The use of *Berkshire* triticale in weaner pigs

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By

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Executive Summary

The development of *Berkshire* Triticale through project 1A-102 is now in the final stages of release to the general farming community. The aim of the breeding program was to increase the yield potential of Triticale as well as improving the overall energy yield through selection with the NIR AusScan system. As part of our commitment to progressing the opportunity with *Berkshire* triticale and for our own information we need to examine the potential for *Berkshire* to improve performance of pigs against other triticale varieties as well as against our standard wheat varieties.

To evaluate the potential an experiment was carried out on 180 male and 180 female pigs from weaning for 6 weeks given a dietary program of either a wheat based diet or a mixed variety triticale based diet or a diet based on *Berkshire* triticale alone. The pigs were housed in commercial pens of 6 pigs per pen and growth performance measured over the 6 weeks.

The results of the experiment indicated there was no significant difference in growth performance of the pigs fed any of the diets based on the different grains although the *Berkshire* triticale diets did produce the heaviest pigs in the experiment.

The conclusion from the experiment was that the first release of *Berkshire* triticale from the CRC breeding program has resulted in a variety that will support excellent growth performance of pigs and that the breeding selection indices will over time produce triticale that will improve the growth performance of pigs due to higher available energy in the grain as well as achieving a high grain yield from an agronomic point of view. This will allow a win/win with the farmer achieving a higher gross margin per hectare and the pig farmer will utilise a grain that will support better pig performance.

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1. Introduction

The development of *Berkshire* triticale through project 1A-102 is now in the final stages of release to the general farming community. The aim of the breeding program was to increase the yield potential of Triticale as well as improving the overall energy yield through selection with the NIR AusScan system. As part of our commitment to progressing the opportunity with *Berkshire* triticale and for our own information we need to examine the potential for *Berkshire* to improve performance of pigs against other triticale varieties as well as against our standard wheat varieties.

Project Implications

The release of the *Berkshire* variety of triticale is associated with an improved yield of energy for pigs in comparison to other triticale varieties and will be similar to wheat.

Project Hypotheses

The hypothesis of this project is that *Berkshire* triticale will produce better growth performance through an increase in rate of gain or better feed efficiency than a wheat based diet or triticale from our pool of triticale sourced from our local region

2. Methodology

Animals and treatments

One hundred and eighty female and one hundred and eighty male pigs (PrimeGro Genetics™) were weaned at an average age of 26 days (average weight 6.8 kg ± 1.43 kg) at the Rivalea Research and Innovation Unit, Corowa NSW and allocated to pens of 6 pigs. Pigs were selected in two replicates, with the first replicate selected on the 7th August 2010. Within replicate, pens were randomly allocated to one of three treatments. The treatment diets were formulated to contain three types of grain as the base component of the diets. The pens were further classified into Light Medium or Heavy categories.

The pigs allocated to the first treatment were offered a diet where the only grain source was wheat from mixed varieties. The pigs allocated to the second treatment were offered diets based on a pooled triticale sample based on varieties available on general release in the previous harvest season 2009/2010. The pigs allocated to the final treatment were offered diets based on Triticale variety *Berkshire* as there only source of grain. The diet composition is shown in Tables 1and 2.

All diets contained the antibiotic medications Chlortetracycline at 400ppm and Tiamulin at 50ppm. Pigs were offered their allocated first-stage weaner diets for the first 21 days post-weaning (Table 1) followed by a second-stage weaner diet for the remaining 19 days (Table 2).

Husbandry and management

All piglets were individually identified at selection using ear tags. Pigs were weaned at an average age of 26 days and transferred into group weaner pens (6 pigs per pen; 0.9 m^2/pig). All weaners were individually weighed at entry (day 0) and at the end of the weaner period (day 40). Pen weights were obtained at the mid-point of the weaner period (day 21), with pen feed intakes measured from

day 0-21 and day 21-40. Feed conversion ratio was subsequently determined from rate of gain and estimated feed intake. Pigs were provided *ad libitum* access to their allocated treatment diets for the entire weaner period, while water was freely available via nipple drinkers in each pen. At 40 days post weaning, pigs were moved to grower. All procedures undertaken in this investigation were approved by the Rivalea Animal Care and Ethics Committee (License SPPL 111).

Statistical analyses

Differences in growth performance due to the effects of the dietary treatments with different grain sources were analysed using an analyses of variance for a randomised factorial design. The factors used for the analysis were grain type (Wheat, Triticale and *Berkshire*), sex (Male and female) and size selection category at the start of the experiment (Large, Medium, and Small). The experimental unit was the pen. Differences in mortalities and removals during the weaner period were analysed using chi squared analyses. All analyses were performed using SPSS 18.

Table 1 - Ingredient profile and nutrient composition of the first-stage weaner diets offered from weaning for 21 days, % of diet (as fed)

Ingredient, %	**Wheat Diet**	**Triticale Diet**	***Berkshire* triticale Diet**
Wheat	59.2		
Triticale		59.2	
Berkshire triticale			59.2
Lupins Kernels	2.0	2.0	2.0
Canola Meal	5.0	5.0	5.0
Soybean meal	7.0	7.0	7.0
Meat meal	3.6	3.6	3.6
Fishmeal	7.6	7.6	7.6
Blood meal	1.7	1.7	1.7
Whey powder	10.0	10.0	10.0
Water	1.0	1.0	1.0
Natuphos 5000	0.01	0.01	0.01
Tallow	1.7	1.7	1.7
Salt	0.2	0.2	0.2
Lysine HCL	0.26	0.26	0.26
Dl-methionine	0.04	0.04	0.04
Threonine	0.10	0.10	0.10
Zinc oxide	0.28	0.28	0.28
Rivalea weaner premix	0.17	0.17	0.17
Endox	0.02	0.02	0.02
Tiamulin 10%*	0.05	0.05	0.05
CTC*	0.20	0.20	0.20
Ronozyme	0.03	0.03	0.03
Fysal SP Dry	0.4	0.4	0.4
Diet Composition**			
DE, MJ/kg	14.3	14.3	14.3
Crude protein (%)	23.6	23.9	23.9
Crude fibre (%)	2.6	2.9	2.9
Crude fat (%)	4.0	4.0	4.0
Total Lysine (%)	1.48	1.49	1.49
Available lysine (%)	1.32	1.32	1.32
Available lysine: DE (g/MJ)	0.92	0.93	0.93

* International Animal Health, Blacktown, NSW

**Estimated from Rivalea Australia Pty Ltd composition data

Table 2 - Ingredient profile and nutrient composition of the second-stage weaner diets offered from 21 days post-weaning to 40 days post-weaning, % of diet (as fed)

Ingredient, %	Wheat Diet	Triticale Diet	*Berkshire* triticale Diet
Wheat	61.1		
Triticale		61.1	
Berkshire triticale			61.1
Lupins Kernels	12.0	12.0	12.0
Canola meal	8.0	8.0	8.0
Soybean meal	7.0	7.0	7.0
Meat meal	5.9	5.9	5.9
Blood meal	1.5	1.5	1.5
Water	1.0	1.0	1.0
Natuphos 5000	0.01	0.01	0.01
	0.02	0.02	0.02
Tallow	1.6	1.6	1.6
Salt	0.2	0.2	0.2
Limestone	0.7	0.7	0.7
Lysine HCL	0.4	0.4	0.4
Dl-methionine	0.12	0.12	0.12
Threonine	0.15	0.15	0.15
Isoleucine	0.03	0.03	0.03
Zinc oxide	0.17	0.17	0.17
Rivalea weaner premix	0.09	0.09	0.09
Endox	0.01	0.01	0.01
Enterodox 100 BMP	0.1	0.1	0.1
Fysal SP Dry™	0.3	0.3	0.3
Diet composition**			
DE, MJ/kg	14.4	14.4	14.4
Crude protein (%)	23.9	23.9	23.9
Crude fibre (%)	3.1	3.1	3.1
Crude fat (%)	4.5	4.5	4.5
Total Lysine (%)	1.43	1.43	1.43
Available lysine (%)	1.23	1.23	1.23
Available lysine: DE (g/MJ)	0.85	0.85	0.85

**Estimated from Rivalea Australia Pty Ltd composition data

3. Outcomes

The use of *Berkshire* triticale as the sole source of grain in the diet of weaner pigs did not significantly improve growth rate or feed intake and thus feed efficiency was also not improved. The performance of the male and female weaner piglets to the different grain types throughout the 40 period after weaning is shown in Table 3. There were significant effects of the average weight of the pigs in the pen at the start of the experiment on the average weight of the pigs at the end of each period and feed intake during each period but was not expressed as a difference in growth rate or feed efficiency during each individual period although there was a significant impact in growth rate over the entire period ($p=0.018$). There were no significant interactions between the average starting weight groups and either sex or treatment and actual results are summarised in table 4 and not in the main table of results.

There was no significant difference between the sexes on any trait measured. There was a significant interaction between sex and treatment for the feed efficiency during the first 21 day period where the feed efficiency of the female pigs given the mixed variety triticale was exceptional low and the for the wheat diet was higher than the other diets and is likely an anomaly in the data rather than any real effect of the grain type.

From a commercial viewpoint of the data it is encouraging to show that the pigs fed the *Berkshire* triticale exhibited the highest rate of gain and feed intake compared to those offered diets based on wheat or mixed variety triticale. Both triticale diets supported better feed efficiency than the wheat based diets. This allows a level of confidence that the *Berkshire* triticale is performing as good as wheat or slightly better and that the selection techniques applied to the *Berkshire* triticale in the breeding process is improving the value to the pig farmer.

Table 3 - Effect of Grain type on the growth performance of male and female weaner pigs

Sex	Female			Male			Combined			Stats							
Treatment	W	T	B	W	T	B	W	T	B	SEM	TMT	Sex(s)	Size(z)	TxS	TxZ	SxZ	TxSxZ
Start Weight	6.8	6.7	7.0	6.8	6.8	6.9	6.8	6.8	6.9	0.1	0.285	0.872	0.000	0.579	0.673	0.261	0.465
20 day Weight	12.6	13.1	14.0	13.2	13.3	13.5	12.9	13.2	13.7	0.4	0.178	0.796	0.000	0.447	0.666	0.781	0.748
Final Weight	23.6	24.6	25.4	24.6	24.8	25.3	24.1	24.7	25.4	0.7	0.219	0.552	0.000	0.714	0.199	0.962	0.433
Phase 1 (0-20 days)																	
Rate of Gain (kg/d)	0.276	0.303	0.331	0.304	0.308	0.314	0.290	0.305	0.322	0.019	0.227	0.731	0.088	0.466	0.518	0.624	0.702
Feed Efficiency	1.48	1.12	1.30	1.28	1.31	1.24	1.38	1.21	1.27	0.07	0.074	0.649	0.166	0.030	0.677	0.667	0.640
Daily Feed Intake (kg/d)	0.405	0.346	0.435	0.378	0.395	0.387	0.392	0.371	0.411	0.023	0.254	0.668	0.001	0.122	0.618	0.732	0.678
Phase 2 (20-40 days)																	
Rate of Gain (kg/d)	0.580	0.607	0.603	0.602	0.605	0.624	0.591	0.606	0.614	0.032	0.781	0.615	0.206	0.918	0.406	0.801	0.470
Feed Efficiency	1.61	1.63	1.63	1.69	1.63	1.61	1.65	1.63	1.62	0.11	0.959	0.826	0.914	0.863	0.638	0.920	0.774
Daily Feed Intake (kg/d)	0.926	0.988	0.977	0.959	0.961	0.971	0.943	0.975	0.974	0.024	0.329	0.999	0.000	0.455	0.113	0.869	0.426
Overall																	
Rate of Gain (kg/d)	0.420	0.447	0.460	0.446	0.449	0.461	0.433	0.448	0.461	0.017	0.264	0.509	0.018	0.715	0.156	0.999	0.378
Feed Efficiency	1.55	1.41	1.50	1.46	1.47	1.41	1.50	1.44	1.46	0.06	0.583	0.473	0.252	0.440	0.852	0.917	0.806
Daily Feed Intake (kg/d)	0.645	0.637	0.690	0.642	0.656	0.645	0.644	0.646	0.668	0.020	0.429	0.573	0.000	0.286	0.269	0.774	0.542

Table 4 - Effects of starting weight group on the performance of weaner piglets

Starting weight group	High	Medium	Low	Total	SEM
Start Weight	8.58	6.73	5.20	6.86	.117
20 day Weight	15.47	12.99	11.24	13.27	.451
Final Weight	27.47	24.24	22.16	24.66	.721
Phase 1 (0-20 days)					
Rate of Gain (kg/d)	0.329	0.298	0.287	0.305	.019
Feed Efficiency	1.347	1.285	1.225	1.287	.071
Daily Feed Intake (kg/d)	0.438	0.377	0.350	0.389	.024
Phase 2 (20-40 days)					
Rate of Gain (kg/d)	0.631	0.592	0.575	0.600	.033
Feed Efficiency	1.668	1.651	1.612	1.644	.111
Daily Feed Intake (kg/d)	1.037	0.932	0.917	0.963	.024
Overall					
Rate of Gain (kg/d)	0.472	0.438	0.424	0.445	.017
Feed Efficiency	1.524	1.469	1.424	1.473	.062
Daily Feed Intake (kg/d)	0.717	0.633	0.601	0.651	.020

4. Application of Research

These research findings indicate the use of triticale is achieving similar performance results in pigs as wheat based diets with possibly an improvement which should increase as breeding for future varieties improves on this result.

The potential for the use of triticale, in particular *Berkshire* triticale, to improve the cost of production in Australian piggeries, rests on increasing the amount of the grain grown in Australia, and exploiting the advantages that are being bred into the varieties to improve pig performance above that of wheat, which is seen as the traditional grain for pig production in Southern Australia.

5. Conclusion

The results of this research demonstrate that the use of triticale in pig diets will result in similar, if not better, growth performance in comparison to the tradition wheat grain. The development of specific triticale varieties for pigs will further enhance the results that can be expected.

6. Limitations/Risks

The results of this experiment were that any difference between actual grain types was not significant, and thus any inference of a difference is not based on a scientific difference as expressed at the 0.05 % probability level.

7. Recommendations

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

The use of triticale in young pig diets is as good as, or better than, wheat in achieving growth performance and feed efficiency.

The indices associated with the selection of *Berkshire* triticale are improving the performance of pigs using this grain.