



Growth performance of Pratapdhan chicks fed graded levels of mustard cake

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ABSTRACT

An experiment was conducted to study the effect of feeding graded levels of mustard cake on growth performance of Pratapdhan chicks. Two hundred pooled sex day-old chicks were divided into four dietary groups consisting of five replicates having 10 chicks each. Basal diet comprising of maize-soyabean de-oiled cake was fed to the chicks. The experimental diets were (MC0, control) and mustard cake at 3% (MC3), 6% (MC6) and 9% (MC9) in the ration substituting soya DOC by 10, 13, and 16%. The birds were maintained following standard rearing practices under deep litter system. Inclusion of mustard cake at 3% (MC3) had highest ($p<0.01$) feed consumption (1845.15 g) as compared MC9 (1768.80g) and lowest in MC0 (1752.11g) and MC6 (1748.73). Body weights and gains increased significantly ($p<0.01$) in the group fed 6% mustard cake as compared to other groups. Significant ($p<0.01$) reduction in FCR was observed in MC6 (2.55) as compared to MC0 (3.37), MC9 (3.05) and MC3 (2.98) groups. Inclusion of mustard cake at 6% in the diet was found to be useful in terms of improved weight gains.

Key words: Pratapdhan, Mustard cake, Body weight gain and feed conversion ratio

Amongst the various animal husbandry enterprises, poultry production has secured highest position and attained industrial status in India. It also contributes immensely to the economy of the country. While commercial poultry has major contribution of 70% of total output, the remaining 30% comes from the free range or backyard poultry. Southern region of India has large sized organized poultry sector and contributes majorly towards egg production. Recently, backyard poultry population has increased by about 46% owing to mainly considerable increase in indigenous and improved chicken germplasm. Conversely, backyard poultry contributes only 23 % of total eggs in India. Large population (300-500 million) of indigenous / improved chickens are important livelihood source for rural women.

Conventional poultry rations constitutes food grains, grain by products, oilseed cakes and animal protein supplements. Soyabean cake contains of 46% protein, 4.4% crude fiber, 11.3% moisture, 0.55% fat and about 7% ash and it's an excellent source of lysine, tryptophan and threonine but it is deficient in methionine. Mustard cake is a vegetable protein which has relatively better amino acid composition but its utilization is restricted owing to

presence of anti-nutritional factors (Vaidya *et al.*, 1979; Prasad and Rao, 1982a). The present research work was aimed to evaluate different levels of mustard cake on growth performance of Pratapdhan chicks under sub humid zone of Rajasthan.

Two hundred Pratapdhan chicks were maintained under strict hygienic conditions for rearing of chicks in brooder houses having 10 feet × 10 feet size for brooding of the chicks. Brooder temperature was maintained at 95°F in the first week and gradually reduced to 74°F by the end of the 5th week. Rice husk was used as bedding material. Ten chicks in one of five replicates of each treatment were reared under deep litter system. The chicks were periodically vaccinated following standard vaccination schedule against important diseases. Standard management practices with respect to housing, lighting, feeding and healthcare were followed during the entire experimental period of 8 weeks.

The chicks were allotted to four different groups in five replicates of 10 chicks and fed diets containing mixture of maize, soya DOC, rice bran extraction (DORB) and vitamin premix. The four treatments groups were MC0 (control diet, no mustard cake), MC3 (control diet with 3% mustard cake), MC6 (control diet with 6% mustard cake) and MC9 (control diet with 9% mustard cake). The mustard cake was included in the respective experimental diets at 0, 3, 6 and 9 % replacing 0, 10, 13.34 and 16.67% soybean de-oiled cake. The rations were isocaloric and isonitrogenous with crude protein contents of 20.19, 19.93, 20.13 and 20.46% in different groups.

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The feed ingredients and chemical composition of experimental diets is given below in Table-1.

Table 1. Ingredient and chemical composition of experimental diets

Ingredient Composition				
Ingredients (g/kg)	Treatments			
	MC0	MC3	MC6	MC9
Maize	530	520	510	490
Soya DOC	300	270	260	250
DORB	145	155	145	145
Di Calcium Phosphate	15	15	15	15
Mustard cake	00	30	60	90
Premix	10	10	10	10
Total	1000	1000	1000	1000
Chemical Composition (% on DM basis)				
Dry Matter	89.26	89.68	90.17	90.72
Crude Protein	20.19	19.93	20.13	20.46
Crude Fibre	3.96	4.25	4.02	3.88
Ether Extract	2.37	2.30	2.67	3.15
Nitrogen Free Extract	70.38	70.66	70.10	69.29
Ash	3.10	2.96	3.08	3.22
ME (Kcal/kg)	2819	2815	2821	2814

Vitamin and mineral premix (Premix) provided thiamine, pyridoxine, cyanocobalamine, niacin, pantothenic acid, tocopherol, riboflavin, menadione, retinal and cholecalciferol and zinc sulfate, manganese sulfate, ferrous sulfate and copper sulfate.

Chicks in different treatment groups were weighed at weekly interval from 0 to 8 weeks and weekly and overall weight gain were calculated. The cumulative feed intake for each week as well as for the entire experimental period was recorded. Feed conversion ratio (FCR) was calculated at weekly interval and for the entire growth period up to 8 weeks of age. Data obtained during the experiment were analyzed as per statistical methods by Snedecor and Cochran (1994).

Mean weekly body weight and gain from day-old to eighth week of age is depicted in Table 2 and 3. The day-old weight was non-significant among treatment groups.

Body weight and the body weight gain from first to eight weeks of age in Pratapdhan chicks were highest ($p < 0.01$) in MC6 and lowest in MC0 group. The mean weekly weights increased with age in all the treatment groups. Significantly ($p < 0.01$) higher overall weight gain at 8 weeks of age was found in MC6 (685.83 g) followed by MC3 (619.94), MC9 (581.53) and lowest in MC0 (520.14). Data revealed higher body weight gain at 6% inclusion of mustard cake while it decreased or has no effect when mustard cake was fed at 9%. The body weight gain was increased in MC6 by

Table 2. Body weight (g) of Pratapdhan chicks fed mustard cake

Age in week	MC0	MC3	MC6	MC9	SEM	p-value
Day-old	31.21 $\pm$ 0.19	31.56 $\pm$ 0.25	31.61 $\pm$ 0.56	31.25 $\pm$ 0.19	0.33	0.77
1	53.86 ^{bc} $\pm$ 0.49	54.80 ^b $\pm$ 0.54	64.68 ^a $\pm$ 0.65	52.24 ^c $\pm$ 1.10	0.73	0.0001
2	106.32 ^d $\pm$ 1.27	115.86 ^b $\pm$ 1.82	131.77 ^a $\pm$ 0.98	111.04 ^c $\pm$ 0.94	1.30	0.0001
3	174.18 ^c $\pm$ 1.69	185.22 ^b $\pm$ 2.98	209.42 ^a $\pm$ 2.77	182.98 ^{bc} $\pm$ 5.09	3.37	0.0001
4	251.28 ^d $\pm$ 1.55	272.38 ^b $\pm$ 3.74	306.70 ^a $\pm$ 1.07	261.86 ^c $\pm$ 1.35	2.20	0.0001
5	313.44 ^d $\pm$ 2.04	338.10 ^b $\pm$ 7.79	388.16 ^a $\pm$ 0.70	324.68 ^c $\pm$ 2.60	4.25	0.0001
6	370.50 ^d $\pm$ 2.81	433.88 ^b $\pm$ 2.10	480.18 ^a $\pm$ 1.25	400.24 ^c $\pm$ 2.45	2.23	0.0001
7	455.20 ^d $\pm$ 3.57	543.82 ^b $\pm$ 6.18	592.54 ^a $\pm$ 1.18	505.38 ^c $\pm$ 1.73	3.72	0.0001
8	551.35 ^d $\pm$ 1.24	651.50 ^b $\pm$ 6.44	717.44 ^a $\pm$ 1.84	612.78 ^c $\pm$ 4.74	4.15	0.0001

Table 3. Weekly weight gain (g) in Pratapdhan chicks on feeding mustard cake

Age in week	MC0	MC3	MC6	MC9	SEM	p-value
1	22.65 ^{bc} $\pm$ 0.50	23.24 ^b $\pm$ 0.47	33.07 ^a $\pm$ 0.73	20.99 ^c $\pm$ 1.10	0.74	0.0001
2	52.46 ^c $\pm$ 1.66	61.06 ^b $\pm$ 1.50	67.09 ^a $\pm$ 1.36	58.80 ^b $\pm$ 1.69	1.56	0.0001
3	67.86 $\pm$ 2.78	69.36 $\pm$ 3.37	77.65 $\pm$ 3.25	71.94 $\pm$ 4.89	3.66	0.2837
4	77.10 ^b $\pm$ 1.82	87.16 ^{ab} $\pm$ 4.56	97.28 ^a $\pm$ 2.70	78.88 ^b $\pm$ 4.98	3.75	0.0059
5	62.16 ^b $\pm$ 2.11	65.72 ^b $\pm$ 8.25	81.46 ^a $\pm$ 0.81	62.82 ^b $\pm$ 2.71	4.49	0.0246
6	57.06 ^c $\pm$ 4.53	95.78 ^a $\pm$ 6.88	92.02 ^a $\pm$ 1.39	75.56 ^b $\pm$ 4.54	4.75	0.0001
7	84.70 ^b $\pm$ 3.98	109.94 ^a $\pm$ 5.63	112.36 ^a $\pm$ 1.27	105.14 ^a $\pm$ 2.30	3.69	0.0003
8	96.15 ^c $\pm$ 3.87	107.68 ^b $\pm$ 3.94	124.90 ^a $\pm$ 2.66	107.40 ^b $\pm$ 4.07	3.68	0.0005
Overall gain	520.14 ^d $\pm$ 1.25	619.94 ^b $\pm$ 6.25	685.83 ^a $\pm$ 1.82	581.53 ^c $\pm$ 4.74	4.08	0.0001

Table 4. Weekly feed consumption(g) in chicks fed mustard cake

Age in week	MC0	MC3	MC6	MC9	SEM	p- value
1	42.87 ^c ±0.34	45.91 ^a ±0.41	44.68 ^b ±0.40	46.92 ^a ±0.42	0.39	0.0001
2	100.91 ^c ±0.33	106.08 ^a ±0.35	104.75 ^b ±0.42	104.13 ^b ±0.37	0.37	0.0001
3	161.70 ^c ±0.40	175.93 ^a ±0.35	172.82 ^b ±0.38	172.01 ^b ±0.32	0.36	0.0001
4	235.90 ^b ±0.31	247.01 ^a ±0.33	221.92 ^d ±0.40	231.62 ^c ±0.39	0.36	0.0001
5	257.01 ^b ±0.36	268.15 ^a ±0.38	245.50 ^d ±0.38	250.20 ^c ±0.31	0.36	0.0001
6	256.64 ^d ±0.34	288.43 ^b ±0.27	296.54 ^a ±2.46	275.55 ^c ±0.37	1.26	0.0001
7	317.17 ^b ±0.42	321.14 ^a ±0.43	300.51 ^c ±0.40	316.37 ^b ±0.41	0.41	0.0001
8	379.91 ^b ±0.34	392.50 ^a ±0.37	362.00 ^d ±0.46	372.01 ^c ±0.34	0.38	0.0001
Total Feed Intake	1752.11 ^c ±2.54	1845.15 ^a ±2.42	1748.73 ^c ±4.22	1768.80 ^b ±2.44	3.00	0.0001

31.85% over MC0, 17.93% over MC9 and 10.63% over MC3. The increase in weight gain may be attributed to better utilization of nutrients in MC6 which was reported by Gurjar et al (2025) in a metabolic trial on these birds observed higher ($p < 0.01$) digestibility (%) of CP, CF, EE and NFE in diet having 6% mustard cake. Similar trend was also found for protein and energy efficiency ratios in this treatment.

These results are in accordance with the findings of Tahir *et al.* (2023) who fed mustard cake at 3, 6 and 9% of the diet and found that the supplementation of mustard meal at 3% increased weight and the weight decreased thereafter while the minimum absolute weight was observed on feeding of mustard oil at 9%. However, in present findings, body weight and gain increased up to 6% level and beyond that it did not increase. Sonowal *et al.* (2018) found highest body weight gain in the group fed 10% treated mustard oilcake compared to group fed 20% untreated mustard oilcake. Tripathi and Mishra (2007) reported that hydrolyzed products of glucosinolates inhibit formation of thyroxine, required for maintenance of basal metabolic rate resulting in lowest body weight gain in the group 20% untreated mustard oil cake. However, body weight and gain were improved at 6% in present trial may be attributed to lower level as well as slow growth rate of Pratapdhan chicks as compared to broiler chicks. Dragzbo *et al.* (2019) fed raw and fermented rapeseed cake and found that fermented rapeseed cake at 15 % had a positive

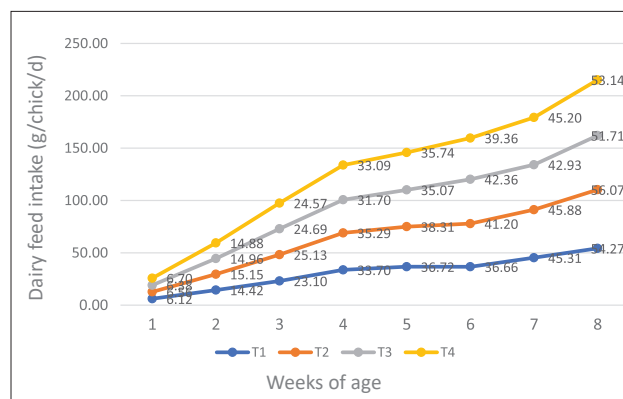


Fig. 1 Daily Feed Intake (g/chicks/d) in Pratapdhan chicks

effect on the body weight of turkey. Rapeseed cake at higher level can compromise growth performance due to presence of toxic factors (Gopinger *et al.* 2014, Amerah *et al.* 2015). Glucosinolates and other toxins present in the cake are considerably reduced by fermentation (Chiang *et al.* 2010). Similar results of higher body weights were obtained on feeding rapeseed cake at 7.5% by Ashnie *et al.* (2015) and at 10% by Tangtaweewipat *et al.* (2004). However, in latter study, the weight gain was increased up to 13% level of replacement of soybean meal with mustard cake and beyond that the body weight was reduced. Gao *et al.* (2020) had also reported found that fermented mustard cake can be fed up to 15% level.

Table 5. Weekly Feed conversion ratio in Pratapdhan chicks fed mustard cake

Age in week	MC0	MC3	MC6	MC9	SEM	p-value
1	1.92 ^c ±0.02	1.98 ^b ±0.01	1.37 ^d ±0.01	2.27 ^a ±0.01	0.01	0.0001
2	1.96 ^a ±0.05	1.75 ^b ±0.07	1.57 ^c ±0.06	1.78 ^b ±0.03	0.05	0.0008
3	2.45 ^b ±0.07	2.60 ^a ±0.02	2.25 ^c ±0.01	2.44 ^b ±0.03	0.04	0.0002
4	3.12 ^a ±0.03	2.95 ^b ±0.02	2.30 ^c ±0.02	2.99 ^b ±0.01	0.02	0.0001
5	4.27 ^b ±0.05	4.45 ^a ±0.04	3.02 ^c ±0.01	4.13 ^b ±0.07	0.05	0.0001
6	4.72 ^a ±0.04	3.10 ^b ±0.02	3.23 ^b ±0.07	4.78 ^a ±0.02	0.04	0.0001
7	4.12 ^a ±0.04	2.95 ^c ±0.02	2.68 ^d ±0.02	3.11 ^b ±0.01	0.03	0.0001
8	4.20 ^a ±0.03	3.81 ^b ±0.03	2.91 ^d ±0.01	3.61 ^c ±0.05	0.03	0.0001
Overall FCR	3.37 ^a ±0.01	2.98 ^b ±0.09	2.55 ^c ±0.01	3.05 ^b ±0.08	0.06	0.0001

Mean feed intake during different weeks is presented in Table 4 while daily feed intake of chick is depicted in Fig 1. It revealed that the feed intake increased with age of chicks in all treatment groups. The feed intake (expressed as g/chick/day) ranged between 6.12 to 54.27 in MC0, 6.56 to 56.07 in MC3, 6.38 and 51.71 in MC6 and 6.70 to 53.14 g in MC9 groups during first to eight weeks of age (Fig 1).

It was found that total feed consumption was highest ($P<0.01$) in MC3 (1845.15 g) compared to MC9 (1768.80 g) and lowest in MC0 (1752.11 g) and MC6 (1748.73 g), the mean values in MC0 and MC6 did not differ. The feed intake in all the groups increased with the age indicating that the supplementation of graded levels of mustard cake had no adverse effect on feed intake up to 9% in the diet of Pratapdhan chicks.

The weekly FCR of birds fed different levels of mustard cake in the diet is presented in Table-5.

The mean overall feed conversion ratio was lowest ($P<0.01$) in MC6. The perusal of data revealed that the supplementation of mustard cake at 6% in the diet did not improve FCR of Pratapdhan chicks up to 8 weeks of age. At the same time, it was also observed that feeding of mustard cake beyond 6% level improved FCR initially but it was at par with the control group where no mustard cake was fed and did not differ with the group having mustard cake at 3% at 8 weeks age.

The total feed intake was lower in MC6 as compared to any other group while the body weight was increased, which may be attributed to better utilization of nutrients. Gao *et al.* (2020) fed raw mustard cake and fermented mustard cake at 15% level and found non-significant effect on feed intake and FCR in different dietary groups. Tangtaweewipat *et al.* (2004) fed 0, 10, 20 and 30 % mustard meal to broiler up to 7 weeks of age and found that the feed intake and FCR increased with increasing levels of mustard meal from 0 to 30% in the diets. Similarly, Tahir (2023) supplemented diets of broiler chicks with mustard seed meal and oil at different levels i.e. 3, 6 and 9% of the diet, but total feed intake had ranged between 2115 to 3976 g in different treatments which was higher than the cumulative feed intake in chicks of the present study which may be attributed to the genetic inheritance as broilers consumed more feed compared to Pratapdhan which is a three-way cross of Mewari, Broiler and RIR.

Smulikowska *et al.* (2006) found that the feed intake and FCR was significantly higher in rapeseed cake extruded group which indicated that the supplementation up to 10 % may be given to broiler chicks without any adverse effects. Sonowal *et al.* (2018) supplemented copper sulphate treated and untreated mustard oilcake and found that the FCR was improved in the group fed 10% treated mustard oil cake as compared to other treatment groups. The higher feed intake and improved FCR may be attributed to the lowest glucosinolates content following copper sulphate treatment of the diet. However, in the present study the feed intake was not affected by the supplementation of mustard cake at 3, 6 and 9% level of intake.

From the present study it may be inferred that incorporation of mustard cake at 6% level in the diet increased body weight and body weight gain and also improved overall feed conversion ratio in Pratapdhan chicks. Supplementation with mustard cake was economical with a B:C ratio 2.17 vs 1.67.

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