Upper limits of inclusion of canola meal and cottonseed meal formulated on a digestible amino acid basis for chicken meat production

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In Australia, one million tonnes of canola meal (CM) and a quarter million tonne of cottonseed meal (CSM) are annually available to the animal feed industry. However the use of these meals in poultry diets has been seriously restricted due to anti-nutritive factors (ANF). Glucosinolates (GSL), condensed tannins and sinapine, the main ANF found in CM have been responsible for liver damage, leg problems, thyroid enlargement, decreased feed intake (FI), liveweight gain (LWG), and energy utilisation in broilers fed CM at high levels (1). Cyclopropene fatty acids (CPFA), gossypol, condensed tannins and fibre in CSM have been responsible for anaemia and laboured breathing development, binding with lysine during heat processing thus reducing amino acid digestibility and availability (2). Variation in the nutritional value and ANF of these meals would be expected due to location, environmental factors, cultivars, and industry processing conditions. It is well known that in Australia CM is produced from 'double zero' varieties low in ANF; also CSM is derived from cultivars containing little gossypol that would be inactivated by adding soluble iron compounds in the diets (3). In addition, solvent-extracted CSM contains less oil thus reducing the negative effects of CPFA. This study evaluated the upper limits of inclusion of CM and CSM in broiler diets formulated on a digestible amino acid (DAA) basis.

Two broiler experiments evaluated graded levels (100, 200, 300, and 400 g/kg) of Australian CM and CSM formulated on a DAA basis. The results showed that bird performance after 41 days was not significantly ($P > 0.05$) affected by the level of CSM in the diet even when FI was reduced ($P < 0.05$) at inclusions of 200 and 400 g CSM/kg. Since bird liver and pancreas weights were not affected at any level of CSM in the diets; satisfactory broiler performance would be obtained when formulating solvent extracted CSM in broiler diets on a DAA basis with adjusted lysine to 0.6 value. The results with CM showed that FI and LWG were significantly ($P < 0.05$) affected by the level and the source of CM in the diet. Except for the Newcastle source, the overall bird feed conversion efficiency (FCE) was significantly ($P < 0.05$) improved for each source of CM. This experiment demonstrated that substantial amounts of CM could be used in broiler diets formulated on a DAA basis.

Diet	FI (g)	LWG (g)	F C E	Liver weight g	Pancreas weight g
Control	4429^{a}	2493	1.77	2.22	0.212
CSM 100 g/kg	4369^{ab}	2508	1.75		
CSM 200 g/kg	4199^{bc}	2379	1.78	2.31	0.192
CSM 300 g/kg	4280^{abc}	2419	1.77		
CSM 400 g/kg	4198^{c}	2395	1.73	2.30	0.197
LSD (P = 0.05)	153	124	0.04	0.23	0.049

Means within a column with different superscripts are significantly different ($P < 0.05$).

1. Summers, JD. 4th Australian feed enzyme seminar. Finnfeed international/ParmoChem 1996.
2. Fernandez SR, Ye Zhang, Parson CM. Dietary formulation with cottonseed meal on a total amino acid versus a digestible amino acid basis. Poultry Science, 1995; 74: 1168–79.
3. Walkins SE, Skinner JT, Adams MH, Waldroup PW. An evaluation of low-gossypol cottonseed meal for broiler chickens. J. Appl. Poultry Res, 1994; 3: 7–16.