GLUCOSINOLATE-POOR RAPESEED MEAL TO BROILER CHICKS

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INTRODUCTION

Earlier Swedish experiments with rapeseed meal from a variety (Sv 71/6) low in glucosinolate content (1.4 %) have given promising results when fed to growing pigs and laying hens, but when used in feed to broiler chicks the feed consumption was low and hence the production results poor (Lagervall, 1976). In the progressing rapeseed breeding program new cultivars have been developed with even lower glucosinolate content and also better cultivating properties. This made new experiments a matter of urgency especially with broiler chicks.

MATERIALS AND METHODS

A joint German-Swedish project in oil extraction resulted in rapeseed meal from the German glucosinolate-poor cultivar Erglu of 00-type, industrially processed at EXAB, Karlshamn, (EI) becoming available for the present feeding experiment. Since it is of great value to be able to use smaller quantities than those processed in the industrial plant, some Erglu material was also processed in the pilot plant at EXAB (EP). This process differs from the full-scale industrial technique in that the oil extraction is made directly on the crushed seed material without pre-pressing. The relatively high energy content of broiler feeds also justified a study of un-defatted rapeseed (ES). The seed material was heated at 135°C for 20 min. Comparisons were also made with industrially processed rapeseed meal from the low-erucic acid cultivar Brink (B), the most widely grown rapeseed cultivar in Sweden at present. Table 1 shows the analysis data of the different rapeseed materials. The content of antinutritional substances has been analyzed as the two main split products, oxazolidinethione (OZT) and isothiocyanate (ITC), according to Appelqvist & Josefsson (1967). The total glucosinolate content has been calculated from these figures. The unprocessed Erglu seeds contained 0.1 % OZT, 0.1 % ITC and 0.5 % total glucosinolates of solids-not-fat.

Male chickens of the broiler type Ross were used, being day-old at the start of the experiment and slaughtered at 37 days of age. They were housed in cages with 15 birds in each, thus making one replikate each. The feed formulae were made isonitrogenous and isocaloric. Feeding was ad lib. with registration of the feed consumption at the weighings, which were made individually at days 13 and 36, and cage-wise at day 21. At the last weighing the frequency and degree of leg abnormalties were also registered individually. At slaughter one bird from each replicate of four of the experimental treatments was selected and the respective livers and thyroid glands were dissected and weighed.

RESULTS AND DISCUSSION

EI gave quite satisfactory production results, even better than the control without any rapeseed material, but with a slight depression at increasing levels. EP showed significantly ($P < 0.001$) lower weight gains at increasing levels and in comparison with EI, but without effects on the feed conversion.

TABLE 1

CHEMICAL COMPOSITION OF THE RAPESEED MATERIALS AND RESULTS FROM FEEDING EXPERIMENT WITH BROILER CHICKS

	Treatment												
	Control	Erglu, industr. proc. (EI)					Erglu, pilot plant proc. (EP)			Erglu, seeds (ES)		Brink, ind.proc. (B)	
Chem. comp. of rapeseed													
CP, % of d.m.		43.6					43.4			24.4		39.3	
EE, % of d.m.		1.1					1.6			44.9		2.0	
CF, % of d.m.		12.7					13.3			7.3		12.3	
Lys, g/16 g N		6.0					6.2			5.9		6.1	
Met, g/16 g N		2.5					2.6			2.3		2.5	
OZT, % of snf		0.0					0.1			0.0		0.9	
ITC, % of snf		0.1					0.1			0.0		0.4	
Tot. gluc., % of snf		0.4					0.5			0.1		4.3	
RS material, % of feeds	0	5	10	15	20	25	5	10	20	9	18	5	10
Results													
No. of replicates	8	8	8	8	6	6	6	8	8	6	6	8	8
Live weight at 13 d.	258	262	259	248	250	247	253	250	225	256	255	252	246
21 d.	509	519	531	499	510	493	534	495	445	502	509	501	484
36 d.	1246	1271	1279	1258	1264	1251	1288	1240	1151	1225	1197	1216	1208
Feed/gain at 13 d.	1.37	1.38	1.37	1.38	1.41	1.38	1.34	1.41	1.39	1.30	1.36	1.37	1.40
21 d.	1.46	1.44	1.45	1.44	1.50	1.50	1.41	1.49	1.48	1.43	1.41	1.46	1.46
36 d.	1.80	1.78	1.80	1.76	1.83	1.83	1.78	1.81	1.82	1.79	1.79	1.82	1.82
Mortality, %	1.7	0.8	0.8	0.8	5.6	4.4	5.6	6.7	5.8	5.6	5.6	5.8	3.3
Leg abnorm. score	0.39	0.38	0.44	0.44	0.49	0.75	0.52	0.42	0.57	0.47	0.72	0.56	0.73
Liver weight, % of b.w.	2.66		3.51		3.22								3.15
Thyroid weight, % of b.w.	0.07		0.13		0.17								0.15

This might be explained by the milder processing conditions in the pilot plant, with lower pressure and temperatures and shorter heating time, which might possibly be of significance for some antinutritional factors. ES gave some what poorer growth results at the first two weighings and drastically poorer at the final one, but still without affecting feed efficiency. This might possibly have been an effect of the high content of unstabilized fat, which could have become rancid at the end of the experiment and affected the palatability and hence the feed consumption. In accordance with the higher levels of glucosinolates, increasing levels of B resulted in significantly ($P < 0.001$) lower weights at all three recordings, compared with other treatments at the same levels. The feed conversion was also inferior.

Mortality was normal but increased slightly at increasing levels of all four rapeseed materials, but significantly ($P < 0.05$) only for EP. Accordingly, the frequency and degree of leg deformities, expressed together in a leg abnormality score, was significantly higher for the groups with the highest levels of both EI, EP and ES and for both levels of B. Already at the start of the experiment the animals showed some signs of leg weakness and this might have contributed to this clear trend. Nevertheless, this is interesting since it also seems to be a clear effect of feeding the rapeseed. Holmes & Roberts (1963) also reported severe leg deformity when feeding a German rapeseed meal, but not when feeding an Algerian rapeseed meal. The effect was absent after ethanol-extraction of the German meal. Several reports document the complex-binding capacity of different metal ions, especially ZN, by phytic acid. Zn deficiency has been demonstrated to result in leg deformities in chicken (Underwood, 1962).

The livers, expressed as % of body weight, tended to be somewhat enlarged for the treatments on EI and B, but this could not be statistically verified. The thyroid enlargement was, however, significant.

LITERATURE

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