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Assessing the chemical composition of Azolla during different stages of growth & effect of feeding Azolla+DDGS on body weight gain of Deoni calves

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Abstract
The present study was conducted to assess the chemical composition of Azolla at different stages of growth and effect on body weight gain in deoni calves. Six ponds were prepared for cultivation of azolla. The azolla samples were collected from each pond on day zero and from day 7 to 17th day of cultivation. Twelve deoni calves divided into two groups with 6 calves each. One group has given half kg of farm made calf ration and calves in second group were supplied with ration with 30% replacement of farm made calf ration with 15% DDGS+15% azolla powder. Dry matter in azolla samples ranges from 93.66 to 94.22 %. Maximum crude protein was found on day 11th which was 23.20% and ranges from 22.4 to 23.20 %. Crude fiber level in azolla ranges from 12.63 to 12.99 %. NFE range found was 47.35 to 47.82 %. No significant difference found in ether extract and acid insoluble values. No-significant change was found in weight gain of deoni calves in both of the groups.

Keywords: Azolla, chemical composition, body weight gain, DDGS

Introduction
There is always an ever ending search for the availability of nutritionally rich and cheap food resources in the developing countries. Aquatic plants are gaining much interest in food and biomedical research, owing to its broad range of uses such as human food, animal feed and bio-fertilizers [4]. Azolla is blue green algae and Azolla pinnata is widely used as a part of concentrate or as a part of green fodder because of their higher protein content. The cultivation practise for azolla is easy and the cost of production is also low. Hence with consideration of higher protein content, it is used as a part of ration for dairy animals, calves, kids to improve growth rate and in poultry ration to reduce the cost of feed and improve weight gain of the birds. Different scientists studied the chemical composition and the feeding value of Azolla meal for egg type-chicks [3], Hariana heifers [1]. Many workers evaluated the chemical composition of azolla by different ways and at any stage of growth. Therefore this study was carriedout to assess the chemical composition of azolla pinnata at different stages of growth and effect of feeding azolla with DDGS on the body weight gain of deoni calves.

Materials and Methods
To study the chemical composition of azolla pinnata at different stages of growth, six ponds were prepared for cultivation of azolla. The azolla samples were collected from each pond on day zero and from day 7 to 17th day of cultivation. The collected samples were analysed to assess the chemical composition of azolla in terms of dry matter, Crude protein, Crude fiber, Ether extract, Total ash, acid insoluble ash, NFE as per [5]. The data was analysed by test and results were depicted as per [6].

Further to study the effect of feeding azolla + DDGS, twelve deoni calves were divided into two groups with 6 calves each. One group has given half kg of farm made calf ration and calves in second group were supplied with concentrate with 30% replacement of farm made calf ration with 15% DDGS+15% azolla powder. Weekly live body weights were recorded for 10 weeks. The data of live body weight was analysed by paired T test (dependent analysis) [6].

Results and Discussions

Table 1: Chemical composition of Azolla pinnata at different stages of growth

Proximate Principles (%)	Day				
	0	7	8	9	10
Moisture	94.22±0.14^{NS}	94.18±0.10^{NS}	94.07±0.07^{NS}	93.70±0.15^{NS}	93.66±0.13^{NS}
DM	5.78±0.14^{NS}	5.82±0.10^{NS}	5.93±0.07^{NS}	6.30±0.15^{NS}	6.34±0.13^{NS}
CP	22.46±0.31^{NS}	22.41±0.27^{NS}	22.78±0.10^{NS}	23.11±0.12**	23±0.05**
CF	12.97±0.06^{NS}	12.88±0.07^{NS}	12.88±0.07^{NS}	12.88±0.07^{NS}	12.99±0.10^{NS}
EE	3.13±0.03^{NS}	3.17±0.05^{NS}	3.22±0.08^{NS}	3.05±0.04^{NS}	3.11±0.03 ^{NS}
NFE	47.35±0.11	47.67±0.22 ^{NS}	47.57±0.16 ^{NS}	47.60±0.13^{NS}	47.80±0.08^{NS}
Acid insoluble Ash	4.28±0.07^{NS}	4.17±0.03 ^{NS}	4.10±0.06^{NS}	4.10±0.05 ^{NS}	4.28±0.04 ^{NS}
TA	14.15±0.34	14.14±0.17 ^{NS}	13.63±0.18*	13.81±0.13^{NS}	13.92±0.06^{NS}

Proximate Principles (%)	Day					
	11	12	13	14	15	16
Moisture	93.96±0.12^{NS}	93.81±0.09^{NS}	93.83±0.09^{NS}	94.11±0.12^{NS}	94.05±0.22^{NS}	93.98±0.18^{NS}
DM	6.04±0.12*	6.19±0.09*	6.17±0.09*	5.89±0.12^{NS}	5.95±0.22^{NS}	6.03±0.18^{NS}
CP	23.20±0.09**	22.83±0.15^{NS}	22.74±0.15^{NS}	22.98±0.04^{NS}	22.93±0.07^{NS}	22.41±0.06^{NS}
CF	12.69±0.04^{NS}	12.80±0.03^{NS}	12.63±0.07^{NS}	12.73±0.08^{NS}	12.70±0.06^{NS}	12.65±0.06^{NS}
EE	3.10±0.04 ^{NS}	3.08±0.03 ^{NS}	3.07±0.02 ^{NS}	3.07±0.04 ^{NS}	3.02±0.03 ^{NS}	3.03±0.03 ^{NS}
NFE	47.67±0.06^{NS}	47.67±0.14 ^{NS}	47.82±0.07^{NS}	47.62±0.14 ^{NS}	47.52±0.08 ^{NS}	47.75±0.07^{NS}
Acid insoluble Ash	4.28±0.08 ^{NS}	4.28±0.04 ^{NS}	4.27±0.05 ^{NS}	4.17±0.04 ^{NS}	4.23±0.06 ^{NS}	4.10±0.05 ^{NS}
TA	13.61±0.16*	13.74±0.06*	13.43±0.08**	13.40±0.06	14.27±0.21 ^{NS}	14.11±0.16 ^{NS}

Chemical composition of *Azolla*

The table no. 1 depicted the values of moisture, dry matter, crude protein, crude fiber, NFE, Total ash and acid insoluble ash in azolla pinnata at different stages of growth. Moisture level found in Azolla was ranges from 93.66 to 94.22 percent. Dry matter level was found in Azolla ranges from 5.78 to 6.34 percent. Maximum crude protein was found on day 11th which was 23.20 percent and lowest Crude protein level found was 22.41 percent. Similar to our findings, the CP content of azolla pinnata was reported in the range of 21.4-25.57 percent [2, 7, 11]. In the contrary to this, [10] obtained lower CP content of 16.5-17.67 percent in azolla pinnata. However, higher CP content (25.69 percent) observed by [9] as compared to present study. Maximum Crude fibre level found was 12.99% on the 10th day of cultivation and lowest crude fibre level was found on day13th (12.63%). The 12.63-12.97 percent crude fiber obtained in the present study is lower than the findings of [1, 9] who reported the CF content of azolla in the range of 13.19-16.54 percent. However similar CF obtained by [3] i.e 12.7 percent. No significant variations were found in Ether extract values at different stages of growth. The ether extract (EE) content of azolla in the present study (3.02-3.22 percent) was slightly lower than the findings of [8, 9]. Both scientists reported EE content of 3.39 percent in azolla. Whereas, lower EE value (2.7 percent) than the EE value found in this study reported by [3]. Nitrogen free extract was maximum on 13th day (47.82%) and minimum NFE found on zero day which was 47.35%. The Nitogen free extract (NFE) content of (47.35-47.82 percent) recorded in the present study was higher than the value reported by [1, 9] as 38.85-39.13 percent NFE in azolla. However similar NFE value was found by [3] i.e 47 percent. The total ash content of azolla obtained in this experiment were ranges from 13.43-14.27 percent. Whereas, [13, 9, 10] reported the total ash was 16.33 percent, 15.88 percent and 36.12 percent respectively. These values were higher than the values found in this experiment. No significant difference was found in acid insoluble ash in Azolla collected on different days of study.

The variations in the chemical composition of azolla pinnata in different studies could be due to differences in the reponse of azolla pinnata to environmental conditions such as temperature, light intensity and soil composition. Furthermore, contamination with epiphytic algae could also be affecting the chemical composition of azolla [12].

Effect of feeding azolla + DDGS on live body weight of Deoni calves

Table 2: Weekly live body weights of deoni calves in control and treatment group.

Sr. No.	Week	Body weights in control group	Mean body weights in treatment group
1	Initial	62.53±7.36	63.65±7.22^{NS}
2	Ist	64.33±7.44	66.37±7.25^{NS}
3	IInd	66.20±7.64	69.20±7.40^{NS}
4	IIIrd	68.05±7.75	71.77±7.50^{NS}
5	IVth	70.38±8.03	74.87±7.58^{NS}
6	Vth	72.03±8.30	77.55±7.73^{NS}
7	VIth	73.88±8.37	79.97±7.76^{NS}
8	VIIth	75.62±8.53	82.65±7.81^{NS}
9	VIIIth	77.53±8.64	85.38±7.73^{NS}
10	IXth	79.40±8.69	88.15±7.90^{NS}
11	Xth	91.38±7.88	81.55±8.52^{NS}

The results from table.2 indicated that non significant difference was found in weekly live body weights of Deoni calves in control group and treatment group. This depicts that farm made concentrate may replace upto 30 percent by the DDGS+Azolla powder without affecting body weight gain.

Conclusion

The crude protein content of azolla varies from 22.41 to 23.20 percent. It is concluded that there is approximately same content of crude protein and other nutrients in azolla during the different stages of growth with regular harvesting. It is also concluded that farm made concentrate may replace upto 30 percent by the DDGS+Azolla powder without affecting body weight gain.

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