Original Research Article

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Effect of Germinated Maize Based Diets on Biochemical Parameters in Kadaknath

Akhelesh Kumar Karoriya, Archana Jain*, M. K. Mehta, Chouhan, Laxmi, Kumar, Rakesh and J. Shakkarpude

Department of Veterinary Physiology and Biochemistry, College of Veterinary Science and A.H., Mhow, Nanaji Deshmukh Veterinary Science University (M.P.), India

**Corresponding author*

ABSTRACT

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Poultry farming is the practice of raising poultry, chicken, turkeys, ducks etc. as an important subcategory of animal husbandry for the production of eggs, meat, feather, etc. Kadaknath is an important Indian poultry breed which has black meat, slow growth rate, smaller body size as well as late sexual maturity. For the increment in the growth of these birds certain feed additives are added to the ration or germination may also increased the nutritive value of maize and other cereals which are main component of the poultry ration. The present experiment was conducted on 128 day old Kadaknath chicks belonging to same hatch and randomly divided into four treatment groups of 32 chicks each viz., T0, T1, T2, and T3. Control group T0 was given standard ration with 100% normal maize based diet. The treatment Groups T1, T2, and T3 were given diets containing standard ration with 50%, 75% and 100% germinated maize, respectively. The significant increase in serum calcium and phosphorus along with significant decrease in alkaline phosphatase and acid phosphatase revealed that the use of germinated maize increase of availability of calcium and phosphorus for better production. A significant decrease in serum cholesterol and significant increase in total protein was also observed in all treated diets as compared to control.

Introduction

Poultry farming is the practice of raising poultry, chicken, turkeys, ducks etc. as an important subcategory of animal husbandry for the production of eggs, meat, feather, etc. Backyard poultry keeping is practiced by

majority of the poor and marginalized rural households all over India. These households rely on low cost backyard poultry rearing to supplement and enhance their livelihoods.

Kadaknath is an important Indian poultry breed, also known as Kalamashi in Hindi, is

known for its black-colored meat, poor egg production, slow growth rate, smaller body size as well as late sexual maturity. The commonly available colours of Kadaknath are jet-black, pencilled and golden. In all the three varieties of Kadaknath breed, most of the internal organs exhibit intense black coloration which is due to the deposition of melanin pigment in the connective tissue of organs and in the dermis (Rao and Thomas 1984). It is being reared by tribal communities in its breeding tract of the Jhabua and Dhar districts in the western region of the state of Madhya Pradesh and in adjoining areas of the states of Gujarat and Rajasthan. Although the meat of this breed has an unattractive appearance, it has a delicious flavor (Panda and Mahapatra, 1989). The flesh of this breed is black, it is considered not only for the delicacy of distinctive taste and flavor, but also of medicinal value.

Maize is one of the main cereals used worldwide in poultry ration. It is free of viscous non-starch polysaccharides, the major anti-nutritive factor present in most other cereals like barley, wheat and oats. At present the feed industry is using maize as a basic energy source in poultry diets. The nutritive value of maize seed depends on the technological processes used, such as milling, oil extraction, starch separation and germination.

The nutritive value of maize and other cereals depends on germination. One of the most important methods to increase the nutritive value of the grains, cereal and oil seeds is to germinate them. The nutritional value of sprouted grains is improved due to the conversion of complex compounds into relatively simpler compounds that are nutritionally more valuable. Sprouting of grains has resulted in increased protein quantity and quality. Sprouting also increases the concentration of certain nutrients including

sugars, minerals and vitamin contents. However, sprouting has resulted in decreased starch contents and dry matter content of grains. It also increases the enzyme contents of grains.

Materials and Methods

The present experiment was conducted on 128 day old Kadaknath chicks belonging to same hatch and randomly divided into four treatment groups of 32 chicks each *viz.*, T0, T1, T2 and T3. Each group was further divided into four replications of 08 birds each. The duration of the experiment was carried out for 240 days. Control groups (T0) was given standard ration with 100% normal maize based diet. The treatment Group T1 was given diet containing standard ration with 50% germinated maize.

The Group T2 was given diet containing standard ration with 75% germinated maize and Group T3 was given diet containing 100% germinated Maize. The experimental birds were vaccinated against Marek's disease, Ranikhet disease and Gumboro disease/IBD at appropriate time. The birds were housed in deep litter system in the well ventilated and lighted rooms and the feed was given *ad.lib.* with plenty of fresh water. The body weight of day old chicks was recorded on arrival and thereafter on weekly intervals.

Blood was collected on every 30th days from each bird. About 3-4ml was collected from wing vein using 22-24 gauge needle in a clean dry vial for biochemical analysis. The blood samples were centrifuged at 3000 rpm for 10 minutes at room temperature and separated serum stored at 4°C till further analysis. The biochemical study was carried out using ERBA standard diagnostic kits. All observations were analyzed by using ANOVA (Snedecor and Cochran, 1994) to compare different treatment group.

Results and Discussion

Calcium and phosphorus

The mean values of Calcium for T0, T1, T2 and T3 were 10.06 ± 0.01 , 11.36 ± 0.01 , 12.36 ± 0.02 and 11.03 ± 0.05 , after 30 days, 10.72 ± 0.05 , 11.63 ± 0.07 , 12.44 ± 0.05 and 11.31 ± 0.03 , after 60 days, 10.97 ± 0.02 , 11.93 ± 0.02 , 12.74 ± 0.01 and 11.66 ± 0.01 , after 90 days, 10.33 ± 0.01 , 12.03 ± 0.04 , 12.96 ± 0.01 , and 11.88 ± 0.02 , after 120 days, 10.32 ± 0.01 , 12.15 ± 0.10 , 13.09 ± 0.02 and 12.12 ± 0.01 , after 150 days, 10.63 ± 0.01 , 12.32 ± 0.05 , 13.34 ± 0.01 and 12.36 ± 0.03 after 180 days, 11.06 ± 0.02 , 12.56 ± 0.03 , 13.74 ± 0.02 and 12.53 ± 0.02 , after 210 days and 11.01 ± 0.01 , 12.93 ± 0.05 , 13.98 ± 0.05 and 12.75 ± 0.02 after 240 days of study, respectively. There was a significant change ($P < 0.01$) in Calcium in treated groups as compared to control group (Table 01 and Figure 01).

The mean values of Phosphorus of T0, T1, T2 and T3 were 11.79 ± 0.01 , 12.24 ± 0.02 , 12.82 ± 0.01 and 11.94 ± 0.02 , after 30 days of study, 11.82 ± 0.07 , 12.76 ± 0.07 , 12.91 ± 0.05 and 12.11 ± 0.04 , after 60 days 11.87 ± 0.01 , 12.87 ± 0.02 , 12.96 ± 0.02 and 12.33 ± 0.01 , after 90 days 11.94 ± 0.02 , 12.92 ± 0.02 , 12.99 ± 0.02 , and 12.68 ± 0.01 , after 120 days 12.00 ± 0.02 , 12.94 ± 0.02 , 13.16 ± 0.04 and 12.82 ± 0.05 , after 150 days 12.06 ± 0.05 , 13.26 ± 0.01 , 13.43 ± 0.02 and 13.03 ± 0.01 after 180 days 12.18 ± 0.05 , 13.49 ± 0.01 , 13.74 ± 0.01 and 13.35 ± 0.05 , after 210 days 12.29 ± 0.01 , 13.94 ± 0.02 , 14.12 ± 0.04 and 13.80 ± 0.01 , respectively, after 240 days of study. There was a significant change ($P < 0.01$) in Phosphorus except for days 30, 60, 90, 150 and 240 days where the level was significance was $P < 0.05$ in all treated groups as compared to control group (Table 01 and Figure 02).

There was a significant ($p < 0.01$) increase in the serum calcium level in all the treated

groups as compared to control groups for germinated maize. The phosphorus concentration was significant ($P < 0.05$) in days 30, 60, 90, 150 and 240 and highly significant after 120, 180 and 210 days of study.

Alkaline and Acid Phosphatase (ALP and ACP)

The mean values of Alkaline phosphatase for T0, T1, T2 and T3 were 153.15 ± 0.02 , 151.20 ± 0.04 , 150.65 ± 0.11 and 151.80 ± 0.04 , after 30 days of study, 153.30 ± 0.07 , 150.77 ± 0.04 , 150.35 ± 0.03 and 151.69 ± 0.08 , after 60 days, 153.64 ± 0.02 , 150 ± 0.05 , 149.96 ± 0.03 and 151.37 ± 0.04 , after 90 days, 153.79 ± 0.04 , 150.29 ± 0.04 , 149.54 ± 0.07 , and 151.15 ± 0.06 , after 120 days, 154.50 ± 0.07 , 150.01 ± 0.04 , 149.38 ± 0.07 and 150.78 ± 0.05 , after 150 days, 153.77 ± 0.04 , 149.83 ± 0.04 , 149.04 ± 0.02 and 150.43 ± 0.13 after 180 days, 153.88 ± 0.03 , 149.43 ± 0.08 , 148.74 ± 0.05 and 150.02 ± 0.10 , after 210 days and 153.80 ± 0.07 , 149.28 ± 0.08 , 148.23 ± 0.05 and 149.88 ± 0.01 , after 240 days of study, respectively. There was a significant change ($P < 0.01$) in ALP except for days 30, 60 and 90 days where the level was significance was $P < 0.05$ in treated groups as compared to control group (Table 02 and Figure 03).

The mean values of Acid phosphatase were 7.87 ± 0.03 , 7.57 ± 0.12 , 6.69 ± 0.01 and 7.69 ± 0.13 , after 30 days of study, 8.16 ± 0.04 , 7.29 ± 0.02 , 6.38 ± 0.03 and 7.16 ± 0.07 , after 60 days 8.14 ± 0.03 , 6.97 ± 0.02 , 6.09 ± 0.02 and 7.05 ± 0.03 , after 90 days 8.06 ± 0.01 , 6.67 ± 0.03 , 5.83 ± 0.04 , and 6.81 ± 0.04 , after 120 days 8.39 ± 0.02 , 6.30 ± 0.04 , 5.45 ± 0.03 and 6.64 ± 0.02 , after 150 days 8.40 ± 0.02 , 6.04 ± 0.04 , 5.31 ± 0.05 and 6.30 ± 0.02 after 180 days 8.42 ± 0.01 , 5.67 ± 0.02 , 5.16 ± 0.02 and 6.19 ± 0.02 , after 210 days 8.19 ± 0.02 , 5.46 ± 0.02 , 5.06 ± 0.03 and 6.06 ± 0.02 after 240 days, respectively, for T0, T1, T2 and T3.

There was a significant change ($P<0.01$) in Acid phosphatase in treated groups as compared to control group (Table 02 and Figure 04). The present study revealed that there was a significant ($p<0.05$) decrease in plasma alkaline phosphatase after 30, 60 and 90 days and acid phosphatase after 30 days, and in remaining days the activities of these enzymes were highly significant ($P<0.01$) in all the treated groups.

Total proteins, Total cholesterol and glucose

The mean values of Total protein for T0, T1, T2 and T3 were 7.01 ± 0.03 , 8.42 ± 0.01 , 9.13 ± 0.03 and 8.12 ± 0.01 , after 30 days of study, 7.05 ± 0.02 , 8.65 ± 0.16 , 9.35 ± 0.01 and 8.40 ± 0.05 , after 60 days, 7.90 ± 0.02 , 8.87 ± 0.03 , 9.30 ± 0.04 and 8.42 ± 0.01 , after 90 days, 7.93 ± 0.01 , 8.57 ± 0.02 , 9.42 ± 0.04 , and 8.33 ± 0.01 , after 120 days, 8.09 ± 0.02 , 8.38 ± 0.01 , 9.42 ± 0.04 and 8.63 ± 0.01 , after 150 days, 8.16 ± 0.02 , 8.41 ± 0.05 , 9.46 ± 0.01 and 8.69 ± 0.02 after 180 days, 8.21 ± 0.01 , 8.70 ± 0.04 , 9.52 ± 0.05 and 8.47 ± 0.14 , after 210 days and 8.32 ± 0.05 , 8.73 ± 0.05 , 9.63 ± 0.02 and 8.51 ± 0.04 after 240 days of study, respectively. There was a highly significant change ($P<0.01$) in Total protein in treated groups as compared to control group (Table 03 and Figure 05).

The mean values of Total cholesterol for T0, T1, T2 and T3 were 125.54 ± 0.63 , 113.58 ± 0.81 , 110.04 ± 0.58 and 113.72 ± 0.02 , after 30 days of study, 129.86 ± 0.23 , 113.98 ± 0.06 , 112.16 ± 0.21 and 112.25 ± 0.05 , after 60 days, 131.59 ± 0.25 , 114.89 ± 0.11 , 112.63 ± 0.21 and 112.12 ± 0.05 , after 90 days, 112.64 ± 0.27 , 114.99 ± 0.07 , 113.73 ± 0.23 , and 112.29 ± 0.04 , after 120 days, 132.74 ± 0.29 , 115.21 ± 0.08 , 113.87 ± 0.23 and 112.89 ± 0.07 , after 150 days, 133.79 ± 0.29 , 115.91 ± 0.08 , 114.33 ± 0.23 and 113.12 ± 0.05 after 180 days, 136.94 ± 0.19 , 113.11 ± 0.03 , 114.47 ± 0.13 and

114.01 ± 0.07 , after 210 days and 134.19 ± 0.29 , 116.71 ± 0.08 , 114.93 ± 0.23 and 114.12 ± 0.07 after 240 days of study, respectively. There was a significant change ($P<0.01$) in Total cholesterol in treated groups as compared to control group (Table 03 and Figure 06).

The mean values of Glucose were 185.68 ± 0.04 , 189.31 ± 0.05 , 191.76 ± 0.02 and 187.21 ± 0.01 , after 30 days of study, 187.95 ± 0.01 , 189.93 ± 0.02 , 192.04 ± 0.01 and 189.12 ± 0.03 , after 60 days, 186.31 ± 0.04 , 191.43 ± 0.02 , 193.96 ± 0.01 and 189.56 ± 0.01 , after 90 days, 187.03 ± 0.03 , 187.03 ± 0.03 , 195.10 ± 0.02 , and 189.52 ± 0.01 , after 120 days, 187.03 ± 0.03 , 195.16 ± 0.01 , 195.32 ± 0.01 and 189.52 ± 0.01 , after 150 days, 189.72 ± 0.05 , 195.46 ± 0.04 , 196.01 ± 0.14 and 190.92 ± 0.05 after 180 days, 184.24 ± 0.01 , 195.12 ± 0.02 , 196.44 ± 0.01 and 191.24 ± 0.02 , after 210 days and 190.74 ± 0.01 , 195.64 ± 0.01 , 196.72 ± 0.02 and 191.25 ± 0.02 after 240 days of study, respectively, for T0, T1, T2 and T3 groups.

There was a significant change ($P<0.01$) in Glucose in treated groups as compared to control group (Table 03 and Figure 07).

The present study revealed a highly significant ($p<0.01$) increase in the level of serum total protein in the entire period of the present study but the levels of total cholesterol was significant ($p<0.05$) decrease in all days of treatment except 210 and 240 days, where the decrease was highly significant ($p<0.01$).

Calcium and Phosphorus

There was a significant ($p<0.01$) increase in the serum calcium level in all the treated groups as compared to control groups for germinated maize. The phosphorus concentration was significant ($P<0.05$) in days 30, 60, 90, 150 and 240 and highly significant after 120, 180 and 210 days of study. This indicated that germinated maize in feed may

have increased activity of phytase enzyme, which may be capable of releasing of calcium and inorganic phosphorus by its action phytic phosphorus (Bound form of phosphorus). So this inorganic phosphorus readily available for

utilization by the body along with increased availability of bivalent ions and trivalent ions like calcium, magnesium, iron and zinc etc. for the growth and other metabolic activities of the body.

Table.1 Effect of germinated maize on biochemical parameters in Kadaknath after 30 to 240 days of study (Mean $\pm$ SE)

Calcium(mg/dl)	30 Days	60 Days	90 Days	120 Days	150 Days	180 Days	210 Days	240 Days
T0	10.06 ^a ± 0.01	10.72 ^a ± 0.05	10.97 ^a ± 0.02	10.33 ^a ± 0.01	10.32 ^a ± 0.01	10.63 ^a ± 0.01	11.06 ^a ± 0.02	11.01 ^a ± 0.01
T1	11.36 ^c ± 0.01	11.63 ^c ± 0.07	11.93 ^b ± 0.01	12.03 ^c ± 0.04	12.15 ^c ± 0.10	12.32 ^c ± 0.05	12.56 ^b ± 0.04	12.93 ^c ± 0.05
T2	12.36 ^d ± 0.02	12.44 ^d ± 0.05	12.74 ^d ± 0.01	12.96 ^c ± 0.01	13.09 ^c ± 0.02	13.34 ^d ± 0.01	13.74 ^d ± 0.02	13.98 ^d ± 0.04
T3	11.03 ^b ± 0.05	11.31 ^b ± 0.03	11.66 ^c ± 0.01	11.88 ^b ± 0.02	12.12 ^b ± 0.01	12.36 ^b ± 0.03	12.53 ^b ± 0.02	12.75 ^b ± 0.02
Phosphorus(mg/dl)	**	**	**	**	**	**	**	**
T0	11.79 ^a ± 0.01	11.82 ^a ± 0.007	11.87 ^a ± 0.01	11.94 ^a ± 0.02	12.00 ^a ± 0.02	12.06 ^a ± 0.05	12.18 ^a ± 0.05	12.29 ^a ± 0.01
T1	12.24 ^c ± 0.02	12.76 ^c ± 0.02	12.87 ^c ± 0.02	12.92 ^c ± 0.02	12.94 ^{bc} ± 0.02	13.26 ^c ± 0.01	13.49 ^c ± 0.01	13.94 ^c ± 0.02
T2	12.82 ^c ± 0.01	12.91 ^d ± 0.05	12.96 ^c ± 0.02	12.99 ^d ± 0.02	13.16 ^c ± 0.04	13.43 ^d ± 0.02	13.74 ^d ± 0.01	14.12 ^d ± 0.04
T3	11.94 ^b ± 0.02	12.11 ^b ± 0.04	12.33 ^b ± 0.01	12.68 ^b ± 0.01	12.82 ^b ± 0.05	13.03 ^b ± 0.01	13.35 ^b ± 0.05	13.80 ^b ± 0.01
	*	*	*	**	*	**	**	*

**Shows Significance at 1% level as compared to control group (P<0.01)

*Shows Significance at 5% level as compared to control group (P<0.05)

Table.2 Effect of germinated maize on biochemical parameters in Kadaknath after 30 to 240 days of study (Mean $\pm$ SE)

Alkaline phosphatase (IU/l)	30 Days	60 Days	90 Days	120 Days	150 Days	180 Days	210 Days	240 Days
T0	153.15 ^a ± 0.02	153.30 ^a ± 0.07	153.64 ^a ± 0.02	153.79 ^a ± 0.04	154.50 ^a ± 0.07	153.77 ^a ± 0.04	153.88 ^a ± 0.03	153.80 ^a ± 0.07
T1	151.20 ^b ± 0.04	150.77 ^c ± 0.04	150.56 ^b ± 0.05	150.29 ^c ± 0.04	150.01 ^a ± 0.04	149.83 ^b ± 0.04	149.43 ^b ± 0.01	149.28 ^b ± 0.08
T2	150.65 ^c ± 0.11	150.35 ^c ± 0.03	149.96 ^c ± 0.03	149.54 ^c ± 0.07	149.38 ^b ± 0.07	149.04 ^c ± 0.02	148.74 ^c ± 0.05	148.23 ^c ± 0.05
T3	151.80 ^a ± 0.04	151.69 ^b ± 0.08	151.37 ^b ± 0.04	151.15 ^b ± 0.06	150.78 ^a ± 0.05	150.43 ^b ± 0.13	150.02 ^b ± 0.10	149.88 ^b ± 0.01
Acid phosphatase (IU/l)	*	*	*	**	**	**	**	**
T0	7.87 ^a ± 0.03	8.16 ^a ± 0.04	8.14 ^a ± 0.03	8.06 ^a ± 0.01	8.39 ^a ± 0.02	8.40 ^a ± 0.02	8.42 ^a ± 0.01	8.19 ^a ± 0.02
T1	7.57 ^a ± 0.12	7.29 ^b ± 0.02	6.97 ^b ± 0.02	6.67 ^b ± 0.03	6.30 ^b ± 0.04	6.04 ^b ± 0.04	5.67 ^b ± 0.02	5.46 ^c ± 0.02
T2	6.69 ^b ± 0.01	6.38 ^d ± 0.03	6.09 ^d ± 0.02	5.83 ^d ± 0.04	5.45 ^c ± 0.03	5.31 ^d ± 0.05	5.16 ^c ± 0.02	5.06 ^d ± 0.03
T3	7.69 ^a ± 0.13	7.16 ^c ± 0.07	7.05 ^c ± 0.03	6.81 ^c ± 0.04	6.64 ^c ± 0.02	6.30 ^c ± 0.02	6.19 ^c ± 0.02	6.06 ^c ± 0.02
	*	**	**	**	**	**	**	**

**Shows Significance at 1% level as compared to control group (P<0.01)

*Shows Significance at 5% level as compared to control group (P<0.05)

Table.3 Effect of germinated maize on biochemical parameters in Kadaknath after 30 to 240 days of study (Mean $\pm$ SE)

Total protein (g/dl)	30 Days	60 Days	90 Days	120 Days	150 Days	180 Days	210 Days	240 Days
T0	7.01 ^a ± 0.03	7.05 ^a ± 0.02	7.90 ^a ± 0.02	7.93 ^a ± 0.01	8.09 ^a ± 0.02	8.16 ^a ± 0.02	8.21 ^a ± 0.01	8.32 ^a ± 0.05
T1	8.42 ^c ± 0.01	8.65 ^b ± 0.16	8.87 ^c ± 0.03	8.57 ^c ± 0.02	8.38 ^b ± 0.01	8.41 ^b ± 0.05	8.70 ^c ± 0.04	8.73 ^c ± 0.05
T2	9.13 ^d ± 0.03	9.35 ^c ± 0.01	9.30 ^d ± 0.004	9.42 ^d ± 0.04	9.42 ^d ± 0.04	9.46 ^d ± 0.01	9.52 ^d ± 0.05	9.63 ^b ± 0.02
T3	8.12 ^b ± 0.01	8.40 ^b ± 0.05	8.42 ^b ± 0.01	8.33 ^b ± 0.01	8.63 ^c ± 0.01	8.69 ^c ± 0.02	8.47 ^b ± 0.14	8.51 ^b ± 0.04
Total cholesterol (mg/dl)	**	**	**	**	**	**	**	**
T0	125.54 ^a ± 0.63	129.86 ^a ± 0.23	131.59 ^a ± 0.25	122.64 ^a ± 0.27	132.74 ^a ± 0.29	133.79 ^a ± 0.29	136.94 ^a ± 0.19	134.19 ^a ± 0.29
T1	113.58 ^a ± 0.81	113.98 ^b ± 0.06	114.89 ^c ± 0.11	114.99 ^c ± 0.07	115.21 ^c ± 0.08	115.91 ^c ± 0.08	113.11 ^a ± 0.03	116.71 ^b ± 0.08
T2	110.04 ^b ± 0.58	112.16 ^c ± 0.21	112.63 ^b ± 0.21	113.73 ^b ± 0.23	113.87 ^b ± 0.23	114.33 ^b ± 0.23	114.47 ^b ± 0.13	114.93 ^a ± 0.23
T3	113.72 ^b ± 0.02	112.25 ^b ± 0.05	112.12 ^b ± 0.05	112.29 ^a ± 0.04	112.89 ^a ± 0.07	113.12 ^a ± 0.05	114.01 ^b ± 0.07	114.12 ^a ± 0.07
	*	*	*	*	*	*	**	**
Glucose (mg/dl)								
T0	185.68 ^a ± 0.04	187.95 ^a ± 0.01	186.31 ^a ± 0.04	187.03 ^a ± 0.03	187.03 ^a ± 0.03	189.72 ^b ± 0.05	184.24 ^a ± 0.01	190.74 ^a ± 0.01
T1	189.31 ^c ± 0.05	189.93 ^a ± 0.02	191.43 ^c ± 0.02	187.03 ^a ± 0.03	195.16 ^c ± 0.01	195.46 ^c ± 0.04	195.12 ^c ± 0.02	195.64 ^c ± 0.01
T2	191.76 ^d ± 0.02	192.04 ^b ± 0.01	193.96 ^d ± 0.01	195.10 ^d ± 0.02	195.32 ^d ± 0.01	196.01 ^d ± 0.14	196.44 ^d ± 0.01	196.72 ^d ± 0.02
T3	187.21 ^b ± 0.01	189.12 ^a ± 0.03	189.56 ^b ± 0.01	189.52 ^b ± 0.01	189.52 ^b ± 0.01	190.92 ^b ± 0.05	191.24 ^b ± 0.02	191.25 ^b ± 0.02
	**	*	**	**	**	**	**	*

**Shows Significance at 1% level as compared to control group (P<0.01)

*Shows Significance at 5% level as compared to control group (P<0.05)

Fig.1 Graph showing effect of germinated maize on calcium (mg/dl) in kadaknath

The value with the different superscripts in a row are different significantly between groups. The value with the no superscripts in a row are having no significant relationship

Fig.2 Graph showing effect of germinated maize on phosphorus (mg/dl) in kadaknath

The value with the different superscripts in a row are different significantly between groups. The value with the no superscripts in a row are having no significant relationship.

Fig.3 Graph showing effect of germinated maize on ALP (IU/L) in kadaknath

Fig.4 Graph showing effect of germinated maize on ACP (IU/L) in kadaknath

The value with the different superscripts in a row are different significantly between groups. The value with the no superscripts in a row are having no significant relationship

Fig.5 Graph showing effect of germinated maize on Total protein (g/dl) in kadaknath

Fig.6 Graph showing effect of germinated maize on Total protein (g/dl) in kadaknath

Fig.7 Graph showing effect of germinated maize on glucose (mg/dl) in kadaknath

Similar observations were also reported by Singh and Khatta (2003), Jain (2008), Osman (2009), Prajapati (2010), Kwari *et al.*, (2012), Jamre (2015), Gautam *et al.*, (2017), and Khan *et al.*, (2017).

Acid and Alkaline Phosphatase

The present study revealed that there was a significant ($p < 0.05$) decrease in plasma alkaline phosphatase after 30, 60 and 90 days and acid phosphatase after 30 days, and in remaining days the activities of these enzymes were highly significant ($P < 0.01$) in all the treated groups. This decrease in acid and alkaline phosphatase enzymes may indicated that sprouted grains given to Kadaknath chicks may increase the activity of some enzymes like phytase, resulted in increased plasma concentration of phosphorus and calcium through liberation of phosphorus, bivalent and trivalent ions, which are readily available to the chicks. All the results reported in the present study were in accordance with the observations reported by Viveros *et al.*, (2002), Fanimola and Akinola (2006), Jain

(2008), Prajapati (2010), Jamre (2015), Gautam *et al.*, (2017) and Khan *et al.*, (2017). In contrast non significant effect was noted by Onifade *et al.*, (1999). Orban *et al.*, (1999) observed that the phosphorus excretion was very much decreased and the phytate phosphorus utilization was increased significantly.

Total proteins, Total cholesterol and glucose

The present study revealed a highly significant ($p < 0.01$) increase in the level of serum total protein in the entire period of the present study but the levels of total cholesterol was significant ($p < 0.05$) decrease in all days of treatment except 210 and 240 days, where the decrease was highly significant ($p < 0.01$). Certain workers (Lee *et al.*, 2010, Demonty *et al.*, 2003) showed that the reduction of the blood's total and LDL cholesterol concentrations with the consumption of products that contain soy protein has been shown repeatedly in humans and several animal models The exact component that is

responsible for this action has yet to be identified. Isoflavone have been proposed to be the active ingredient that is responsible for the hypocholesterolemic effects of soy. One of the study suggested that isoflavonerich soy protein is considerably more effective than isoflavone-depleted soy protein, though this finding is controversial. The cholesterol-lowering effect is one of several proposed mechanisms by which soy reduces the risk of heart disease (Gardner *et al.*, 2001). During germination protease enzymes are activated that convert the protein polymers into amino acids and small peptides (Shewry *et al.*, 1995). These enzymes convert the complex compounds of protein into albumin and globulin thus, improve the quality protein. They also improve the lysine content of grains (Chavan and Kadam, 1989). Activation of amylase and lipase during germination increases the sugar and essential fatty acid content of grains (Chavan and Kadam, 1989).

The glucose concentrations were highly significant ($p < 0.01$) of the entire study period in germinated maize supplemented group except on Days 60 and 240 where it was significant at $p < 0.05$. The observations for total proteins, total cholesterol and glucose in the present study were in accordance with the findings of El-Deek *et al.*, (2009), Osman (2009), Lee *et al.*, (2010), Gautam *et al.*, (2017) and Khan *et al.*, (2017). On the contrary, Jain (2008), Manwar and Mandal (2009) and Prajapati (2010) found no significant effect on the above parameters in treated groups as compared to control.

From the present study, it is concluded that supplementation of germinated maize in feed of kadaknath layer birds had very good effect on availability of protein, calcium, and phosphorus, along with certain enzymes and also there was a decreasing trend in total cholesterol, specially at the level of 50% and 75% germinated maize as compared to the

non-germinated maize based diets. Germination of grains may cause activation of different enzymes eg. protease, which convert the protein polymers into amino acid and small peptides. They may also improve the lysine content of grains and make feed more nutritive and palatable to Kadaknath. Phytase made available the bi and tri- valent ions like calcium and phosphorus and beta glucanase affects the availability of energy by fiber digestion.

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