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Effect of replacement of maize with graded levels of mango seed kernel powder on immunological parameters in Giriraja birds

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Abstract
An experiment was conducted to study the effect of replacement of maize with graded levels of mango-seed kernel powder on immunological parameters in Giriraja birds during 1 to 8 weeks of age. A total of 150 one day old Giriraja chicks were distributed into five treatment groups with three replicates in each group and ten chicks in each replicate. Basal diet (T_1) prepared following ICAR (2013) and the experimental diets were prepared by replacing maize with mango-seed kernel powder at 2.5 per cent in T_2, 5 per cent in T_3, 7.5 per cent in T_4 and 10 per cent in T_5, respectively. No significant (P>0.05) improvement on immune response against Newcastle disease and Infectious bursal disease on the 56th day of the experiment and also non-significant (P>0.05) difference on immune organ weight. Based on the above results it was concluded that maize can be replaced with mango-seed kernel powder up to 10 per cent in a diet without any adverse effects on immunological parameters in Giriraja birds.

Keywords: infectious bursal disease, immune response, newcastle disease, Giriraja poultry birds

Introduction
Shortage of maize as a source of energy for feeding poultry may be serious cause of concern. Maize being the staple Indian diet and also finding its use in many industrial uses is causing undue pressure on poultry industry. The above situation is likely to cause escalation in the prices of feed for poultry industry. The deficit of feed resources has reflected in improved feeding system, more efficient use of available feeds and use of many unconventional feeds. There is a need to maximize production comparatively at a lower cost. These problems can be solved efficiently by the use of unconventional feeds in poultry diet.

Mango seed kernels are the by products available after mango have been consumed by the human being or are left unutilized after preparation of jams, pickles etc. from the fruit canning industry. The rough estimates show that the availability of kernel may be around one million tonnes per year in India and 20 thousand tonnes per year in Gujarat (Anon, 2002) [1]. Mango seed kernels are poor source of protein and have 1.2% digestible crude protein. However, it is an excellent source of energy containing about 13% ether extract (El Alaily *et al*., 1976) [2] and 77% NFE providing 74% total digestible nutrients (Patel *et al*., 1971) [4].

Kout-Elkloub *et al*. (2019) [3] observed in an investigation was undertaken to study the effects feeding mango seed kernel (MSK) as partially substituting of yellow corn on immunological parameters of Gimmizah cockerels. A total number of 100 Gimmizah cockerels aged 28 days were distributed into four groups. Each group was represented by five replicates (5 cockerels per rep.) from 4-16 week of age. The first group (control) fed the basal diet. The second, third and fourth groups were fed the basal diet with the substitution of yellow corn with MSK with 10, 15 and 20%, respectively. The immunological status was significantly improved due to an increase in globulin, IgG and IgM for cockerels fed diets containing the MSK levels (10%, 15%). It could be concluded that MSK can be used up to 10% without any adverse effect on immunological parameters of Gimmizah cockerels during the growing period.

Materials and Methods
A total of one hundred and fifty, day old Giriraja chicks will be procured from the Department of Poultry Science, Veterinary College, Hebbal, Bengaluru. Chicks will be weighed; wing banded and allocated to five experimental groups each consisting of three replicates with ten chicks each. Basal diet (control) T_1 will be prepared using maize and soya bean meal as per the ICAR (2013) standards with medication as per the requirements from day one to 56 days of

experimental period. For the treatment groups T_2, will be fed with basal diet (control) along with 2.5% Mango seed kernel powder supplementation by replacing maize from day one to 56 days and for the treatment groups T_3, will be fed with basal diet (control) along with 5% mango seed kernel powder by replacing maize up to 56 days. For the treatment groups T_4 will be fed with basal diet along with 7.5% mango seed kernel powder by replacing maize up to 56 days. For the treatment groups T_5 will be fed with basal diet along with 10% powder up to 56 days. Birds will be vaccinated against Newcastle disease and Infectious bursal disease as per the schedule. Feed and water will be provided *ad libitum*. Birds will be reared under standard managemental practices. Blood samples were collected from two birds from each replicate on 56th day. Serum was separated and antibody titres against Newcastle disease and Infectious bursal disease was estimated using HA followed by HI (Allan and Gough, 1974) and using indirect ELISA kit, respectively at the end of trial in treatments groups. At the end of the experiment, two birds from each replicate in each treatment groups were slaughtered to record the weight of lymphoid organs viz., spleen, thymus and bursa of fabricius. The recorded weights were expressed as the per cent of pre slaughter bird weight (% of live weight).

General formula for calculation of per cent relative weight of immune organ is as follows:

$$\text{Organ weight (\%)} = \frac{\text{Organ weight (g)}}{\text{Pre slaughter live weight (g)}} \times 100$$

Results and Discussion

Immunological response - Antibody titres against Newcastle disease and Infectious Bursal Disease

The results of the effect of feeding mango-seed kernel powder on antibody titres against Newcastle disease and Infectious bursal disease during 56th day in Giriraja birds were presented in Table 1.

At the end of 56th day, the antibody titres (Log_{10} HI titre) against Newcastle disease in groups T_1, T_2, T_3, T_4 and T_5 were 1.309, 1.219, 1.119, 1.259 and 1.304, respectively. ANOVA revealed no significant (P>0.05) difference in antibody titre against Newcastle disease among the various treatment groups and also compared to control.

At the end of 56th day, the antibody titres against Infectious bursal disease in groups T_1, T_2, T_3, T_4 and T_5 were 1670, 1645, 1619, 1622 and 1627.83, respectively. Statistical analysis revealed no significant (P>0.05) difference in antibody titres against Infectious bursal disease among the various treatment groups and also compared to control.

Lymphoid organ weights (% of live weight)

The results of the effect of feeding mango-seed kernel powder on per cent relative lymphoid organ weights (% of live weight) at 56th day in Giriraja birds are presented in Table 2.

The weight of spleen (%) on 56th day of the experiment in groups T_1, T_2, T_3, T_4 and T_5 were 0.121, 0.118, 0.124, 0.129 and 0.115, respectively. Statistical analysis revealed no significant (P>0.05) difference in weight of spleen between the treatments and control.

The weight of thymus (%) on 56th day of the experiment in groups T_1, T_2, T_3, T_4 and T_5 were 0.276, 0.265, 0.261, 0.258 and 0.243, respectively. ANOVA revealed no significant (P>0.05) difference in weight of thymus between the treatments and control.

The weight of bursa (%) on 56th day of the experiment in groups T_1, T_2, T_3, T_4 and T_5 were 0.097, 0.102, 0.093, 0.097 and 0.092, respectively. Statistical analysis revealed no significant (P>0.05) difference in weight of bursa between the treatments and control.

There was no significant difference (P>0.05) on immunological response against Newcastle disease and Infectious bursal disease of birds in the groups fed with graded levels of mango-seed kernel powder compared to the control group until the end of the experiment. (56th day).

The present results were also contrary to experiment observed in experiment conducted by Kout-Elkloub *et al*. (2019) observed effects feeding mango seed kernel (MSK) as partially substituting of yellow corn on immunological parameters of Gimmizah cockerels. A total number of 100 Gimmizah cockerels aged 28 days were distributed into four groups. Each group was represented by five replicates (5 cockerels per rep.) from 4-16 week of age. The first group (control) fed the basal diet. The second, third and fourth groups were fed the basal diet with the substitution of yellow corn with MSK with 10, 15 and 20%, respectively. The immunological status was significantly improved due to an increase in globulin, IgG and IgM for cockerels fed diets containing the MSK levels (10%, 15%). It could be concluded that MSK can be used up to 10% without any adverse effect on immunological parameters of Gimmizah cockerels during the growing period.

Table 1: Effect of replacement of maize with graded levels of mango seed kernel powder on antibody titres against Newcastle disease (Log_{10} HI titre) and Infectious bursal disease (ELISA) on 56th day in Giriraja birds.

Experimental group	Description of the treatment	NDV	IBD titre
T1	**Basal diet**	1.309 ± 0.100	1670.50 ± 28.55
T2	2.5% mango seed kernel powder in basal diet with replacement of maize	1.219 ± 0.100	1645 ± 61.92
T3	5% mango seed kernel powder in basal diet with replacement of maize	1.119 ± 0.092	1619 ± 45.83
T4	7.5% mango seed kernel powder in basal diet with replacement of maize	1.259 ± 0.092	1622 ± 30.07
T5	10% mango seed kernel powder in basal diet with replacement of maize	1.304 ± 0.100	1627.83 ± 33.72

Table 2: Effect of replacement of maize with graded levels of mango seed kernel powder on Lymphoid organs weight (% of live weight) (Mean ± SE) in Giriraja birds.

Experimental group	Description of the treatment	Lymphoid organs weight (g/100g body weight)		
		SPLEEN	THYMUS	BURSA
T1	Basal diet	0.121 ± 0.008	0.276 ± 0.016	0.097 ± 0.013
T2	2.5% mango seed kernel powder in basal diet with replacement of maize	0.118 ± 0.022	0.265 ± 0.031	0.102 ± 0.019
T3	5% mango seed kernel powder in basal diet with replacement of maize	0.124 ± 0.031	0.261 ± 0.029	0.093 ± 0.026
T4	7.5% mango seed kernel powder in basal diet with replacement of maize	0.129 ± 0.033	0.258 ± 0.033	0.097 ± 0.009
T5	10% mango seed kernel powder in basal diet with replacement of maize	0.115 ± 0.021	0.243 ± 0.037	0.092 ± 0.019

Conclusion

Effect of replacement of maize with graded levels of mango seed kernel powder in Giriraja birds showed no significant improvement on immune response against Newcastle disease and Infectious bursal disease on the 56th day of the experiment and also showed non-significant (P>0.05) difference on immune organs weight of birds fed with different treatment groups compared to control at the end of the experiment (56th day).

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