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Effect of dietary incorporation of pea (*Pisum Sativum* L.) pods residue powder by replacing rice polish on haemato-biochemical parameters in commercial broiler chickens

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Abstract
A feeding trial was conducted to discern the effect of dietary incorporation of pea (*Pisum sativum* L.) pods residue powder on haemato-biochemical parameters in commercial broiler chickens. 120 (one day-old) broiler chicks divided into four treatment groups with three replicates of 10 chicks in each for 42 days *viz.*, 0-21 days (starter phase) and 22-42 days (finisher phase). The groups were T_1 (control) having no any replacement where as T_2, T_3 and T_4 were incorporated with pea pods residue powder at 50, 75 and 100 per cent levels by replacing rice polish, respectively. No significant difference was observed in haematological parameters among different treatment groups and all the values were in normal range. The serum cholesterol, triglycerides, glucose, albumin, globulin, alkaline phosphatase (ALP) and glutamate oxaloacetate transaminase (SGOT) have no significant difference among the different treatment groups. Whereas total protein was significantly ($P<0.05$) higher in T_3 (3.60 g/dl) and T_4 (3.40 g/dl) as compared to T_2 (2.67 g/dl) and T_1 (2.84 g/dl). A significant decrease was recorded in SGPT enzyme among the treatment groups. Serum SGPT levels were observed to significantly decreases with incorporation of pea pod residue powder in T_2 (19.74), T_3 (19.15) and T4 (19.01) groups as compare to T_1 (21.95 U/L) groups respectively. Therefore, it could be concluded that incorporation of pea (*Pisum sativum* L.) pods residue powder in the diets of commercial broiler chickens had higher level of total protein and lower level of SGPT enzyme in serum.

Keywords: pea pods residue, rice polish, triglycerides, cholesterol, total protein, albumin, globulin, commercial broiler chickens

1. Introduction
In India, poultry sector has experienced an exemplary switch in structure and action of functioning from basic backyard rearing to major commercial agricultural based industry. Broiler industry is thought out be among the rapidly growing agro based industry in India. As per 20th Livestock census, poultry population has increased from 729.21 million to 851.81 million during the year 2012 to 2019. Feed is a major factor affecting net income from the poultry business, because approximately 70-80% of the total cost of poultry production is due to feed (Asghar *et al.*, 2000) [2]. The contribution of poultry production in our country is about 0.66% its GDP and 7.72% GDP of the livestock sector. (Prabakaran, 2014; Rajenderan *et al*., 2014). Due to rapid growth in poultry production the per capita availability for a year has also raised considerably and reached to 60 eggs and 2.5 Kg of meat. There may be huge problem of disposing by-products generated by plant food processing industries although these by-products are important sources of nutrients. These by-products act as possible source of functional feeds.

In India, yearly production of pea pod is more than one million tons out of which sizeable quantity discarded as waste. Pea pods which otherwise are discarded in bins or as animal feed and thus exploited for their nutritional benefits. Pea pods contain many nutrients like protein, sugars, minerals and vitamins. The pea pods contain protein 10.8%, fat 1.3%, sucrose 7.9%, glucose 11.9%, fructose 1.2%, starch 3.7%, and dietary fibre 58.6% on dry matter basis as well as iron (1.20%) which is higher than potassium (1.03%) (Mateos-Aparicio *et al*., 2010). Pea pod contains dietary fibre as a major constituent. Dietary fibre plays an important role in many physiological processes and in the prevention of diseases (Jones *et al*., 2006) [10]. Pea pod powder produced is also use as a prospective dietary fiber supplement in biscuits with sugar replaced by jaggery to further enhance the nutritive value (Garg, 2015) [7].

Many people consume it as pea pod soup as it contains vitamins A and C for immunity, and phytosterols to regulate cholesterol. They are also good sources of vitamin K, iron, and copper to build blood as well as calcium for bone health. Pea pods produce a mellow juice, which can be taken with apple and lemon.

Presently there is very less information available about feeding of pea pods residue powder as feed additives in commercial broiler chickens. Rice polish is commonly used in poultry diets as a conventional feed ingredients. Though both of these feed additives have been fed separately in various experiments, but information about combined feeding of these feed additives and /or feed ingredients is not available. Therefore the objective of the present study was to investigate the effect of powder of pea pods residue by replacing rice polish on haemato-biochemical parameters in commercial broiler chickens.

2. Materials and Methods

A total of 120, day-old commercial broiler chicks were procured from R. K. Poultry, Bajpur, Uttarakhand were randomly distributed into 4 treatment groups with 3 replication having 10 chicks in each in a completely randomized design. The broiler chicks' in-group T_1, were fed basal diet (control) whereas chicks of group T_2, T_3 and T_4 were fed basal diet incorporated with 50%, 75% and 100% replacement of rice polish with pea pods residue powder, respectively. The feeding trial lasted for 42 days viz., 0-21 days (starter phase) and 21-42 days (finisher phase). The ingredient compositions of diets are presented in Table 1. The birds were vaccinated for RD vaccine (F- strain) on 7th day, IBD vaccine on 14th day and ND vaccine (*Lasota* strain) booster on 28th day. The feed offered daily to birds in different treatment groups was weighed and recorded.

2.1 Procurement of pea pods residue powder

Pea pods residue bought from Pantnagar shopping market and dried under ambient temperature After this the required amount of was weighed with weighing machine and grounded in mixer to convert it into powder of smaller particle size.

2.2 Blood collection and analysis

Blood samples were collected at the end of feeding trial (42nd day). Blood sample (about 3.0 ml) was collected aseptically from the wing vein with sterile needle into well labeled blood collecting vials containing EDTA which act as anticoagulant for hematological analysis.

2.3 Hematological parameters

Haemoglobin concentration (g/dl) was estimated following the method described by Sharma and Singh (2000) using Sahli's haemoglobinometer with acid haematin method. Micro haematocrit method was used to estimate PCV as described by Sharma and Singh (2000). Total erythrocyte counts (TEC) and total leucocytes count (TLC) was performed with Neubauer's counting chamber as described by Jain (1986) [8].

2.4 Serum biochemical parameters

Cholesterol concentration in serum was estimated spectrophotometrically using Erba diagnostic kit with Enzymatic CHOD-PAP (cholesterol oxidase - phenol + amino phenazone) method at 505 nm wavelength (Tietz, 1998). Serum triglycerides were estimated using Autospan diagnostic kit based on the method of Wako and the modifications by McGowan *et al*. (1983) at 505 nm wavelengths. Estimation of serum glucose was conducted by enzymatic GOD-POD (glucose oxidase- peroxidase) method with using Autospan diagnostic kit at 505 nm wavelength against blank reagent (Sacks, 1998). Total protein concentration in serum was estimated by biuret method using Erba diagnostic kit at 540 nm wavelength (Johnson *et al*., 1999) [9]. Albumin concentration in the serum was estimated by bromocresol green end point assay method with the aid of AUTOSPAN diagnostic kit at 630 nm wavelength (Johnson *et al*., 1999) [9]. The serum albumin content was subtracted from serum total protein content to arrive at serum globulin content. For the estimation of serum glutamate pyruvate transaminase (SGPT), 4 - DNPH method (2, 4-Dinitrophenylhydrazin) of Reitman and Frankel (1957) was followed using AUTOSPAN diagnostic kit. The activity of serum glutamate oxaloacetate transaminase (SGOT) or aspartate aminotransferase (AST) was measured following 2, 4 - DNPH method of Reitman and Frankel (1957) using a AUTOSPAN diagnostic kit. The alkaline phosphatase activity in serum was assayed using Autospan diagnostic kit.

2.5 Statistical analysis

The experimental data obtained in the present study were analyzed statistically (Snedecor and Cochran, 1994) by using general linear model procedure. Difference between treatments means were compared using Duncan's multiple range test (Kramer, 1957) [11].

3. Result and Discussion

3.1 Haematological parameters

Dietary of incorporation of pea (*Pisum sativum* L.) pods residue powder on haemoglobin, packed cell volume, total erythrocyte count, showed significant changes ($P \leq 0.05$) as shown in Table 2. There was no significant difference in the packed cell volume of the commercial broiler chickens incorporated with pea pods residue powder. Total leukocyte counts was not significantly changed. These results corroborated with Bingol *et al.* (2016) [3] who found that total protein, beta-globulin and gamma-globulin concentrations were significantly higher in broiler chickens fed with pea and it may be assumed that pea amino acid composition influenced total protein concentration and that resulted from the differences among protein concentration.

3.2 Serum biochemical parameters

There was significant ($P \leq 0.05$) change in the serum total protein, serum glutamate pyruvate transaminase (SGPT), cholesterol, triglycerides, glucose, serum glutamate, oxaloacetate transaminase (SGOT), and globulin content on incorporated with pea (*Pisum sativum* L.) pods residue powder in the broiler chickens as shown in Table 3.

The mean serum cholesterol values of the different groups incorporated with pea pods residue powder did not differ significantly among the groups. The mean values for the T1, T2, T3 and T4 were 119.18, 133.33, 130.82 and 131.58 (mg/dl) respectively. The serum triglycerides, glucose, albumin, globulin, alkaline phosphatase (ALP) and glutamate oxaloacetate transaminase (SGOT) have no significant difference among the different treatment groups. Whereas total protein was significantly ($P<0.05$) higher in T_3 (3.60 g/dl) and T_4 (3.40 g/dl) as compared to T_2 (2.67 g/dl) and T_1 (2.84 g/dl). A significant decrease was recorded in SGPT

enzyme among the treatment groups. Serum SGPT levels were observed to significantly decreases with incorporation of pea pod residue powder in T_2 (19.74), T_3 (19.15) and T_4 (19.01) group as compare to T_1 (21.95 U/L) groups respectively. This decrease of SGPT level in pea pods residue powder incorporated groups might be due to presence of nutrients like antioxidants, vitamins and minerals that regulate the liver metabolism and allowing it to cleanse itself of toxins and create new cells to stop the leakage of SGPT into the blood.

Table 1: Ingredient composition (%) of broiler chicks (Starter and Finisher) basal diets

Ingredients	Starter (0-3 weeks) feed				Finisher (3-6 weeks) feed			
	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
Yellow maize	52.00	52.00	52.00	52.00	56.00	56.00	56.00	56.00
Deoiled soybean meal	30.00	30.00	30.00	30.00	25.00	25.00	25.00	25.00
GNC	10.00	10.00	10.00	10.00	08.00	08.00	08.00	08.00
Rice polish	4.00	2.00	1.00	0.00	6.00	3.00	1.50	0.00
Dried pea pods residue powder	0.00	2.00	3.00	4.00	0.00	3.00	4.50	6.00
Vegetable oil	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Dicalcium phosphate	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Lysine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
DL- methionine	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Choline chloride	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Mineral mixture	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Common salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Hepatocare	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vitamin premix	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Coccidiostates	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total (kg)	100	100	100	100	100	100	100	100
Cost of feed (Rs./kg)	23.30	22.90	22.70	22.50	23.8	23.30	23.00	22.70

Table 2: Haematological values of commercial broiler chickens fed diets with pea (*Pisum sativum* L.) pods residue powder by replacing rice polish (42nd days)

Parameters	Treatments				SEm
	T_1	T_2	T_3	T_4	
Haemoglobin (%)	8.73±0.23	8.40±0.17	8.80±0.49	8.60±0.59	0.38
Packed cell volume (%)	30.26±2.36	25.07±1.46	26.71±1.22	30.28±2.43	1.76
Total erythrocyte counts (10^6 /µl)	2.58±0.04	2.62±0.07	2.59±0.03	2.61±0.05	0.54
Total leukocyte counts (10^3 /µl)	23.94±0.46	24.22±1.05	23.62±0.35	22.95±0.49	0.69

Table 3: Average values of serum biochemical constituents of commercial broilers fed diets incorporated with pea (*Pisum sativum* L.) Pods residue powder by replacing rice polish (42nd days)

Parameters	Treatments				SEm
	T_1	T_2	T_3	T_4	
Cholesterol (mg/dl)	119.18±5.07	133.33±3.70	130.82±2.99	131.58±5.89	5.16
Triglyceride(mg/dl)	23.69±1.20	25.77±0.46	22.71±0.45	29.00±1.19	1.76
Glucose (mg/dl)	141.94±2.36	153.62±3.80	144.02±2.47	152.72±1.44	2.81
Total protein (g/dl)	2.84^{ab}±0.34	2.67^{b}±0.01	3.6^{a}±0.21	3.40^{a}±0.19	0.19
Albumin (g/dl)	1.48±0.10	1.57±0.11	1.79±0.27	1.63±0.11	0.17
Globulin (g/dl)	1.36±0.31	1.10±0.10	1.82±0.13	1.77±0.08	0.18
Serum glutamate pyruvate transaminase (U/L)	21.95^{a}±0.39	19.74^{b}±0.53	19.15^{b}±0.15	19.01^{b}±0.51	0.48
Serum glutamate oxaloacetate transaminase (U/L)	172.82±1.28	172.09±0.64	171.35±0.53	172.97±1.50	0.94
Serum Alkaline Phosphatase (U/L)	77.48±2.14	81.03±1.74	84.39±3.22	88.82±3.79	2.96

4. Conclusion

It could be concluded that incorporation of pea pods residue powder by replacing rice polish at the levels of 50, 75 and 100% in the feed of commercial chickens had a positive action on total protein and SGPT enzyme level in serum and the overall haemato-biochemical parameters in commercial broiler chickens.

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