1,008 sows (PIC line 1020 and Camborough 42) selected over seven weeks in May to July 2024. Sows were weaned directly into pens of eight and remained there from weaning until seven days after weaning, with a space allowance of 2.2 m², on partially slatted concrete flooring. Sows were grouped by size (parity 1 and 2, or 3-7), as is standard protocol at this site to prevent welfare issues caused by sow aggression, with pens allocated equally to treatment. All sows were fed a wean to mate diet (Table 1; 13.4 DE MJ/kg, 0.55 g SID lysine/MJ DE) and had access to one *ad libitum* feeder and four water nipples per pen.

Table 1 Ingredient composition of the wean to mate diet fed

Diet Composition, %	
Barley	43.6
Wheat	18.0
Millrun	7.30
Peas (field)	13.3
Canola meal	2.50
Blood meal	0.70
Meat meal	2.50
Salmon oil	0.43
Vegetable oil blend	1.00
Dextrose	5.00
Limestone fine	0.95
Monocalcium phosphate	0.40
Betaine	0.30
Gilt developer concentrate	4.00

Fenceline boar contact was provided from day 3 following weaning onwards, for a minimum of 10 minutes per pen at 0800 h. If a sow displayed 'standing heat', she was artificially inseminated (using post-cervical artificial insemination) in the pen, with a second mating 24 h later. All sows remained in their mating pen until 1330 h seven days after weaning when they were moved to gestation accommodation. At this time, sows that were not mated due to reproductive reasons were grouped together, receiving full contact boar exposure going forwards. Any sow that showed signs of health issues was removed from the group pens immediately and moved to a hospital pen for close monitoring and treatment, and these sows were recorded and removed from the experiment. In gestation, sows were housed in group pens (n = 55) with access to shoulder stalls, and floor fed 2.5 kg of a standard gestation diet daily. Sows were allocated to gestation pens based on parity to reduce aggression and remained in these pens until confirmation of pregnancy at day 35 via ultrasonography. Non-pregnant sows were removed, with pregnant sows relocated to pens of 55, on partially slatted concrete floors, fed 2.2 kg daily via an electronic

sow feeder. At approximately day 110 of gestation, sows were moved to farrowing accommodation, with subsequent farrowing performance recorded.

Treatments

Sows were allocated to one of three treatments accounting for previous performance (average total number of pigs born, previous number of pigs weaned), body condition at weaning (backfat at the P2 site) and parity (one to seven). The treatments were as follows:

1. Control, n=42 pens: sows weaned into a barren group pen.
2. Block, n=42 pens: sows weaned into a group pen provided with an enrichment block (Barastoc Swine Block™, Ridley Agriproducts, Pakenham, VIC) suspended from the ceiling in the middle of the pen.
3. Silage (corn), n=42 pens: sows weaned into a group pen and floor fed with 3 kg/sow of fresh silage daily. Silage was inoculated with Magniva Platinum (Lallemand Animal Nutrition, Mooroochydore, QLD), which contains *Lentilactobacillus hilardii* CNCMI-4785/*Lentilactobacillus buchneri* NCIMB 40788, *Pediococcus pentosaceus* NCIMB 12455, xylanase and beta-glucanase.

Prior to sows being moved into mating accommodation, all pens were hosed and any block weighing less than 12 kg was replaced (starting weight 20 kg). All blocks were weighed at sow entry and exit from the mating pen with disappearance recorded. Silage was weighed and provided prior to sows entering the mating pen and then daily at 0730 h. The silage was tested at packing of the product with results presented below (Table 2).

Table 2 Chemical composition and energy content of the corn silage.

	Silage
Dry matter (DM)	42.3
Gross energy, MJ/kg (%DM)	12.64
Crude protein (%DM)	7.5
Ash (%DM)	3.12
Neutral detergent fibre (%DM)	27.7
Acid detergent fibre (%DM)	16.5
TDN (%DM)	78.0
Starch (%DM)	50.5
Butyric Acid (%DM)	-

Measurements

Entry data were collected the day prior to weaning to allow for balanced treatment allocation and to reduce intervention on the day of weaning. Entry measures included ultrasonic measurement of backfat at the P2 site, parity, previous lactation performance, caliper score and injury score. The sow body condition caliper is an objective tool that can be used to standardise sow body condition, as it is a simple and easily applicable method that reduces the interobserver variation often found with body condition scores (Knauer & Baitinger, 2015). The injury score applied in this experiment was modified from Gonyou et al. (1988), where each sow was given one whole body injury score based on number and severity of abrasions,

as opposed to assessing six different regions of the sow for number of abrasions only (Table 3.)

Table 3 Guidelines for assessing sow injury scores modified from Gonyou et al. (1988).

Score	Classification	Description
0	None	No abrasions evident
1	Mild	<5 abrasions, less than 2 cm in length
2	Moderate	>5 abrasions, less than 2 cm in length
3	Severe	>5 abrasions, greater than 2 cm in length

Six days after weaning, exit measures (backfat at the P2 site, caliper score and injury score) were recorded on sows while they remained in their mating pen.

A startle test was conducted at 1330 h on day 1 and 6 of the experimental period across the three treatment groups: control (n=27 pens), block (n=28 pens), and silage (n=29 pens). The startle response to a loud unexpected stimulus, a metal pipe hitting a solid metal gate placed in the middle of the raceway at the first and third quarter of the test area, was recorded. On each test day, the sound stimulus was conducted three times (labelled startle 1-3) at 3-min intervals. The score of the startle response displayed by each sow was scored using the 6-point scale developed by Doyle et al. (2018) by a single observer (Table 4). At each startle, sows were given an individual startle score; however, as we were unable to individually identify sows we were unable to measure individual startle score over time, instead a pen average was calculated for each time point.

Table 4 Guidelines for measurement of the startle score developed by Doyle et al. (2018).

Score	Description
0	No response
1	Ears move
2	Head moves and no freeze
3	Head moves and short freeze (≤ 5 seconds)
4	Head moves and long freeze (> 5 seconds)
5	Flinch and freeze (body changes position)

As the replication of pen was high due to small pen sizes and the large number of animals studied, we were able to analyse the number of pigs produced per pen. This takes into account the mating rate, pregnancy rate and farrowing rate along with the number of pigs born to give an overall understanding of the effect enrichment plays in the wean to mate period.

Statistics

All data were analysed in SPSS (v28 IBM, Armonk, NY, USA) with $P < 0.05$ achieving significance and $P < 0.10$ indicating a trend. All normally distributed data were analysed using a linear mixed model (total born, parity, number of pigs weaned, lactation length, entry/exit P2, entry/exit caliper score, entry/exit injury score,

block disappearance, wean to service interval, P2 change, caliper change, injury change, gestation length, subsequent parity, subsequent total born, subsequent born alive, subsequent wean age, subsequent number of pigs weaned), count data using negative binomial regression (subsequent born dead, subsequent mummified) and yes/no data using binary logistic regression (wean to first service interval < 7 days, stale rate (no heat) %, removal rate %, conception rate %, farrowing rate %). Fixed effects included treatment (Control, Block, Silage) and week (one to seven), with pen fitted as a random term. Data from the startle tests were not normally distributed so average startle score was analysed using a generalized linear mixed model with treatment (Control, Block, Silage) and week (one to seven) as fixed effects. Analysis of average startle score at each startle (1, 2 or 3) was conducted using a Kruskal Wallis test with the treatment and startle number as target fields. Pigs produced per pen was calculated by summing the total born at the subsequent farrowing for each pen. Data were normally distributed and analysed using a linear mixed model with week and treatment as fixed factors.

3. Outcomes

There was no significant difference in all entry traits between treatment groups (Table 5).

Table 5 Mean ± SEM of previous lactation data and entry measures recorded on sows prior to experiment commencing.

	Control		Block		Silage		P value
	Mean	SEM	Mean	SEM	Mean	SEM	
n (sows)	336		336		336		
Total pigs born	12.4	0.19	12.3	0.19	12.3	0.19	0.88
Parity	2.7	0.09	2.7	0.91	2.7	0.09	0.96
Lactation length (days)	21.4	0.15	21.3	0.15	21.3	0.15	0.51
Number of pigs weaned	9.4	0.11	9.2	0.11	9.3	0.11	0.92
Entry P2 fat (mm)	13.8	0.17	14.0	0.18	13.8	0.17	0.67
Entry caliper	14.2	0.14	14.2	0.14	14.1	0.14	0.96
Entry injury score	0.1	0.02	0.2	0.02	0.1	0.02	0.18

During the startle test on day 1 (weaning day) there was no difference between treatments in the score of pen average startle (Table 6, $P > 0.05$). The startle response of all sows was low. On day 6 following weaning, the average startle score across all three startles was significantly different for each treatment group (Table 6, $P < 0.001$), with the lowest response seen in the silage treatment followed by the block and the highest response seen in the control treatment.

Table 6 Mean ± SEM of startle score across three startles at day 1 and day 6 of experimental period in the control, block and silage treatment groups.

	Control		Block		Silage		P value
	Mean	SEM	Mean	SEM	Mean	SEM	
n (pens)	27		28		29		
Day 1 startle score	0.026	0.010	0.013	0.010	0.011	0.009	0.496
Day 6 Startle score	1.161 ^a	0.064	0.835 ^b	0.063	0.352 ^c	0.062	<0.001

^{a,b,c} Within a row, means not having the same superscript are significantly different.

When the average score of response to each startle (1, 2 or 3) at day six was compared there was no difference in the startle score of control or block (Control 12.4 ± 1.79 vs Block 10.4 ± 1.50 , $P < 0.05$) treatments at the first stimulus. However, at the next two startles the score was lower for the block in comparison to the control treatments (startle 2: Block 7.1 ± 0.92 ; Control 10.0 ± 1.26) (startle 3: Block 5.4 ± 0.77 ; Control 7.7 ± 1.06). Sows in the silage treatment showed a lower startle score to control and block sows at all startles ($P < 0.05$, Figure 1).

Startle score day 6

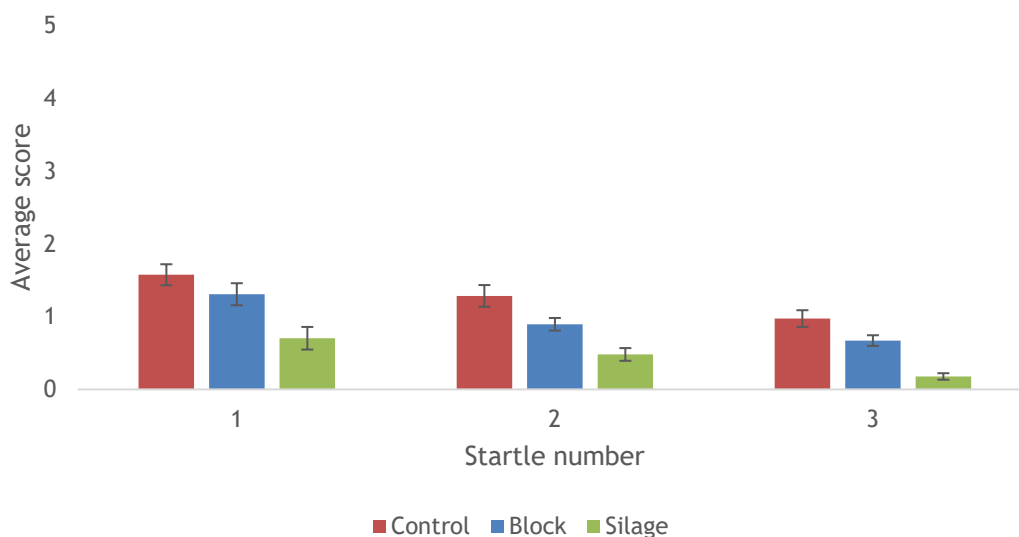


Figure 1 Mean ± SEM of startle score at startle 1, 2 and 3, on day six of the experimental period for control, block and silage treatment groups.

There was a tendency for sows provided with silage to lose less P2 when compared to the block and control treatments in the wean to mate period; however, there was no difference in exit caliper or injury scores (Table 7).

Table 7 Mean ± SEM of body condition and injuries of sows in the control, block and silage treatment groups in the wean to mate period.

	Control		Block		Silage		P value
	Mean	SEM	Mean	SEM	Mean	SEM	
n (sows)	331		330		334		
Exit P2 fat (mm)	13.0	0.17	13.2	0.17	13.4	0.17	0.37
P2 fat change (mm)	-0.7	0.09	-0.7	0.09	-0.4	0.09	0.055
Exit caliper	13.9	0.13	13.8	0.13	13.9	0.13	0.59
Caliper change	-0.2	0.06	-0.3	0.07	-0.1	0.06	0.17
Exit injury	1.0	0.06	0.9	0.06	1.0	0.05	0.77
Injury change	0.9	0.06	0.8	0.06	0.9	0.06	0.31

No differences were observed in sow mating performance, measured by the wean to service interval, stale rate (% of sows not bred within 7 days of weaning), conception or farrowing rates (Table 8). No difference in the number of pigs removed from the pen due to health reasons was observed (removal rate, Table 8).

Table 8 Mean ± SEM of mating performance of sows in the control, block and silage treatment groups in the wean to mate period.

	Control		Block		Silage		P value
	Mean	SEM	Mean	SEM	Mean	SEM	
n (sows)	336		336		336		
Wean to service interval < 7 days (days)	4.2	0.06	4.1	0.56	4.1	0.06	0.58
Stale rate (%)*	11	7-16	12	9-18	11	8-16	0.86
Removal rate (%)*	14	10-18	11	8-16	10	7-14	0.72
Pregnancy rate (%)*	90	77-100	91	77-100	93	79-100	0.97
Farrowing rate (%)*	87	82-90	90	85-93	88	84-92	0.54

*95% confidence intervals rather than SEM presented for binary data

No significant differences between treatments were observed in the subsequent litter size data (Table 9).

Table 9 Mean ± SEM of reproductive output at subsequent farrowing of sows in the control, block and silage treatment groups in the wean to mate period.

	Control		Block		Silage		P value
	Mean	SEM	Mean	SEM	Mean	SEM	
n (sows)	251		251		256		
Gestation length (days)	116.1	0.10	116.3	0.10	116.3	0.09	0.142
Parity	3.7	0.10	3.7	0.10	3.7	0.09	0.808
Total pigs born	12.6	0.19	12.5	0.19	12.9	0.19	0.372
Pigs born alive	11.9	0.19	11.9	0.19	12.3	0.19	0.179
Pigs born dead	0.2	0.03	0.3	0.04	0.2	0.03	0.436
Pigs born mummified	0.2	0.04	0.3	0.04	0.2	0.03	0.149

No significant difference between treatments was observed in the number of pigs produced per pen at the subsequent farrowing (Table 10).

Table 10 Mean \pm SEM of the number of pigs produced per pen at the subsequent farrowing of sows in the control, block and silage treatment groups in the wean to mate period.

	Control		Block		Silage		P value
	Mean	SEM	Mean	SEM	Mean	SEM	
n (pen)	42		42		42		
Pigs produced per pen	75.4	2.86	74.9	2.95	78.4	3.25	0.65

All blocks were weighed at sow entry and exit from the mating pen with disappearance rate measured at an average of 605 ± 49 g/day.

4. Application of Research

Sows provided with enrichment in the wean to mate period showed reduced startle behaviour when exposed to an adverse noise, compared to sows housed in a barren environment. The form of enrichment further affected startle behaviour, with sows provided fresh silage daily showing lower levels of startle behaviour than that of sows provided with Barastoc Swine Block™ suspended from the ceiling. Sows provided with silage tended to lose less condition, as measured by P2 backfat. Despite the shift in behavioural response to startle tests, indicating that environmental enrichment improves the mental state and welfare of these sows, there was no differences observed in injury scores, mating or reproductive performance. Our hypothesis was partially supported by these results with enrichment improving the welfare of the sows in the wean to mate period; however, it does not appear that the effect was great enough to shift performance data. Future work should investigate the effect of silage as not only an enrichment but as a feed source, and whether it is an acceptable alternative to a targeted wean to mate diet (i.e. part of the ration).

In pigs, a potential indicator of affective valence and hence welfare is the variation in the defense cascade response (Statham et al, 2020). An effective way to measure this is by conducting a startle test which measures the response of an animal to an aversive and unexpected stimulus. In this experiment a startle test was conducted on day one and day six, with no difference in startle score on day one, as would be expected as sows had not been exposed to the enrichment for long enough to have altered welfare state. By day six sows housed in a barren environment showed a greater response to the startle test than those housed in enriched environments. Enrichment is therefore having a positive effect on the mental state and welfare of these sows. Both the block and silage treatments have previously been shown to improve sow welfare by encouraging the sow to express natural foraging and exploration behaviours (Muller et al. 2017; Rijen et al. 2003; Akerfeldt et al. 2018). When comparison was made between sources of enrichment, startle score was reduced at each startle on day six in the silage compared to the block treatment group. The inclusion of silage in sow diets has been associated with behavioural benefits, as high fiber diets increase satiety and promote natural foraging behaviours, thereby reducing stress-related behaviours and aggression (Meunier-Salaün et al. 2001). Silage provision is likely enhancing butyrate concentrations in the gastrointestinal tract due to hind gut fermentation of fiber. Silage is rich in fermentable fibers, which serve as substrates for microbial fermentation in the

large intestine, leading to the production of short-chain fatty acids, including butyrate (Le Sciellour et al. 2021). Butyrate producing bacteria proliferate in response to fiber rich diets, further contributing to butyrate synthesis (Wang et al. 2020). This increase in butyrate has several positive effects on sow welfare. As a key energy source for colonocytes, butyrate enhances gut integrity and function, supporting intestinal barrier maintenance and reducing the risk of leaky gut syndrome (Guilloteau et al. 2010), which can be exacerbated during periods of high stress such as weaning (Zhang et al. 2019). The results of the startle test would indicate that while the block is having a positive effect on sow welfare, the effect is not as great as the silage with the bulk and so satiation it provides.

Despite the positive influence of the block and silage treatments on sow affective valence, as indicated by the startle test, no significant differences in injury scores were observed between treatment groups and the control by day six of the experiment. Injury scores increased by approximately one point across all groups, suggesting that the enrichment did not sufficiently mitigate aggression-related injuries. Anecdotally, sow aggression began immediately upon entry to the mating pen, indicating that social hierarchy establishment was the primary driver of aggression. Although it was hypothesised that enrichment would provide a distraction and reduce injuries, in this case it did not appear to be highly motivating enough to override the stress of weaning and dominance behaviours. However, overall injury scores remained low for such a stressful event, likely due to effective farm management strategies such as grouping sows by size and maintaining small pen sizes, both of which are known to reduce aggression-related injuries in group housed sows (Verdon et al. 2015; Bench et al. 2013).

Sows often experience body condition loss in the wean to mate period due to a combination of metabolic, behavioural and physiological factors. The high energy demands of lactation deplete body fat reserves, and following weaning, sows must recover these stores while preparing for the next reproductive cycle (Quesnel et al. 2009). Reduced feed intake following weaning, driven by stress and hormonal shifts, can prolong this negative energy balance, while increased physical activity and social aggression during mixing further contribute to condition loss (Thaker and Bilkei, 2005; Verdon et al. 2015). Providing silage during this period showed a tendency to help mitigate these effects, likely by increasing intake and improving gut function. The high fermentable fiber content of silage promotes satiety, stabilizes gut microbiota and enhances nutrient absorption, leading to improved energy utilization and the recovery of fat stores (Quesnel et al. 2009). As discussed previously, fermentation products such as butyrate potentially mitigate the negative effect of post-weaning stress on digestive function and feed efficiency (Verdon et al. 2015). By promoting consistent nutrient intake, silage provision in the wean to mate period may help maintain sow body condition and improve reproductive performance in subsequent cycles. Despite the tendency for sows provided with silage to better maintain condition in the wean to mate period, there were no differences observed in subsequent reproductive performance, not supporting our initial hypothesis. This lack of expected improvement may be explained by the diet and feeding regimen of the experimental site.

As the sows were housed in small group sizes with access to *ad libitum* feed it is highly likely that they did not experience any feed restriction. While this is easily

achievable in group pens it does present an issue on farms that wean into large group sizes or stalls. In addition, the experimental site feeds a diet formulated specifically for the wean to mate period differing in its energy density and includes functional additives to support reproductive recovery and body condition maintenance. While this is a viable option for this site it may not be possible for smaller herds or batch systems due to the small amount of diet required. Future work should investigate if the provision of silage in the wean to mate period could act as a replacement for targeted wean to mate diets, thereby reducing the costs associated with formulating, milling and storing of a diet that is fed for a relatively short period of time.

Initially, farm staff expressed concerns regarding the use of silage, particularly the potential for blockages and effluent management challenges. However, by the end of the experimental period, they reported no such issues, despite each pen of silage-treated sows receiving 24 kg of silage daily. Staff expressed a preference for mating in the silage pens, as these sows remained cleaner, reducing the time required for pre-mating hygiene procedures. The presence of silage also improved floor traction, enhancing safety during pen mating for both staff and animals. The silage used was baled for international export so was very expensive, but because we only wanted a small quantity this was the easiest to use. The cost of this baled silage was \$780/T. Typically corn silage from a bunk delivered on farm is ~\$350/T, less than a standard dry sow ration (\$400-500/T).

5. Conclusion

This study demonstrated that providing sows with environmental enrichment in the wean to mate period, particularly silage, had a positive effect on their affective valence when assessed at day six, as indicated by a reduced startle response. The inclusion of silage not only served as an effective enrichment, promoting natural foraging behaviour and satiety, but also showed a tendency to reduce condition loss, likely through improved gut function and nutrient utilization. Despite these benefits, no significant differences were observed in injury scores, mating success, or reproductive performance, suggesting that while enrichment *per se* improves welfare, its effects may not be substantial enough to influence productivity under well-managed conditions.

The findings highlight the potential for silage to serve as both an enrichment and dietary supplement, particularly for farms that do not have access to specialized wean to mate diets. Future research should explore the feasibility of using silage as an alternative to targeted wean to mate diets, particularly in systems where feed is restricted or where formulation of a specialized diet is not practical.

6. Limitations/Risks

Whilst the farm was chosen based on its mating shed infrastructure, which allowed for small pen sizes and high replication, a limitation to this study was the inability to measure feed intake. As body condition maintenance was the only production trend of interest it would have been beneficial to investigate the effect silage

provision played in feed intake. Further work should examine if silage could, potentially, partially or fully replace a standard wean to mate diet, as this would be a beneficial alternative for producers in years where grain is expensive, and silage is plentiful.

7. Recommendations

As a result of the outcomes of this study the following recommendations have been made:

1. The Barastoc Swine Block™ and corn silage are both effective enrichment? strategies to improve the welfare of sows in the wean to mate period.
2. Provision of the Barastoc Swine Block™ and corn silage did not improve any measures of subsequent reproduction performance.
3. Provision of the Barastoc Swine Block™ is an easily implementable form of enrichment in the later part of the wean to mate period.
4. Enrichment alone does not appear to be enough to mitigate the initial social stresses of weaning.

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Appendix 1 - Notes

Confidential Information

If a Final Report contains Confidential Information:

- The Researcher must indicate on the cover of the Final Report that the Final Report contains Confidential Information.
- APRIL may request the Researcher to produce a non-confidential version of the Final Report in a form suitable for general distribution, and the Researcher must do so within 28 days of receiving the request.

Deficient Report

If APRIL reasonably forms the view that the Final Report does not adequately set out matters referred to, it must notify the Researcher of the extent to which it believes the Final Report is deficient.