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# Effect of Incorporation of Rice DDGS on Serum Biochemical Profile, Carcass Characteristics and pH in Japanese Quail Diets

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**ABSTRACT**

The present study was carried out to study the effect of dietary incorporation of rice DDGS on serum biochemical profile and carcass characteristics of Japanese quails. Day old Japanese quails (n=180) were distributed randomly into five dietary groups each with three replicates of 12 birds and were maintained under uniform conditions. Experimental diets were prepared with incorporation of rice DDGS at 0% ($T_1$: control), 5% ($T_2$), 10% ($T_3$), 15% ($T_4$) and 20% ($T_5$) levels by marginal adjustment of other feed ingredients. All the rations were made iso-caloric and iso-nitrogenous. Feed and water were provided *adlibitum*. The birds were housed in battery cages during the experiment period of 0-5 weeks. Findings revealed that serum total protein was significantly ($p<0.05$) increased with increasing levels of rice DDGS. Whereas, Serum albumin, globulin and Albumin Globulin ratio were not affected by level of rice DDGS. But, serum total cholesterol was significantly decreased ($p<0.05$) with increasing levels of rice DDGS. The carcass traits like live weight and carcass weight were significantly ($p<0.05$) increased with increasing levels of rice DDGS. On other hand, incorporation of rice DDGS from 0 to 20% in diet had no significant effect on dressing percentage, liver, heart, gizzard and giblet weights. The meat quality parameter *i.e.,* pH of meat of quails revealed that incorporation of rice DDGS up to 20% level had no effect. Rice DDGS can be incorporated at 20% level in diets of quails without having any adverse effect on serum profile, carcass traits and pH.

**HIGHLIGHTS**

- Rice DDGS is an unconventional feed source used in quail ration which decreases serum cholesterol and increases serum total protein.
- Use of rice DDGS helps in achieving good dressing percentage in quails.

**Keywords:** Rice DDGS, serum biochemical profile, carcass characteristics, pH

Feed is the single largest expense in poultry production, accounting up to 70% of total cost (Filgueira *et al*., 2014). Availability of soya and corn for feed could be a major challenge for the poultry industry (Mark and Vijay, 2016). Soybean meal is the major proteinic ingredient utilized in poultry diet. Due to scarcity of soybean, there is a need to utilize locally available alternate protein ingredients. The ingredient that gained importance in recent times is Distiller's Dried Grain with Solubles (DDGS).

The DDGS is co-product of the ethanol industry produced during the dry milling process. Availability of DDGS is increasing as ethanol is used as biofuel. The DDGS contain all the nutrients from grain in a concentrated form except for the majority of the starch, which has been utilized in the fermentation process during ethanol production. Rice DDGS has moisture (%) 8.28, DM(%) 91.72, CP(%) 45, EE(%) 4.49, CF(%) 4.89, TA(%) 10.22, NFE(%) 27.12,

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AIA(%) 4.28, Ca(%) 0.73, P(%) 0.77 and GE (kcal/kg) 4097 (Gupta *et al*., 2017). DDGS contain approximately 6% yeast biomass which is rich in mannans, there may be anti-nutritional effects associated with mannans (Radfar *et al*., 2013). Rice DDGS also have yeast enzyme (probiotic factor) which increases the level of production (Gupta *et al*., 2017). Rao *et al*. (2016) and Gupta *et al*. (2016) found diets with 10% rice DDGS was safe for broilers and layers respectively.

Most of the researches are limited to feeding value of corn, wheat, sorghum, barley based DDGS with very scanty reports on rice DDGS in quails. So, the present study was conducted to know the efficiency of rice DDGS by incorporating in the diets of Japanese quails.

## MATERIALS AND METHODS

### Serum biochemical profile

Blood samples were collected from two birds/ replicate at the end of the experiment into anticoagulant free vials and allowed to clot so that the serum got separated. The separated serum was then made clear by centrifugation at 3000 rpm for 10 minutes and stored in a refrigerator for estimation of serum parameters.

### Estimation of serum total protein

Serum total proteins were estimated by using a diagnostic kit (Coral clinical systems) following the Biuret method.

### Estimation of serum albumin

Serum albumen was estimated by using a diagnostic kit (Coral clinical systems) following BCG method.

### Estimation of serum globulin

Serum globulin was estimated by subtracting obtained albumin values from obtained total protein values. Assuming that the fibrinogen concentration was negligible and almost same in both the groups.

### Albumin globulin ratio

Albumin Globulin ratio was calculated from obtained albumin and globulin values.

$$\text{Albumin: Globulin ratio} = \frac{\text{Concentration of albumin}}{\text{Concentration of globulin}}$$

### Estimation of serum total cholesterol

Serum cholesterol was estimated colorimetrically by using a diagnostic kit (M/s. ERBA) by enzymatic method of Allian *et al.* (1974) for *in vitro* estimation.

### Carcass characteristics

At the end of the trial period (5$^{th}$ week), two birds per replicate and thus a total of six birds per treatment were randomly selected, weighed and slaughtered. Individual weights of eviscerated carcass (*i.e*., carcass yield) and edible organs like liver, heart and gizzard were collected and weighed. Thus relative weights (% of live body weight at slaughter) of carcass yield plus total edible organs were calculated.

### Estimation of pH

pH of the meat sample was determined by following the method of Trout *et al*. (1992) using deluxe digital pH meter (model 101E). Representative sample of 5g was homogenized with 45 ml of distilled water in a laboratory blender for about one minute. The pH was recorded by immersing the combination glass electrode of digital pH meter in the homogenate. Before the measurement of pH, the pH meter was calibrated with buffer solutions of pH 4 and pH 7 as per user manual instructions to avoid errors.

## STATISTICAL ANALYSIS

Statistical analysis of the data was carried out according to the procedures suggested by Snedecor and Cochran (1989). The data obtained were subjected to one- way ANOVA. Differences between means were tested at the 5% probability level using Duncans, (1955) LSD test.

## RESULTS AND DISCUSSION

### Serum total protein

In the present study, serum total protein level significantly ($p<0.05$) increased with increasing levels (0, 5, 10, 15 and 20%) of rice DDGS in the diet of quails. Similarly, Gupta

*et al.* (2017) in CARI Sonali layers reported significant increase ($p<0.01$) in serum protein by incorporating rice DDGS with and without enzyme.

**Serum albumin**

The present study revealed incorporation of varying levels (0, 5, 10, 15 and 20%) of rice DDGS in the diet of quails showed non-significant difference ($p>0.05$) in serum albumin level. Similarly, Gupta *et al.* (2017) results explained that, there was no significant difference ($p>0.05$) in the level of serum albumin by incorporating rice DDGS without and with enzymes at 0, 5, 7.5 and 10% level in 45 week old CARI Sonali layers.

**Serum globulin**

In the present study, incorporation of graded levels (0, 5, 10, 15 and 20%) of rice DDGS in the diet of quails had no effect ($p>0.05$) on serum globulin level. Similarly, Gupta *et al.* (2017) reported no significant difference ($p>0.05$) in the level of globulin by incorporating rice DDGS (0, 5, 7.5 and 10%) in CARI Sonali layers.

**Albumin globulin ratio**

The present study revealed that incorporation of varying levels (0, 5, 10, 15 and 20%) of rice DDGS in quails showed non-significant difference ($p>0.05$) in A/G ratio. The present study values ranged between 0.57 to 0.80. The obtained values are within the normal range (Agina *et al.,* 2017).

**Serum Cholesterol**

Serum cholesterol has significantly ($p<0.05$) decreased in quails with increasing levels of DDGS in the diet. The findings are very much in line with Karadagoglu *et al*. (2015) in quails and Dinani *et al.* (2019a) in broilers when fed with corn DDGS and rice DDGS, respectively at 15% level. Similarly, Gupta *et al.* (2017) reported non-significant ($p>0.05$) decrease in the level of serum cholesterol by incorporating rice DDGS with and without enzyme in CARI Sonali layers.

**Carcass Characteristics**

Pre slaughter live weight showed a significant ($p<0.05$) increase with increase in rice DDGS level (0, 5, 10, 15 and 20%) when compared with control. However, Gacche *et al.* (2016) reported non significant difference ($p>0.05$) in pre slaughter live weight of broilers at 0, 10 and 20% levels of DDGS when replaced soybean meal in the diet.

In the present study, feeding varying levels (0, 5, 10, 15 and 20%) of rice DDGS showed no significant effect ($p>0.05$) on liver, heart, gizzard weight in quails. These findings were similar with Dinani *et al.* (2018) in broilers by incorporation of rice DDGS @ 12.5 and 15% along with protease, xylanase and multi enzymes supplementation. Increased levels of inclusion of rice DDGS from 0 to 20% in the diet of quails had no effect on relative weight of giblets. The results obtained were similar with Youssef *et al*. (2013) in broilers with inclusion of DDGS at 0, 5, 10 and 15% DDGS. In contrast Dinani *et al.* (2018) reported significant ($p<0.01$) decrease in giblet weight at 15% level when compared with 0 and 12.5% levels of rice DDGS.

**Table 1:** Mean (± S.E) serum biochemical profile of Japanese quail fed with different levels of rice DDGS from day old to 5 weeks

| Treatment | Total protein (g/dl) | Albumin (g/dl) | Globulin (g/dl) | AG ratio | Cholesterol (mg/dl) |
|---|---|---|---|---|---|
| $T_1$ (0%) | $3.55^{b}$±0.29 | 1.54±0.17 | 2.01±0.42 | 0.75±0.45 | $175.55±6.92^{a}$ |
| $T_2$ (5%) | $3.91^{ab}$±0.22 | 1.44±0.06 | 2.47±0.20 | 0.60±0.05 | $162.69±9.16^{ab}$ |
| $T_3$ (10%) | $4.24^{ab}$±0.35 | 1.82±0.09 | 2.42±0.30 | 0.80±0.08 | $160.46±10.10^{ab}$ |
| $T_4$ (15%) | $4.42^{a}$±0.20 | 1.55±0.13 | 2.88±0.22 | 0.57±0.09 | $146.96±10.12^{b}$ |
| $T_5$ (20%) | $4.66^{a}$±0.16 | 1.65±0.16 | 3.00±0.28 | 0.59±0.10 | $136.58±7.76^{b}$ |
| SEM | 0.13 | 0.06 | 0.14 | 0.10 | 4.46 |
| N | 6 | 3 | 3 | 3 | 3 |
| P value | 0.038(*) | 0.313(NS) | 0.163(NS) | 0.216(NS) | 0.045(*) |

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

**Table 2:** Mean (±S.E) carcass traits and pH of Japanese quail fed with varying levels of rice DDGS from day old to five weeks

| Treatment | Live weight(g) | Carcass weight (g) | Heart (g) | Liver(g) | Gizzard (g) | Giblet weight (g) | Dressing % | $P^H$ |
|---|---|---|---|---|---|---|---|---|
| $T_1$ (0%) | 181.83±3.36[b] | 125.59±2.28[b] | 1.73±0.12 | 4.72±0.18 | 3.73±0.27 | 11.51±0.38 | 69.10±0.89 | 6.16±0.04 |
| $T_2$ (5%) | 187.83±2.56[ab] | 132.42±2.49[ab] | 2.06±0.11 | 5.91±0.49 | 3.53±0.19 | 10.81±0.59 | 70.51±1.04 | 6.18±0.04 |
| $T_3$ (10%) | 198.64±5.58[a] | 140.52±5.84[a] | 2.11±0.21 | 4.74±0.52 | 3.96±0.28 | 11.82±0.80 | 70.60±1.06 | 6.10±0.04 |
| $T_4$ (15%) | 200.68±2.24[a] | 141.69±0.79[a] | 1.90±0.09 | 6.32±0.20 | 3.60±0.17 | 11.35±0.23 | 70.66±1.08 | 6.08±0.04 |
| $T_5$ (20%) | 200.40±6.76[a] | 141.34±4.77[a] | 1.98±0.15 | 5.57±0.59 | 3.81±0.31 | 11.13±0.86 | 70.55±0.94 | 6.08±0.03 |
| SEM | 2.34 | 1.94 | 0.06 | 0.21 | 0.11 | 0.28 | 0.43 | 0.02 |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| P value | 0.017(*) | 0.018(*) | 0.363(NS) | 0.053(NS) | 0.773(NS) | 0.381(NS) | 0.782(NS) | 0.193(NS) |

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

Carcass weight showed a significant ($p<0.05$) increase with increase in rice DDGS level (5, 10, 15 and 20%) when compared with control. Similarly, Dinani *et al.* (2018) observed no significant difference ($p>0.05$) in eviscerated percentage in broilers by feeding rice DDGS.

In the present study, feeding varying levels (0, 5, 10, 15 and 20%) of rice DDGS showed no significant effect ($p>0.05$) on dressing percentage in quails. The results were similar with observations of El-Abd (2013), Konca *et al.* (2011), Karadagoglu *et al*. (2015) in quails and Dinani *et al.* (2018) in broilers who reported non-significant difference ($p>0.05$) in dressing percentage when fed with corn DDGS and rice DDGS, respectively.

### pH of meat

The present study revealed that incorporation of rice DDGS up to 20% in the diet had no effect on pH value of meat in quails. The results were similar with the findings of Lukasiewicz *et al*. (2012), Min *et al.* (2012) and Zhang *et al.* (2013) who reported non-significant difference ($p>0.05$) when DDGS was included in diets of broilers.

## CONCLUSION

The results concluded that rice DDGS can be incorporated up to 20% level in diets of Japanese quails without any adverse effects on serum biochemical profile, carcass characteristics and pH.

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