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Supplementation of *Asparagus racemosus* (Shatavari) on the growth performance and carcass traits in Giriraja birds

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Abstract
An experiment was conducted to study the supplementation of *Asparagus racemosus* (Shatavari*)* on growth performance and carcass characteristics in Giriraja birds. A total of 150 day old Giriraja birds were distributed into five treatment groups with three replicates in each group and ten birds in each replicate. Basal diet (T_1) without Shatavari supplementation and the experimental diets were prepared by incorporating Shatavari at 0.25 per cent (T_2), Shatavari at 0.50 per cent (T_3), Shatavari at 1.0 per cent (T_4) and Shatavari at 1.50 per cent (T_5). The birds were fed with ad libidum for a period of 56 days and the standard management practices were carried out. The growth parameters revealed significantly higher body weight, lower feed intake and better feed efficiency in Shatavari supplemented groups. The carcass characteristics were significantly higher in dressing percentage, breast muscle yield and thigh muscle yield in Shatavari supplemented groups. There was non-significant difference in abdominal fat percent and drumstick yield in treated groups. Supplementation of *Asparagus racemosus* at 1.0 or 1.50 per cent was beneficial in improving the growth parameters *viz* body weight, feed intake, feed efficiency and carcass characteristics in Giriraja birds.

Keywords: Body weight gain, feed consumption, feed conversion ratio carcass characteristics, Shatavari

Introduction
In poultry production, feed consumption plays a major role in affecting net return from the poultry because about 65 to 70 per cent of the total expenditure in terms of cash is spent on feed. Over a period of time extensive efforts have been taken to lower down the cost of production by lowering the expenses on feed. In the past, the major growth promoters were antibiotics used as antibiotic growth promoters (AGP) have been helpful in improvement of growth performance and feed conversion ratio in poultry (Izat *et al*., 1990; Dibner and Buttin, 2002 and Miles *et al*., 2006) [9, 5, 15]. However, constant treatment of poultry by antibiotics may result in residues of these substances in poultry products and bacterial resistance against treatments in the human body. Due to such threats to human health, use of antibiotics in poultry is banned in many countries (Hinton, 1988; Botsoglou and Fletouris, 2001; Alcicek *et al.*, 2004 and Owens *et al*., 2008) [8, 2, 1, 16]. To ensure more net return and to lessen the adverse effect of the synthetic feed additives on animal as well as on consumer's health; many of the herbal growth promoters are being used as an alternative feed additive in the poultry ration. There is also some evidence from the earlier workers that the use of commercial blends of herbs can reduce the cost of poultry production and increase in body weight (Majdanski, 1991) [14]. The dietary use of herbal growth promoter increases the performance of broiler by increasing live weight gain and reduces FCR (Prasad and Sen, 1993 and Samarth *et al*., 2002) [18, 20]. Among these alternatives, photogenics are drawing much attention now-a-days.

Asparagus racemosus (Shatavari) is the one of the most commonly used herbs in traditional medicine due to the presence of steroidal saponins and sapogenins in various part of the plant (Krishna *et al*., 2005) [12]. In Ayurveda this herb is known as the "Queen of Herbs". Traditionally it is used as a health tonic (Pandey, 1998) and common Indian home remedy used as rejuvenator or promoter of strength (Dash, 1991) [4].

The genus *Asparagus* includes about 300 species around the world and is common at low altitudes in shade and in tropical climates throughout Asia, Australia and Africa. In Indian system of medicine *Asparagus racemosus* is an important medicinal plant and its root paste or root juice has been used in various ailments and as health tonic.

Parts used of this plant are roots (Rhizome) and leaves. *Asparagus racemosus* is used for preventing ageing, increase longevity, impart immunity, improve mental function, nervous disorders, dyspepsia, tumors, inflammation, neuropathy and hepatopathy. Most of the literature review showed that root extract of *Asparagus racemosus* has antiulcer activity, antioxidant, anti-diarrheal, anti-diabetic and immunemodulatory activities (Shukla *et al*., 2018) [23].

The beneficial effects of *Asparagus racemosus* may be attributed to its concentrations of saponins (active principle), known as *Shatavarins* and having properties like nutritive tonic and anti-stress effects (Rege *et al.*, 1989; Kamat *et al.*, 2000) [19, 10]. The root powder of *Asparagus racemosus* is used as herbal feed additive or supplement in poultry feed. *Asparagus racemosus* augment the appetite and stimulates the liver function. Sharma *et al.* (1986) [22] showed that *Asparagus racemosus* possess anabolic properties viz. growth promotion, laxative, antacid and appetizer beneficial. *Asparagus racemosus is* playing a role of antiseptic, anticancer, astringent, cooling effect (Dinabandhu Moharana, 2008) [6] and immune modulation (Seena and Kuttan, 1993) [21]. Cowan (1999) [3] reported that plant extract has a wide range of pharmacological activities and contain the essential oil that shows antimicrobial activity. The tuberous roots of *Asparagus racemosus* have sweet and bitter taste and act as potential antioxidant. The antioxidant properties of *Asparagus racemosus* can be used therapeutically to capture free radicals generated in the body as a result of stress.

Materials and methods

One hundred and fifty day old Giriraja chicks were obtained from Department of Poultry Science, Veterinary College, Hebbal, Bengaluru for the experimental study. Chicks were wing banded, weighed and randomly distributed to five treatment groups with the inclusion levels of 0.0, 0.25, 0.50, 1.00 and 1.50 percent *Asparagus racemosus* mixture Chicks were reared under deep litter system up to eight weeks of age, with supply of *ad libitum* feed and water. Standard management practices were followed during the experiment. The day old chicks were vaccinated against Marek's disease with HVT strain through subcutaneous route. On 7th day chicks was vaccinated with ND with B_1 strain followed by booster dose on 21st day through ocular or nasal route. On 14th day against IBD with intermediate vaccine followed by booster dose on 28th day through ocular route.

Description of experimental groups

Sl No.	Treatments	Inclusion level of *Asparagus racemosus*	No. of birds
1	T1	Basal diet	30
2	T_2	Basal diet + 0.25% *Asparagus racemosus*	30
3	T_3	Basal diet + 0.5% *Asparagus racemosus*	30
4	T_4	Basal diet + 1.0% *Asparagus racemosus*	30
5	T_5	Basal diet + 1.5% *Asparagus racemosus*	30

Body weight gain of individual birds, feed consumption and Feed conversion ratio (FCR) was recorded at the end of each week and at the end of the 8 weeks on cumulative basis. At the end of the experiment (8 weeks) four birds from each treatment (one per replicate) was slaughtered by severing jugular vein and carotid artery on one side of the neck allowed to bleed for 1-2 minutes and scalding at 54°C for minutes in dunking scalder and de feathered mechanically for 30-60 seconds in a rotary drum picker. The birds will be dressed by cutting the head at atlanto-occipital joint, leg at hock joint and the carcass will be eviscerated by making a slit opening at the abdominal area. The data on body weight, feed consumption, feed efficiency, carcass characteristics was subjected to statistical analysis under completely randomized block design and Analysis of variance.

Results and discussion

Growth performance

In the present study, the result showed that there was significantly ($p \leq 0.05$) increase in the body weight of the birds fed with *Asparagus racemosus* compared to the control group from second week to end of the experiment (56th day). The improvement in the body weight may due to principal component of *Asparagus racemosus* is "Saponins" which is also known as Shatavarins have property like nutritive tonic, good laxative, antacid, appetite stimulator with anabolic properties, stimulates liver function which helps in improvement of digestibility in turn leads to better growth weight (Gaikwad *et al.*, 2015; Kant *et al.*, 2016) [7, 11]. The better body weight of Shatavari supplemented group was likely to be due to their higher immunomodulatory, antioxidant, and anti-stress effects. There was significantly ($p \leq 0.05$) lower feed intake in the birds fed with *Asparagus racemosus* compared to control group from sixth week to end of the experiment (56thday). The decrease in feed intake during phase of growth might be due to bitterness which has no adverse effect of smell and/or taste of Shatavari in the diets of broilers. These results are in agreement with those of other workers who reported that feed intake of all the chicks receiving SRP was lower than the control and there was a linear decrease in level of addition (Kumari *et al.*, 2012, Gaikwad *et al.*, 2015; Kant *et al.*, 2016) [13, 7, 11]. There was significantly ($p \leq 0.05$) better FCR in the birds fed with *Asparagus racemosus* compared to the control group from second week up to end of the experiment (eighth week).The better FCR values obtained with supplementation of *Asparagus racemosus* may be due to effect of multifarious properties such as nutritive tonic, indicating efficiency of liver stimulants in improving gut function, nutrient assimilation and better feed utilization (Gaikwad *et al.*, 2015; Kant *et al.*, 2016) [7, 11]. The results of the growth performance are presented in Tables 1, 2 and 3 respectively.

Carcass traits

The results of supplementation of *Asparagus racemosus* in Giriraja birds on different carcass traits (% of live weight) showed significantly higher dressing percentage, breast yield and thigh yield whereas no significant ($P > 0.05$) difference was observed in abdominal fat percent and drumstick yield. The presence of profound hypolipidemic, antioxidants and phenolic substance in *Asparagus racemosus* supplementation causes improvement of carcass yield in chicken (Kant *et al.*,

2016) [11]. The results of the carcass traits are presented in Table 4.

Conclusions

The effect of Supplementation of *Asparagus racemosus* at 1.5 percent resulted significant

improvement in body weight and better feed efficiency whereas supplementation of *Asparagus racemosus* at 1.0 percent resulted significantly lower feed intake. Supplementation of *Asparagus racemosus* at 1.5 percent showed high dressing percentage and breast muscle yield per cent compared to other treatment groups and control whereas thigh muscle yield per cent was recorded high in 1.0 per cent *Asparagus racemosus* supplemented group. Supplementation of *Asparagus racemosus* at 1.0 per cent would be beneficial on the growth performance and carcass characteristics.

Table 1: Supplementation of *Asparagus racemosus* at different age intervals on weekly cumulative body weight (g/bird/week) (Mean ± SE) in Giriraja birds

Experimental group	Description of the treatment	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	7th Week	8th Week
T_1	Basal diet	128.55 ± 2.46	215.57 ± 6.17^{c}	437.03 ± 9.19^{c}	701.93 ± 15.55^{c}	963.75 ± 18.31^{c}	1171.58 ± 10.22^{b}	1391.58 ± 10.11^{b}	1691.38 ± 10.01^{b}
T_2	Basal diet+ 0.25 per cent *Asparagus racemosus*	133.10 ± 2.56	223.28 ± 4.45^{bc}	458.50 ± 9.71^{bc}	756.98 ± 14.64^{bc}	998.67 ± 16.49^{bc}	1212.60 ± 21.12^{b}	1438.60 ± 21.24^{b}	1714.16 ± 20.11^{b}
T_3	Basal diet+ 0.50 per cent *Asparagus racemosus*	131.47 ± 2.61	248.05 ± 6.34^{ab}	463.46 ± 11.26^{ab}	778.97 ± 17.54^{ab}	1021.97 ± 23.46^{b}	1223.20 ± 36.36^{b}	1453.80 ± 36.56^{b}	1708.80 ± 32.43^{b}
T_4	Basal diet+ 1.0 per cent *Asparagus racemosus*	136.18 ± 1.86	251.20 ± 4.69^{a}	471.08 ± 7.39^{a}	787.30 ± 14.52^{a}	1129.77 ± 16.64^{a}	1364.19 ± 23.39^{a}	1592.23 ± 23.46^{a}	1883.14 ± 21.32^{a}
T_5	Basal diet+ 1.5 per cent *Asparagus racemosus*	137.11 ± 2.10	253.32 ± 4.51^{a}	468.36 ± 10.51^{a}	796.01 ± 15.64^{a}	1159.10 ± 15.19^{a}	1388.12 ± 22.15^{a}	1605.12 ± 22.26^{a}	1898.31 ± 20.13^{a}

^{a,b,c} Means in the same column with no common superscript differ significantly ($p \leq 0.05$)

Table 2: Supplementation of *Asparagus racemosus*at different age intervals on weekly cumulative feed intake (g/bird/week) (Mean ± SE) in Giriraja birds

Experimental group	Description of the treatment	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	7thWeek	8thWeek
T_1	Basal diet	80.05±7.65	318.42±6.21	616.26±11.37	1119.24±3.14	1749.24±6.51	2693.42±10.29^{a}	3612.42±10.39^{a}	4488.22±10.94^{a}
T_2	Basal diet+ 0.25 per cent *Asparagus racemosus*	79.88±1.37	314.62±19.21	619.99±35.64	1110.98±26.11	1727.52±20.33	2685.83±17.42^{a}	3595.24±21.32^{a}	4495.34±19.91^{a}
T_3	Basal diet+ 0.50 per cent *Asparagus racemosus*	79.24 ±1.74	317.84±4.61	614.28±31.24	1114.92±16.24	1711.64±13.61	2518.49±17.54^{b}	3583.91±36.12^{a}	4464.36±31.32^{a}
T_4	Basal diet+ 1.0 per cent *Asparagus racemosus*	78.98±1.21	312.76±27.17	618.20± 06.39	1101.43±8.42	1715.49±9.42	2529.64±24.27^{b}	3362.14±23.22^{b}	4212.32±21.24^{b}
T_5	Basal diet+ 1.5 per cent *Asparagus racemosus*	78.38±2.42	316.52±11.46	611.33±30.29	1108.22±33.21	1719.22±27.34	2516.22±36.43^{b}	3358.34±21.29^{b}	4238.24±19.22^{b}

^{a,b,c} Means in the same column with no common superscript differ significantly ($p \leq 0.05$)

Table 3: Supplementation of *Asparagus racemosus* at different age intervals on weekly cumulative feed conversion ratio (Mean ± SE) in Giriraja

Experimental group	Description of the treatment	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	7th Week	8th Week
T_1	Basal diet	0.623 ± 0.066	1.481 ± 0.024^{a}	1.410 ± 0.028^{a}	1.594 ± 0.029^{a}	1.815 ± 0.029^{a}	2.299 ± 0.014^{a}	2.596 ± 0.022^{a}	2.653 ± 0.017^{a}
T_2	Basal diet+ 0.25 per cent *Asparagus racemosus*	0.600 ± 0.014	1.410 ± 0.064^{a}	1.352 ± 0.079^{b}	1.511 ± 0.038^{b}	1.731 ± 0.027^{a}	2.214 ± 0.021^{b}	2.512 ± 0.031^{b}	2.622 ± 0.024^{b}
T_3	Basal diet+ 0.50 per cent *Asparagus racemosus*	0.602 ± 0.014	1.281 ± 0.019^{b}	1.325 ± 0.025^{b}	1.431 ± 0.012^{b}	1.714 ± 0.009^{b}	2.061 ± 0.019^{b}	2.510 ± 0.019^{b}	2.612 ± 0.021^{b}
T_4	Basal diet+ 1.0 per cent *Asparagus racemosus*	0.603 ± 0.008	1.251 ± 0.089^{b}	1.312 ± 0.011^{b}	1.411 ± 0.022^{b}	1.524 ± 0.013^{b}	1.854 ± 0.028^{c}	2.111 ± 0.032^{c}	2.241 ± 0.029^{c}
T_5	Basal diet+ 1.5 per cent *Asparagus racemosus*	0.572 ± 0.015	1.250 ± 0.052^{b}	1.305 ± 0.041^{b}	1.401 ± 0.025^{b}	1.512 ± 0.022^{b}	1.812 ± 0.039^{c}	2.101 ± 0.038^{c}	2.232 ± 0.041^{c}

^{a,b,c} Means in the same column with no common superscript differ significantly ($p \leq 0.05$)

Table 4: Supplementation of *Asparagus racemosus* on carcass traits (% of live weight)(Mean ± SE) in Giriraja birds

Experimental group	Description of the treatment	Dressing percentage	Abdominal fat (%)	Drumstick yield (%)	Breast yield (%)	Thigh yield (%)
T_1	Basal diet	65.17 ± 1.72^{b}	1.98 ±0.10	13.97 ±0.14	29.91 ±0.12^{b}	10.63 ± 0.11^{b}
T_2	Basal diet +0.25 per cent *Asparagus racemosus*	65.39 ± 1.84^{b}	1.89 ±0.12	13.68 ±0.12	29.68 ± 0.13^{b}	10.71 ± 0.09^{b}
T_3	Basal diet+ 0.5 per cent *Asparagus racemosus*	66.05 ± 1.68^{b}	1.94 ±0.15	13.95 ±0.15	30.05 ±0.15^{b}	10.89 ±0.13^{b}
T_4	Basal diet + 1.0 per cent *Asparagus racemosus*	70.24 ±1.45^{a}	2.01 ±0.09	14.67 ±0.16	33.67 ±0.16^{a}	12.77 ±0.11^{a}
T_5	Basal diet + 1.5 per cent *Asparagus racemosus*	71.07 ±1.23^{a}	1.97 ±0.16	14.06 ±0.30	33.76 ±0.30^{a}	12.66 ±0.19^{a}

^{a,b,c} Means in the same column with no common superscript differ significantly ($p \leq 0.05$)

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