CANADIAN EXPERIENCE WITH THE USE OF RAPESEED MEAL IN RATIONS FOR POULTRY

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Rapeseed meal is widely used in Canada in rations for poultry. This is because of its proven nutritional value and availability at relatively low cost. The following is a brief review of Canadian experience with the use of this feedstuff in rations for poultry.

CHICKENS

GOITROGENIC EFFECTS

Several Canadian workers have reported thyroid enlargement as a result of feeding rapeseed meal to poultry. In general, meal produced from Argentine-type seed (Brassica napus) has been shown to cause a greater degree of thyroid enlargement than meal produced from Polish-type seed (Brassica campestris). This was found to be due to the higher progoitrin content of rapeseed meal produced from B. napus seed as compared to that produced from B. campestris seed.

Rapeseed meal produced from Canadian-grown rapeseed is only slightly goitrogenic. This is because over 80 percent of the rapeseed that is grown in Canada is of the B. campestris type (i.e. the type of seed that is low in progoitrin), and, because during the extraction process sufficient heat is applied early in the process to destroy the enzyme (myrosinase) which is responsible for the conversion of progoitrin to goitrin, the thyroid enlarging factor in rapeseed. However, it would appear, that even in situations where some goitrin is released from the progoitrin in rapeseed meal as a result of incomplete destruction of myrosinase or as a result of myrosinase getting into the mixed feed as a grain contaminant, poultrymen have little to fear from the goitrin released. This opinion is based on the finding in both Canada and Japan that chickens fed fairly high levels of goitrin were, in a period of three to four weeks, able to make compensatory adjustments in their thyroid glands which were believed to result in normal levels of thyroxine secretion.

STARTING AND GROWING CHICKENS

In 1963 and 1964, in our laboratory, fourteen samples of commercial prepress-solvent and solvent-processed rapeseed meal were included in a 23 percent protein broiler ration at the 15 percent level as a replacement for part of the soybean meal in the ration. The rations were kept iso-nitrogenous and iso-caloric. Energy levels were maintained constant by including extra stabilized tallow in the rations containing rapeseed meal. Growth of chicks and feed conversion were equally as good in the rations containing rapeseed meal as in those containing soybean meal. In feeding trials just completed, eight samples of prepress-solvent and solvent-processed rapeseed meal were tested in a 22 percent protein broiler ration at the 15 percent level as a replacement for part of the soybean meal in the ration. The rations were kept iso-nitrogenous and iso-caloric. Again, growth of chicks and feed conversion were equally as good in the rations containing rapeseed meal as in those containing soybean meal, see Table I. The thyroid-to-body weight ratios were slightly higher in the chicks that were fed the rapeseed meal-containing rations than in those fed the soybean meal control ration. However, as previously indicated, this is considered to have no practical significance.

TABLE I

EFFECT OF ISO-NITROGENOUS, ISO-CALORIC REPLACEMENT OF PART OF THE SOYBEAN MEAL IN A BROILER RATION WITH HIGH QUALITY RAPESEED MEAL

Treatments	Protein in Ration %	6-Week Data		
		Average Body Wt. Grams	Grams Feeding/g Gain	mg Thyroid/ 100 g body Weight
Soybean meal control	22.0	796.7	2.16	6.98
Rapeseed meal #1 - 15%	21.8	766.8	2.12	8.92
Rapeseed meal #2 - 15%	21.8	793.1	2.05	9.77
Rapeseed meal #3 - 15%	21.7	771.6	2.10	9.72
Rapeseed meal #4 - 15%	22.1	801.2	2.13	10.95
Rapeseed meal #5 - 15%	22.0	782.1	2.15	15.00
Rapeseed meal #6 - 15%	22.2	792.5	2.14	15.77
Rapeseed meal #7 - 15%	23.0	821.4	2.10	9.16
Rapeseed meal #8 - 15%	22.2	819.4	2.09	10.48
Rapeseed meal - Averages	21.1	793.5	2.11	11.22

METABOLIZABLE ENERGY VALUE FOR CHICKENS

Formulators are cautioned to adjust the energy levels of rations in which rapeseed meal is used to replace soybean meal, since for chickens rapeseed meal contains only about three-quarters as much metabolizable energy as soybean meal (44% protein). Metabolizable energy studies with chickens in our laboratory using the Sibbald and Slinger method of metabolizable energy determination indicate that a metabolizable energy value of 800 kcal per pound (air-dry basis) should be used for rapeseed meal when formulating rations for chickens.

AMINO ACID CONTENT OF RAPESEED MEAL

The fact that 15 percent prepress-solvent or solvent-processed rapeseed meal may be used to replace a corresponding amount of protein from soybean meal for growth promotion is not surprising, since the essential amino acid content of the protein of good-quality rapeseed meal compares favourably with that of the protein of soybean meal, see Table II. From the point of view of the two most limiting amino acids in chick starters based on vegetable protein supplements, i.e. lysine and methionine, rations supplemented with rapeseed meal are likely to be higher in methionine and slightly lower in lysine content than those supplemented with soybean meal.

LAYING AND BREEDING CHICKENS

Recently, studies were completed at our institution in which the performance of duplicate groups of 150 pullets of each of two strains of White Leghorns fed a laying ration containing 2 percent meat meal, 2 percent herring meal and 6.5 percent soybean meal as sources of supplementary protein was compared with that of four similar groups of pullets fed a laying ration containing 2 percent meat meal, 2 percent herring meal and 10 percent solvent-processed rapeseed meal as sources of supplementary protein. The two rations were designed so as to be iso-nitrogenous and iso-caloric. During the first laying year, records were kept on mortality, egg production, egg size, Haugh units, specific gravity of eggs, body weight, feed efficiency, fertility and hatchability. The results obtained (see Table III) indicate that the inclusion of 10 percent solvent-processed rapeseed meal in the laying ration as a replacement for soybean meal increased mortality and decreased egg production and affected certain of the other traits studied to a minor degree. Similar results (Table III)

TABLE II

AMINO ACID CONTENT OF RAPESEED MEAL AND SOYBEAN MEAL

	Rapeseed Meal		Soybean Meal
	Prepress-Solvent(1)	Solvent(2)	Solvent(3)
Amino Acids(4), % of Protein			
Alanine	4.4	4.5	4.2
Arginine	5.6	5.7	6.5
Aspartic Acid	7.0	7.0	11.2
Cystine	1.2	1.2	1.3
Glutamic Acid	18.7	19.0	18.0
Glycine	5.1	5.1	4.6
Histidine	2.7	2.6	2.4
Isoleucine	3.8	3.9	4.7
Leucine	7.0	7.0	7.5
Lysine	5.9	5.9	6.3
Methionine	1.9	1.8	1.4
Phenylalanine	3.8	3.9	4.8
Proline	6.1	6.3	4.9
Serine	4.4	4.4	5.0
Threonine	4.4	4.4	3.8
Tryptophane	1.2	1.3	1.2
Tyrosine	2.3	2.3	2.8
Valine	4.9	5.0	5.0

(1) Eight Samples.
(2) Seven Samples.
(3) Six Samples.
(4) All amino acids except tryptophane were done by a Technicon Amino Acid Analyzer. Tryptophane was done microbiologically.

were obtained in a second experiment in which 10 percent prepress-solvent rapeseed meal was used as a replacement for soybean meal. Hence, it would appear that this level of rapeseed meal in the ration of laying birds is too high. Studies, just completed at the University of Alberta, suggest that 5 percent rapeseed meal in the ration of laying and breeding chickens as a replacement for an equivalent amount of protein from soybean meal may be expected to give good results.

TABLE III

EFFECT OF ISO-NITROGENOUS, ISO-CALORIC REPLACEMENT OF SOYBEAN MEAL IN A LAYING RATION WITH HIGH QUALITY RAPESEED MEAL, SUMMARY OF DATA COLLECTED DURING 20 TO 72 WEEK PERIOD

Strain	Laying Period Treatment	Number Birds 20 Wks.	Mortality %	Av. Production Hen-housed %	Av. Production Hen-Day %	Average Egg Wt. g	Average Egg Haugh Units	Average Egg Specific Gravity	Av. Wt. Females 72 Wks. G	Feed Per Doz. Eggs kg	Average Hatch of Eggs Set %
EXPERIMENT 1											
S	10%RSM	320	6.0	68.2	71.2	58.6	69.2	1.0793	1923	2.26	81.6
D	10%RSM	320	13.7	54.6	58.8	56.2	68.0	1.0788	1786	2.46	82.4
Average			9.8	61.4[a]	65.0[c]	57.4[e]	68.6[g]	1.0791	1855[j]	2.36	82.0
S	SBM	320	4.3	71.2	73.1	59.4	70.0	1.0794	1988	2.30	82.0
D	SBM	320	6.7	59.8	61.8	57.2	69.2	1.0788	1844	2.52	80.8
Average			5.5	65.5[a]	67.4[c]	58.3[e]	69.6[g]	1.0791	1916[j]	2.41	81.4
S	Both	640	5.2	69.7[b]	72.1[d]	59.0[f]	69.6[h]	1.0794[i]	1956[k]	2.28[l]	81.8
D	Both	640	10.2	57.2[b]	60.3[d]	56.7[f]	68.6[h]	1.0788[i]	1815[k]	2.49[l]	81.6
EXPERIMENT II											
S	10%RSM	640	23.8[m]	59.6[n]	72.0[o]	59.3[p]	69.7[q]	1.0770	1873[r]	2.39[s]	84.2
S	SBM	640	12.5[m]	67.0[n]	74.6[o]	60.1[p]	71.5[q]	1.0774	1908[r]	2.29[s]	80.0

[1] In Experiment I the figures for number of birds at 20 weeks represent the total number of females started in the duplicate groups on each treatment and the 10 males included in each duplicate group. In Experiment II the figures for number of birds at 20 weeks represent the total number of females started in the quadruplicate groups on each treatment and the 10 males included in each quadruplicate group.

NOTE: Figures with common superscripts are significantly different from each other ($P \leq 0.05$).

TURKEYS

STARTING AND GROWING TURKEYS

Workers at the Swift Current Station in Saskatchewan reported that the inclusion of 20 percent of expeller-processed rapeseed meal in a turkey starter ration as a replacement for meat meal reduced growth rate. However, the fact that these workers observed white barring in the rapeseed meal fed groups suggests that the rapeseed meal used was low in lysine probably as a result of being exposed to excessive heat during expeller-processing. At the University of Guelph in Ontario it was shown that 10 percent of solvent-type rapeseed meal in the rations of starting and growing turkeys reduced weight gains. On the other hand, at the University of Alberta, use of 10 percent prepress-solvent or solvent-processed rapeseed meal in rations for starting poults as a replacement for soybean meal gave comparable growth results. In view of these contradictory findings, it would appear that more research work should be undertaken to determine the effects of feeding various levels of high-quality prepress-solvent and solvent-processed rapeseed meal to starting and growing turkeys.

LAYING AND BREEDING TURKEYS

In studies on the use of expeller and prepress-solvent processed rapeseed meal in turkey breeding rations as a replacement for soybean meal, workers at the Swift Current station in Saskatchewan found that 10 percent expeller or prepress-solvent processed meal could be used without adverse effects on egg production or feed efficiency. In so far as hatchability was concerned, there were indications that expeller-processed rapeseed meal did not support quite as high hatchability as soybean meal. These workers suggested that the expeller processed meal may have been slightly low in lysine content and that this may have accounted for the difference in the results obtained from the two types of meals. In a two-year study at the University of Alberta in which, in each year, duplicate groups of 72 Broad Breasted turkeys were fed a breeding ration containing meat meal, herring meal and soybean meal as the main supplementary sources of protein and one in which solvent processed rapeseed meal replaced part of the meat meal and herring meal and all of the soybean meal in the ration, no adverse effects on egg production, feed conversion or percentage hatch as a result of the substitution were noted (see Table IV). Hence, it would appear that 10 percent of high quality rapeseed meal may be used in the ration of laying and breeding turkeys.

TABLE IV

PERFORMANCE OF BREEDER TURKEYS FED 10% OF RAPESEED MEAL AS COMPARED TO THOSE FED A CONTROL RATION

	Experiment 1		Experiment 2	
	Control	10% Rapeseed Meal	Control	10% Rapeseed Meal
No. Hens	144	144	162	162
No. Days Production	120	120	129	129
Mortality, %	3	4	2	2.5
Production, Hen-Housed, %	55.5 ± 1.08[a]	55.5 ± 1.08[a]	56.5 ± 1.01[a]	55.0 ± 1.01[a]
Feed Per Doz. Eggs, kg	6.8 ± .23	7.2 ± .23	7.0 ± .11	7.1 ± .11
No. of Eggs Set	4911	4937	2659	2494
Fertility, %	82.7 ± 2.69	79.4 ± 2.69	78.2 ± 2.33	76.5 ± 2.33
Hatch of Fertile Eggs, %	66.6 ± 1.53	72.0 ± 1.53	65.8 ± 3.16	69.6 ± 3.16
Hatch of all Eggs Set, %	55.0 ± 2.57	57.1 ± 2.57	51.4 ± 2.16	53.0 ± 2.16
Daily Water Consumption (g/hen/day)	-	-	443	468

[a] Standard error of means.