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NUTRITIONAL BENEFITS FROM THE "PIG-ON'LITTER" SYSTEM

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Introduction

Anyone who is concerned about the humane treatment of farm animals and/or eliminating environmental problems from pig waste must be impressed and attracted by the pig-on-litter system with added bacterial products (1). If it is to be accepted widely in practice, however, it must be shown to have economic advantages also - a faviourable balance of value of sales against costs. We have just started an experimental programme to determine whether there really is (as some have claimed) an accumulation in the litter of nutrients useful to the pigs, which could be one possible mechanism for the improved feed conversion ratios which are also claimed. The preliminary results reported here, from only the first month of the first experiment, are quite surprising and indicate that the experiments should be continued.

Material and Methods

8 identical pens were set up at the Takwuling Pig Breeding Centre of the Agriculture & Fisheries Department in mid March 1991. The floor area of each pen was 3.7 m^2 and fresh sawdust was laid to a depth of 15 cm in each pen. Four pigs of average age of 100 days at the start of the experiment were put into each pen. The 8 pens were randomly divided into 2 groups of 4 pens each and will be used also for measurements of feed conversion ratio. The bacterial product Vitocogen was added to complete feed for pigs in the Treatment group. No additive was added to the complete feed for pigs in the control group. Other than the addition of bacterial product, the complete feed used for both groups was identical. The pigs were fed adlibitum, fresh sawdust was weighed and analysed prior to putting into the pig pens. Sawdust litter samples were monitored at weekly intervals and the litter bed was thoroughly mixed before each sampling. The sawdust litter samples were analysed by standard methods (2-6) for available carbohydrates, moisture and ash, crude and digestable protein, Kjeldahl nitrogen, P_2O_5, K_2O, Ca, Mg, Na, Mn, Cu, Zn, Fe, organic matter, organic carbon, C:N, BOD, pH, EC and water soluble total Kj-N, NH_4+-N and NO_3-N. In addition, litter samples were subjected to acid hydrolysis and amino acid analysis, as a possible guide to the nutritive potential of proteins accumulating in the litter.

Results

In must be emphasised that these are preliminary results only, of the first four weeks of the experiemnt, and not yet subjected to analysis of varience. Also, the accumulated litter has not been weighed yet, so that results are proportionate only, do not relate to the total quantity of litter, and cannot be interpreted yet as reflecting a mass balance or nutrient balance.

The tables show a striking and progressive increase in all the "nutrient" parameters measured in dried litter material, though water extracts show a levelling off in NH_4-N, NO_3 and BOD.

An unexpected feature is that there is little or no apparent difference between treatment and control groups. But of course this does not mean that litter in the two groups is of equal potential value as a feed for the inmates of the pen, who presumably would not wish to taste the stinking mess of an untreated litter.

Discussion

It is surprising that the differences between treatment and control groups, in respect of the parameters studied are so small. There may be substantial qualitative differences, however, and as already mentioned these may be crucial for the success of the pig-on-litter system as improving the nutrition of the pigs kept on litter.

A full appreciation of the processes going on in the litter in the two groups will only be possible at the conclusion of the experiment when the whole of the litter in each pen will be

weighed, and analysed as indicated here, and thus make it possible to indicate mass balances for each relevant component of the feed, pigs produced, and the final litter. Taken together with the feed conversion ratios achieved (especially of any differences which appears between the two groups) we should get a clear picture as to mechanism.

Conclusion

Various nutrients accumulate in the litter in a rapidly progressive manner, but no difference is detectable in groups with and with without Vitacogen (at the level of chemical analysis and in the first four weeks).

Reference

(1) Association for advancement of Agricultural Technique, Japan, May 1984.
(2) Methods of Chemical Analysis for Soil Survey Samples A.J. Metson 1956.
(3) A textbook of soil Chemical Analysis P.R. Hesse 1971.
(4) S.C. Jolly, Official, Standardised and Recommended Methods of Analysis 1963.
(5) Official Methods of Analysis of the Association of Official Analytical Chemists 13 ed. by W. Horwitz 1980.
(6) Manual for Food Composition Analysis Ed. by Toskio Oiso and Kenji Yamaguchl South East Asian Medical Information Centre Tokyo 1985.

Table 1: Comparison of chemical and nutrients composition in sawdust litter with and without bacterial product additive in feeds (Figures represent mean of 4 replicates)

Time of Sampling	Experiment Group	Moisture content %	pH (water)	Electrical conductivity (mmhos/cm)	% dry matter: Total Kjeldahl Nitrogen	Total P_2O_5	Total K_2O	Organic carbon	C:N	Water extracts (mg/Kg dry weight): Total Kjeldahl -N	NH_4^+-N	NO_3^--N	BOD
0 day (fresh sawdust)	Treatment	13.54	5.45	0.69	0.13	0.10	0.19	57.31	443.58	20.81	16.44	0	133
	Control	13.52	4.48	0.45	0.13	0.06	0.16	57.48	463.53	17.16	14.13	0	59
1 week	Treatment	55.06	7.53	1.76	0.63	0.63	0.44	56.96	91.56	324.48	249.60	47.22	2043
	Control	58.76	7.1	1.65	0.57	0.53	0.43	56.82	101.26	304.62	249.3	45.48	1793
2 weeks	Treatment	54.93	7.75	2.65	1.34	1.12	0.82	55.98	42.58	761.28	680.25	67.85	1888
	Control	60.24	7.7	2.94	1.25	1.15	0.87	63.53	45.28	875.62	785.03	82.72	2702
3 weeks	Treatment	53.29	7.28	3.33	1.47	1.62	1.19	55.21	37.75	687.36	596.35	79.93	3573
	Control	60.19	7.13	3.48	1.47	1.46	1.06	55.18	37.62	875.56	755.28	107.1	4261
4 weeks	Treatment	58.79	7.18	4.33	1.5	2.3	1.18	54.37	36.45	700.52	609.32	91.05	3666
	Control	60.12	7.05	3.77	1.45	1.83	1.33	53.9	37.52	808.08	689.46	107.8	3494

Time of Sampling	Experiment Group	Crude Protein	Digestable Protein	Total Aminoacids	Thr	Val	Ile	Leu	Phy	His	Lys	Arg	Total Available Carbohydrate (as glucose)
0 week (Fresh sawdust)	Treatment	0.81	0.12	0.25	0.022	0.024	0.012	0.025	0	0.009	0.015	0	0.40
	Control	0.79	0.13	0.24	0.022	0.025	0.013	0.026	0	0.013	0.015	0	0.31
1 week	Treatment	4.12	2.21	0.97	0.064	0.091	0.052	0.124	0.054	0.016	0.065	0.031	0.80
	Control	3.52	1.73	0.87	0.047	0.079	0.048	0.109	0.015	0.044	0.038	0.017	0.79
2 week	Treatment	8.35	5.13	1.98	0.115	0.173	0.125	0.252	0.087	0.059	0.132	0.054	1.52
	Control	7.80	4.71	1.79	0.144	0.159	0.116	0.210	0.099	0.039	0.083	0.059	1.27
3 weeks	Treatment	9.17	6.33	2.49	0.171	0.205	0.159	0.276	0.073	0.060	0.140	0.081	1.66
	Control	9.17	6.70	1.86	0.108	0.165	0.127	0.229	0.046	0.092	0.121	0.046	1.32
4 weels	Treatment	9.35	6.20	2.96	0.210	0.203	0.145	0.290	0.176	0.065	0.143	0.1475	2.01
	Control	9.08	6.20	2.59	0.190	0.175	0.137	0.257	0.142	0.055	0.140	0.116	1.75