INFLUENCE OF RAPESEED MEAL ON THE EATING QUALITY OF CHICKEN

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In Canada, rapeseed meal may be included as a protein supplement in commercial rations for broiler chickens at levels up to 15%. Although many studies have investigated the nutritive value of rapeseed meal and the performance of broilers raised on rapeseed meal (3,4,6), there is very little published information regarding the effect of feeding rapeseed meal at levels (15%) present in some commercial feeds utilized in Canada on the eating quality of broilers. Recently, a report from Australia (9) suggested that feeding greater than 5% rapeseed meal could produce off-flavors in chicken meat. Rapeseed meal has also been implicated in the production of "fishy" eggs laid by certain strains or breeds of hens (5,1,2). Thus, the major purpose of this research was to evaluate the eating quality characteristics of light meat, dark meat and broth samples from broiler chickens fed rations containing 15% Span rapeseed meal.

EXPERIMENTAL METHOD

Three trials were conducted. In each trial, fifty male White Mountain x Hubbard chickens were placed on each of four rations (Table 1): a soybean control ration, SBM; a soybean meal ration, SBMF, with a fiber and fat content comparable to that of the rapeseed meal ration; a 15% Span rapeseed meal ration, RSM; and a 15% Span rapeseed meal ration with 5% herring meal, 0.1% DL methionine, and 0.05% choline chloride, RSMHM. This latter ration was devised to include a high level of methyl groups. The composition of the rations is given in Table 1. At eight weeks of age, the chickens were commercially killed and processed. For each of the three trials, twelve chickens representing each of the ration treatments were randomly selected, packaged and frozen for later evaluation. Thus a total of thirty-six chickens for each ration treatment was evaluated by the trained taste panel. The remaining chickens (432) were frozen for use in a consumer study.

Four chickens representing one from each ration treatment were randomly selected for each of the nine testing sessions. Before cooking, the neck and wing tips were removed from each thawed chicken. All chickens were individually cooked in household ovens at 163°C to an internal temperature of 89°C, using a recording potentiometer. Broth samples were prepared from the wing tips and neck of each chicken using a modified method of ref. (7).

At each panel session six trained panelists evaluated the eating quality of light meat samples obtained from the breast, warm dark meat samples obtained from the thigh and broth samples. The panelists were trained to distinguish differences between the palatability of good quality chicken meat and broth and "fishy" chicken meat and broth over an intensive, seven-week training period prior to the study. A seven-point descriptive scale, (with 7 representing the highest possible score and 1 indicating the lowest score) was used to score the odor and flavor of the light and dark meat samples. Overall acceptability was evaluated on a desirability scale of 7 (extremely desirable) to 1 (extremely undesirable).

The odor and flavor of broth samples were evaluated using a Multiple Comparison Test. Judges scored each of the coded samples in comparison with the reference (SBM control ration) sample. A descriptive five-point scale, with 5 indicating "no difference" from the reference and 1 indicating an "extreme difference" from the reference, was used for scoring.

A consumer study was also conducted to evaluate the eating quality of chickens fed the SBM, RSM and RSMHM rations. One hundred forty-four consumer households received three frozen coded chicken halves, one representing each of the three ration treatments, a questionnaire to discern general information about the consumer population, an instruction sheet and a score-card for evaluation of the chickens. The consumers were instructed to individually drugstore wrap each thawed chicken-half in aluminium foil and cook the three chicken halves on a rack in a baking pan at 176^{o}C until done. The participants evaluated the odor, flavor and overall acceptability of the chickens using a five-point hedonic scale, with 5 representing the highest score.

Data were analysed using analysis of variance. Means within significant sources of variation were compared using Duncan's New Multiple Range Test at the 5% level (8).

RESULTS AND DISCUSSION

Data for odor, flavor and overall acceptability of light and dark meat obtained from chickens fed the four rations are given in Table 2. Scores for odor, flavor and overall acceptability of the light meat and the odor of dark meat from chickens fed the RSMHM ration were significantly lower than the scores for comparable chickens fed the SBM, SBMF and RSM rations, which were similar. The flavor and overall acceptability of dark meat samples taken from chickens fed the RSMHM ration were rated significantly lower than that of comparable samples from broilers raised on the SBM, SBMF and RSM rations. Panelists frequently described the odor and flavor of the light and dark meat from the chickens fed RSMHM ration as "fishy" and "rancid". In addition, dark meat obtained from chickens fed the RSM ration received significantly lower flavor and overall acceptability scores than comparable samples from control chickens (SBM ration). Dark meat taken from chickens fed the SBMF ration received flavor and overall acceptability scores similar to comparable samples from chickens fed the SBM or RSM rations.

Evaluations of broth odor and flavor by the trained panel (Table 2) indicate that the odor and flavor scores for broths prepared from chickens fed the RSMHM ration were significantly lower than the scores for broths made from comparable chickens fed the other three rations. The flavor scores of broths representing the SBMF and RSM rations were similar and significantly lower than the flavor score of the SBM control broth.

Results of the consumer study (Table 3) show that chickens fed the RSMHM ration received significantly lower odor, flavor and overall acceptability scores than comparable chickens fed either the SBM or RSM rations. For all palatability characteristics evaluated, the consumer panelists assigned slightly lower scores to chickens fed the RSM ration than to SBM control chickens, however these differences were not significant. Thus, data from the consumer panel were similar to the trained panel results. Consumers were also asked to rate the cooked chicken samples according to preference. Chickens fed the RSMHM ration were rated significantly lower than chickens fed either the SBM or RSM ration which received similar ratings.

In summary, feeding 15% Span rapeseed meal with 5% herring meal, 0.1% DL methionine and 0.05% choline chloride (RSMHM ration) to broiler chickens had adverse effects on the odor, flavor and overall acceptability of the chicken meat as evaluated by both a trained panel and a consumer panel. Data from the trained and consumer panels also indicate that inclusion of 15% Span rapeseed meal in broiler rations (RSM ration) may have caused a slight decrease in eating quality.

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Table 1. Composition of the rations[1] fed to broiler chickens

	Rations[2]			
	SBM	SBMF	RSM	RSMHM
Ground wheat (13% protein)	62	51.95	53.45	55.05
Wheat shorts	1.67	0.17	0.17	1.97
Stabilized fat	3	6.3	6.3	6.3
Dehydrated alfalfa meal (17% protein)	1	1	1	1
Soybean meal (48.5% protein)	28	31.25	19.75	11.15
Rapeseed meal (36% protein)	-	-	15	15
Herring meal (75% protein)	-	-	-	5
Solka-floc	-	5	-	-
Ground limestone	1.5	1.5	1.5	1.5
Calcium phosphate	1.75	1.75	1.75	1.75
Iodized salt	0.25	0.25	0.25	0.25
Manganese oxide	0.02	0.02	0.02	0.02
Zinc oxide	0.01	0.01	0.01	0.01
A-D premix*	0.25	0.25	0.25	0.25
Broiler vitamin mix*	0.5	0.5	0.5	0.5
Amprol	0.05	0.05	0.05	0.05
DL Methionine	-	-	-	0.1
50% Choline chloride	-	-	-	0.1

[1]Expressed in percentage.

[2]Rations: SBM = Soybean meal (control) ration; SBMF = Soybean meal ration-high fat, high fiber content; RSM = Rapeseed meal ration; RSMHM = Rapeseed meal and herring meal ration with added methyl groups.

*Supplied the following levels per kilogram of ration: Vitamin A, 3000 I.U.; Vitamin D_3, 600 I.C.U.; Vitamin E, 10 I.U.; Vitamin K, 1 mg; Riboflavin, 4 mg; Calcium pantothenate, 5 mg; Niacin, 20 mg; Choline chloride, 60 mg; Folic acid, 1 mg; Vitamin B_{12}, 10 mcg; and DL methionine, 227 mg.

Table 2. Means for subjective evaluations by a trained panel for light meat, dark meat and broth samples from chickens fed the four rations.

Measurements	Rations[2] SBM	SBMF	RSM	RSMHM
Light meat[3]				
Odor	4.6[a]	4.6[a]	4.6[a]	3.4[b]
Flavor	4.8[a]	4.7[a]	4.6[a]	2.7[b]
Overall acceptability	4.7[a]	4.6[a]	4.7[a]	2.7[b]
Dark meat[3]				
Odor	4.2[a]	4.1[a]	4.1[a]	2.6[b]
Flavor	4.5[a]	4.3[ab]	4.1[b]	2.1[c]
Overall acceptability	4.5[a]	4.3[ab]	4.2[b]	2.0[c]
Broth[4]				
Odor	4.4[a]	4.2[a]	4.3[a]	3.3[b]
Flavor	4.3[a]	4.0[b]	4.1[b]	2.8[c]

[2]See footnote 2, Table 1.

[3]Highest possible score, 7 points. Values are the means of 36 judgements by each of six panelists.

[4]Highest possible score, 5 points. Values are the means of 36 judgements by each of six panelists.

[abc]Means within the same row sharing a common superscript letter are not significantly different at $p \leq 0.05$.

Table 3. Means for subjective evaluations by a consumer panel for chicken meat from chickens fed the three rations.

Measurements	Rations[2] SBM	RSM	RSMHM
Odor[3]	3.8[a]	3.6[a]	3.3[b]
Flavor[3]	4.0[a]	3.9[a]	3.4[b]
Overall acceptability[3]	3.9[a]	3.7[a]	3.3[b]
Preference[4]	1.8[b]	1.9[b]	2.3[a]

[2]See footnote 2, Table 1.

[3]Highest possible score, 5 points. Values are the means of 144 determinations.

[4]Three point scale with 1 being "most preferred" and 3 being "least preferred". Values are the means of 142 determinations.

[ab]Means within the same row sharing a common superscript letter are not significantly different at $p \leq 0.05$.

SESSION K / SESSION K / SITZUNG K

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