



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2020; 9(6): 16-17

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www.thepharmajournal.com

Received: 07-04-2020

Accepted: 09-05-2020

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Nutritional evaluation of *Azolla pinnata*

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Abstract

Present study was conducted to evaluate the chemical composition of *Azolla pinnata* used in diet of Sahiwal heifers. For this *Azolla* was cultivated, harvested and sundried. Sundried *Azolla* was evaluated for proximate analysis. The dry matter of *Azolla* was 90%. The CP, CF, EE, TA and NFE contents of dried *Azolla* meal were found to be 25.63%, 7.44%, 1.64%, 19.20% and 46.09%, respectively. The proximate analysis of *Azolla* reveals that it is rich in crude protein content.

Keywords: *Azolla*, proximate analysis, dry matter.

Introduction

Azolla is a free-floating fresh water fern belonging to the family *Azollaceae* and order Pteridophyta. *Azolla* hosts a symbiotic blue green algae *Anabaena azollae*, which is responsible for the fixation and assimilation of atmospheric nitrogen (Pillai *et al.*, 2002) [14]. *Azolla* produces more than 4-5 times of protein in comparison to lucerne and hybrid napier (Mathur *et al.*, 2013) [12]. It contains a good source of protein and almost all essential amino acids, minerals such as iron, calcium, magnesium, potassium, phosphorus, manganese etc, apart from appreciable quantities of Vitamin A precursor beta-carotene and vitamin B₁₂ (Cherryl *et al.*, 2014) [6]. *Azolla* is called as 'Green gold mine' due to its high nutritive value and 'super plant' due to its fast growth (Wagner, 1997) [19]. *Azolla* is cultivated widely in China, Vietnam, Philippines, Thailand, Brazil and many other countries, mostly along rice fields. It is rich in crude protein (18–20 percent in dry matter), minerals, chlorophyll, carotenoids and vitamins, and is a potential feed ingredient for livestock (Lumpkin, 1984) [11] and broilers (Singh and Subudhi, 1978) [17]. Nowadays *Azolla* is cultivated in India, in a big way. Dairy farmers in South Kerala and Kanyakumari have started to take up the low cost production technology and it is hoped that the *Azolla* technology will be taken up more widely by dairy farmers, in particular those who have too little land for fodder production. (Pillai *et al.*, 2002) [14]. On dry weight basis, *Azolla* consists of 25-35 per cent protein, 10-15 per cent mineral and 7-10 per cent amino acids, a combination of amino acids, bio-active substances and bio-polymers (Kathirvelan *et al.*, 2015) [7]. Thus the bio composition of *Azolla*, makes it one of efficient feed substitutes for livestock. Moreover *Azolla* can be easily digested by livestock, owing to its high protein and low lignin content. *Azolla* is a promising supplementary green feed from the point of ease in cultivation, productivity and in nutritive value (Lumpkin and Plucknette, 1982) [10]. In terms of above facts present study was conducted to evaluate chemical composition of *Azolla*.

Materials methods

Azolla was propagated at Bull Mother Experimental Farm, College of Veterinary Science and Animal Husbandry Anjora, Durg. There were 4 *Azolla* pits of dimension 8'x6'x1', depending on need and available size of the plastic sheet. All the roots and stones were cleared from the floor of pits. Soil bed is prepared with the help of fertile soil. Cow dung (8-10 kg) and 20 gm super phosphate were mixed in water to make slurry. Water was filled to a three fourth level in the pit and regular care was taken to maintain the water level. In a week, the *Azolla* spreads all over the bed and develops a thick mat like appearance. To sustain the production of *Azolla*, super phosphate was added once every week. 25 to 30% of the water was to be replaced with fresh water once every 15 days to prevent nitrogen build up in the pit.

The fresh *Azolla* was harvested and washed thoroughly, with clean water to remove the extraneous materials. To form *Azolla* meal sun dried it for 2-3 days such that it becomes crispy.

Proximate analysis: The sundried Azolla meal was analyzed for various proximate principles viz., dry matter (DM), crude protein (CP), crude fiber (CF), total ash (TA), ether extract (EE) and nitrogen free extract (NFE) according to methods of Association of Official Analytical Chemists (AOAC, 2000)^[2]. Nitrogen free extract was calculated by difference.

Result and discussion

The proximate composition of sundried Azolla meal used in experimental ration of Sahiwal heifers was shown in Table 1.

Table 1: Proximate composition of Sundried Azolla Meal (Percentage Dry matter basis)

S. No.	Nutrient evaluation	Percentage DM basis
1.	Dry matter	90.00
2.	Crude protein	25.63
3.	Crude fibre	7.44
4.	Ether extract	1.64
5.	Total ash	19.20
6.	Nitrogen free extract	46.09

The crude protein content of Azolla meal of present study was found 25.63%. It was found similar to values reported by Balaji, *et al.* (2009)^[3], Bolka (2011)^[4], Chatterjee, *et al.* (2013)^[5], Sharma P. (2013)^[16] and Rawat, *et al.* (2015)^[15]. Whereas found higher to values reported by Alalade and Iyayi (2006)^[1], Srinivas, *et al.* (2012)^[18] Parashuramulu, *et al.* (2013)^[13] and Kavya, *et al.* (2015)^[8].

The crude fibre content obtained in present study was 7.44%. This was in agreement with Parashuramulu, *et al.*, 2013^[13], Kumar, *et al.*, 2015^[9].

The ether extract was obtained in this study was 1.64%. This was found similar to that as observed by Alalade and Iyayi, 2006^[1], Srinivas, *et al.*, 2012^[18] and Parashuramulu, *et al.*, 2013^[13].

The total ash estimated in Azolla meal of present study was 19.20%. Similar values were reported by Chatterjee, *et al.*, 2013^[5], Sharma P., 2013^[16]. The NFE content of Azolla meal was found 46.09%. This was in close agreement with Alalade and Iyayi, 2006^[1] and higher than values reported by Kavya, *et al.*, 2015^[8] and Rawat, *et al.*, 2015^[15].

Conclusion

The proximate analysis of sun dried Azolla meal was indicated that Azolla is rich in crude protein content and could be used as a protein source in livestock feeds. The differences in proximate analysis in Azolla meal with respect to different places might be attributed to the prevailing soil and water condition, climate or the methodology adopted for cultivation of different species of Azolla.

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