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The performances of Japanese quail fed on diet prepared with the different level of rapeseed meal

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ABSTRACT

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The current study was carried out to assess the effect of dietary inclusion of Rapeseed meal (RSM) on growth performance of Japanese quails. Day old Japanese quails of either sex (n=150) were distributed randomly into five dietary groups each with three replicates of 10 birds. The birds were maintained under uniform management conditions. Five diets were formulated by inclusion of RSM at 0% (Basal diet, T_1), 10% (T_2), 15% (T_3), 17.5% (T_4) and 20% (T_5) levels by marginal adjustment of other feed ingredients. All the rations were made iso-caloric and iso-nitrogenous. The feed and water were provided *ad lib* and the birds were housed in battery cages during the entire experimental period of 35 days. Results revealed that mean body weights, mean cumulative body weight gains, cumulative feed intake and cumulative feed conversion ratio did not exhibit any significant ($p>0.05$) difference. The digestibility of rapeseed meal decreased significantly ($p<0.05$). The cost of feed per kg live weight also decreased significantly ($p<0.05$) when fed with different levels of rapeseed meal. Based on the results, it can be concluded that Rapeseed meal can be included up to 20% level in diets of quails without affecting production performance.

Keywords: Rapeseed meal, Production parameters, Japanese quails

INTRODUCTION

Poultry meat and eggs contribute to human nutrition by providing high-quality protein and low levels of fat, with a desirable fatty acid profile. The poultry industry in India has experienced rapid and significant growth over the recent decades. In terms of annual production (BAHS,2022) India produced 129.60 billion eggs with a growth rate of 6.19% and 4.78 million tonnes of poultry meat contributing to 51.44% of total meat production with a growth rate of 6.86%.

Presently the poultry production is challenged by increase in the expense associated with feed cost which accounts for 70% of cost of production. The major feed ingredients in poultry feed are soyabean and maize, both reached peak prices recently. As a result of this, there is a requirement to explore underutilized or unconventional feed stuffs such as agro-industrial by-products that can serve as partial or complete replacement for conventional ingredients, this is essential for reducing feed cost. The feedstuffs that gained significance in recent times is rapeseed meal.

Rapeseed belongs to the Brassicaceae family and genus *Brassica*. Rapeseed meal is by-product of oil industry, representing the residue remaining after the removal of oil content from rapeseed. In India, the annual production of rapeseed is 9.1 million tonnes (FAO statistics, 2019).

Rapeseed meal represents a cost-effective protein source (34 to 39 % CP) that exhibits a potential substitute to soybean in quail diets (Mushtaq *et al.,* 2007; Beski *et al.,* 2015). Rapeseed meal not only serves as valuable source of protein but also provides essential vitamins like biotin, choline, folic acid, riboflavin, niacin, and thiamine. Wickramasuriya *et al.* (2015) argued that rapeseed meal possesses an amino acid profile that is comparable to soyabean, while it contains higher levels of methionine and cysteine and lower levels of lysine in comparison with soyabean meal.

MATERIALS AND METHODS

Experimental design

A total of one-hundred-and-fifty-day-old Japanese quail chicks were individually weighed, wing banded. Subsequently they were randomly distributed into five equal groups each comprising of three replicates, with each replicate consist of 10 chicks. The allocation of each group with their respective dietary treatments was also done random. The experiment was carried out throughout the 0-5 weeks of age by providing *ad libitum* feed and water.

Experimental diet

Pretreated rapeseed meal was acquired from feed company. Feed ingredients were acquired from the local market. The proximate composition (AOAC, 2005), calcium and phosphorus (Talapatra *et al.,* 1940) contents were estimated in all major ingredients, before to the formulation of experimental diets. All the feed ingredients were grounded, mixed with in the feed mixing facility affiliated with Department of Animal Nutrition of the institute. Five experimental diets were formulated with 0%, 10 %, 15 %, 17.5 % and 20 % inclusion of rapeseed

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meal in the diet, as shown in Table 1. All the feeds were prepared as per NRC (1994) standards and compound feed also analyzed for proximate principles (Table 2). All the diets in the experiment were formulated to be iso-nitrogenous and iso-caloric. The experiment is approved by institutional animal ethics committee, number: No.8 /IAEC / NTR CVSc /2023

Performance parameters

Bodyweight gains, Feed intake, Feed conversion ratio:

At the beginning (day 0) and on days 7, 14, 21, 28, and 35 body weights and feed residue were recorded, basing on the feed residues the feed intake (FI) levels and feed conversion ratio (FCR) were calculated. Mortality was recorded daily.

Digestibility of nutrients

During the final 3 days of the trial, faeces was gathered from all the five treatment groups, each comprising of 3 replicates. These quails had been previously fasted for 12 hours and weighed daily. The collected faeces were subjected to 18-hour oven drying process approximately at a temperature of about 105^{0}C, with daily weight measurements. After the collection period, the faecal samples obtained from each treatment for each day were combined, ground and thoroughly mixed to achieve a uniform mixture. These faecal samples underwent proximate analysis following established methods outlined (AOAC, 2005) and the resulting data was utilised to calculate the apparent digestibility using the formula below.

Table 1: Ingredient composition of experimental diet (100kg) fed to Japanese quail

Treatment/ (RSM%) Feed ingredients (kg)	T_1(0%)	T_2(10.0%)	T_3(15.0%)	T_4(17.5%)	T_5(20.0%)	Cost/kg(RS)
Maize	51.5	50.4	50.4	50.4	50.4	28.00
Soyabean meal	45	36	31	28.5	26	63.00
RSM	0	10	15	17.5	20	35.00
DCP	1	1	1	1	1	35.00
Shell grit	1.3	1.3	1.3	1.3	1.3	7.00
Salt	0.3	0.3	0.3	0.3	0.3	10.00
Trace mineral*	0.1	0.1	0.1	0.1	0.1	100.00
DL-Methionine	0.1	0.1	0.1	0.1	0.1	360.00
Vit AB2D3	0.02	0.02	0.02	0.02	0.02	410.00
Palm oil	0.5	0.6	0.6	0.6	0.6	100.00
Liver tonic	0.01	0.01	0.01	0.01	0.01	90.00
Lysine	0.06	0.06	0.06	0.06	0.06	180.00
Choline	0.1	0.1	0.1	0.1	0.1	240.00
Coccidiostat	0.01	0.01	0.01	0.01	0.01	450.00
Total	100	100	100	100	100	
Feed cost/kg (Rs)	44.68	42.30	40.90	40.20	39.50	

*Trace minerals contains- Manganese sulphate 55000 mg, Ferrous sulphate 50000 mg, Zinc sulphate 50000 mg, Cobalt sulphate 500 mg, Copper sulphate 3000 mg, Potassium iodide 3000 mg, Sodium selenite 500 mg in 1kg.

Table 2: Chemical composition of experiment diets incorporated with Rapeseed meal at varying levels fed to Japanese quail (Calculated values on DM basis)

Treatment/ (RSM%) Nutrients	T_1(0%)	T_2(10.0%)	T_3(15.0%)	T_4(17.5%)	T_5(20.0%)
DM (%)	91.50	91.08	91.56	91.86	91.10
OM (%)	92.70	92.67	92.08	91.99	91.76
CP (%)	24.13	24.05	24.19	24.25	24.17
EE (%)	2.43	2.67	2.51	2.56	2.59
CF (%)	5.99	6.05	6.23	6.34	6.47
NFE (%)	60.15	59.90	59.15	58.84	58.53
TA (%)	7.30	7.33	7.92	8.01	8.24
ME (Kcal/kg)	2907	2899	2897	2901	2905
AIA (%)	1.97	2.07	2.01	2.05	1.99
Ca (%)	0.96	0.94	0.97	0.91	0.95
TP (%)	0.61	0.55	0.63	0.57	0.59

$$\text{Apparent digestibility coefficient} = \frac{\text{Nutrient in feed} - \text{Nutrient in faeces}}{\text{Nutrient in feed}} \times 100$$

Cost economics

Using current market prices of feed ingredients, an economic evaluation of raising quails up to five weeks of age with inclusion of RSM at various levels in their diets was calculated.

Statistical analysis

The data were statistically analyzed following the guide lines recommended by Snedecor and Cochran (1989). The collected data underwent one way ANOVA, with mean differences being evaluated at a significance level of 5% through Duncan's LSD test. (Duncan,1955).

RESULTS AND DISSCUSION

The body weight gains did not exhibit any significant difference ($p>0.05$) between treatment groups (Table 3). In the line with current findings, Abdel-Moneim *et al.* (2020) and Mnisi and Mlambo (2017) observed that there is no significant impact ($p>0.05$) on body weight gains in quails when supplemented with full fat canola seed and canola meal, respectively. Similarly, Gopinger *et al.* (2014) reported that there is no significant difference in body weight gain in broiler when fed with canola meal.

The feed intake did not exhibit any significant difference ($p>0.05$) between treatment groups (Table 3). In the line with current findings, Sathyanarayana *et al.* (2018) reported that there is no significant impact ($p>0.05$) on feed intake in broilers when supplemented rapeseed meal. Similarly, Gopinger *et al.* (2014) reported that there is no significant difference in feed intake in broiler when fed with canola meal.

The feed conversion ratio did not exhibit any significant difference ($p>0.05$) between treatment groups (Table 3). In the line with current findings, Mnisi and Mlambo (2017) concluded that there is no significant impact ($p>0.05$) on feed conversion ratio in quails when supplemented rapeseed meal. Similarly, Gopinger *et al.* (2014) reported that there is no significant difference in feed conversion ratio in broiler when fed with canola meal.

The digestibility coefficients of organic matter, crude fibre, nitrogen free extract did not exhibit any significant difference ($p>0.05$) between treatment groups (Table 4). But the digestibility coefficients of dry matter, crude protein, ether extract was significantly ($p<0.05$) reduced in birds that were fed with a level of 20% RSM when compared to compared to other treatment groups (Table 4). In the line with current findings, Ashnie *et al.* (2015), concluded that digestibility coefficients of dry matter, crude protein decreased significantly ($p<0.05$) when supplemented with rapeseed meal. Similarly, Gopinger *et al.* (2014) reported that digestibility coefficients of dry matter, crude protein reduced significantly ($p<0.05$) when fed with canola meal.

The RSM generally exhibits lower digestibility, primarily attributed to the presence of enzyme inhibitors

Table 3: Mean (± S.E) Body weight gain, Feed intake, Feed conversion ratio of Japanese quail fed with different levels of RSM (0-5 weeks)

Treatment	BODY WEIGHT GAIN (g)	FEED INTAKE(g)	FCR
T_1	182.27±3.47	515.26±5.50	2.86±0.06
T_2	174.32±4.00	534.76±5.23	3.09±0.05
T_3	176.23±3.63	529.63±5.94	3.03±0.06
T_4	177.24±3.42	524.10±5.24	2.99±0.07
T_5	180.66±3.64	520.18±5.64	2.90±0.11
p	0.417	0.450	0.24

NS ($p>0.05$)

Table 4: Mean (±S.E) digestibility coefficients of proximate constituents of feed of Japanese quail fed with different levels of RSM (0-5 weeks)

Treatment	Dry matter (%)	Organic matter (%)	Crude protein (%)	Ether extract (%)	Crude fibre (%)	NFE (%)
T_1	69.05^{a}±0.23	71.78±0.37	65.11^{a}±0.54	86.05^{a}±0.53	18.46±0.15	80.05±0.71
T_2	68.41^{ab}±0.46	71.41±0.20	64.56^{ab}±0.46	86.00^{a}±0.37	17.40±0.37	79.43±0.22
T_3	68.28^{ab}±0.34	71.26±0.11	63.91^{ab}±0.43	84.78^{ab}±0.20	17.25±0.14	79.28±0.23
T_4	67.52^{bc}±0.52	70.81±0.34	62.73^{b}±0.26	84.25^{b}±0.47	17.09±0.49	79.17±0.48
T_5	67.13^{c}±0.49	70.61±0.43	62.64^{b}±0.33	83.62^{b}±0.28	16.73±0.26	79.11±0.64
P	0.014	0.129	0.032	0.019	0.112	0.624

Values in column bearing different super scripts differ significantly *($p<0.05$), NS ($p>0.05$).

Table 5: Mean (±S.E) cost economics of Japanese quail fed with different levels of RSM (0-5 weeks)

Treatment	COST ECONOMICS				
	Cost of feed/ 100 kg (₹)	Cumulative feed intake	Cost of feed/ bird(₹)	Body weight gain (g)	Feed cost/kg live weight gain (₹)
T_1	4468.5	515.26±5.50	23.02^{a}±0.15	182.27±3.47	126.31^{ab}±1.52
T_2	4230.4	534.76±5.23	22.62^{ab}±0.25	174.32±4.00	129.78^{a}±1.89
T_3	4090.3	529.63±5.94	21.66^{bc}±0.32	176.23±3.63	122.94^{bc}±1.47
T_4	4020.7	524.10±5.24	21.07^{cd}±0.29	177.24±3.42	118.87^{c}±1.77
T_5	3950.7	520.18±5.64	20.51^{d}±0.47	180.66±3.64	113.50^{d}±1.62
p		0.45	0.001	0.417	0.001

Values in column bearing different super scripts differ significantly ** ($p<0.01$), NS ($p>0.05$).

and anti-nutritional factors (ANFs) such as glucosinolates, erucic acids, polyphenolic substances (sinapine and phytate), Non-starch polysaccharides (NSPs), phytic acids and trypsin inhibitors (Tis) (Canola Council of Canada, 2009). The digestibility of RSM can be increased by use of enzymes or emulsifiers or both Wisniewska *et al.* (2023).

A significant ($p<0.01$) decrease in cost of feed per kg live weight gain was observed as the level of rapeseed meal inclusion in the diet increased from 0 to 20 %, with T_5 exhibiting significantly ($p<0.01$) lowest cost when compared to other groups (Table 5). The cost of feed per kg live weight gain in T_5 was ₹. 12.81 less that in T_1 group. The decrease in the cost of feed per kg live weight gain at 20 % rapeseed meal can be attributed to lower cost of rapeseed meal, better feed efficiency and better body weight gains among the quails which are fed with different levels of RSM. The findings are similar with the results of Ashnie *et al.* (2015) and Naseem *et al.* (2006), where the addition of rapeseed meal to the broiler diets yielded the highest net returns. The outcome also was consistent with findings of Sharma *et al.* (2009), who concluded that the inclusion of Rapeseed meal in the diet resulted in higher economic efficiency.

CONCLUSION

Based on the results of the current study it can be concluded that rapeseed meal can be included up to 20 % level diets of quails without affecting production performance and decreased the feed cost/ kg live weight gain.

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