The Pharma Innovation Journal 2022; SP-11(7): 2687-2689

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(7): 2687-2689

www.thepharmajournal.com
Received: 14-05-2022
Accepted: 17-06-2022

Naveen Kumar Sharma
Department of Animal Nutrition, College of Veterinary & Animal Science, Navania, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Sachin Chaudhary
Department of Animal Nutrition, College of Veterinary & Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Hitesh Purohit
Department of Animal Genetics and Breeding, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Uma Ram
Department of Animal Nutrition, College of Veterinary & Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Corresponding Author
Naveen Kumar Sharma
Department of Animal Nutrition, College of Veterinary & Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

A study on nutritive value and production of green Azolla (*Azolla pinnata*)

Naveen Kumar Sharma, Sachin Chaudhary, Hitesh Purohit and Uma Ram

Abstract
The nutritive value of feed and its production is most important step for assessing its quality. In the present study production of green Azolla (*Azolla pinnata*) and its nutritive value was estimated according to AOAC (2016). Azolla (*Azolla pinnata*) was cultivated in water trough and harvested on day to determine nutritive value. The dry and organic matter content of Azolla (*Azolla pinnata*) was 90.20% and 79.60% respectively. The crude protein, ether extract, crude fiber and nitrogen free extract content was 23.45%, 3.10%, 12.45% and 40.60% respectively. The total Ash content was 20.40%. The *Azolla pinnata* contained 42.29% NDF, 31.22% ADF and 11.07% HC. The mineral profile of *Azolla pinnata* indicates 1.66% Calcium and 0.47% Phosphorus and other minerals in trace levels. It was concluded that green Azolla (*Azolla pinnata*) was a rich source of crude protein, trace minerals and vitamins.

Keywords: Production**,** nutritive value, azolla, dry matter, organic matter

Introduction
To enhance the productive performance of animals there is need to supply enough nutrients. There are various newer and non-conventional feeds which may be incorporated for animal feeding. One of such feed is Azolla. It is believed that through Azolla, the consumption and digestibility of feed is improved therefore animals get more nutrients from the ration. The green Azolla *(Azolla pinnata)* may be an alternative to green fodder and as supplementary protein diet due to its high palatability and enhanced yield. Azolla considered to be the most promising because of the ease of cultivation, minimal water for propagation, high productivity and good nutritive value. Azolla is very rich in proteins, essential amino acids, vitamins (vitamin A, vitamin B_{12}, Beta Carotenes), growth promoter intermediaries and minerals like calcium, phosphorous, potassium, iron, copper, magnesium etc. and on a dry weight basis, is constituted of 25-35% protein content, 10- 15% mineral content and 7-10%, a combination of amino acids, bio-active substances and biopolymers (Kathirvelan *et al.*, 2015) [8]. Carbohydrate and oil content reported in Azolla are very low. It is also found to contain probiotics and biopolymers (Pillai *et al*. 2002) [16]. Thus, Azolla appears to be a potential source of nutrients and has a considerably high feeding value (Hossiny *et al*. 2008) [7]. The bio composition of Azolla makes it one of the most economic and efficient feed substitutes for livestock. Moreover, Azolla can be easily digested by livestock, owing to its high protein and low lignin content. With high protein content, as it can promptly colonize regions of fresh water and develop at extraordinary speed multiplying its biomass each a few days. Azolla is considered as the most economic and efficient feed substitute and a sustainable feed for livestock. It is a potential source of nitrogen and thereby a potential feed ingredient for livestock (Lumpkin, 1984; Pannaerker, 1988) [13, 14]. Azolla can be used as unconventional feed with protein supplement for many species including ruminants, poultry, pigs and fish (Hossiny *et al*., 2008) [7].
On the basis of above background, the present investigation was under taken to find out the nutritive value of green Azolla (*Azolla pinnata)* and its production.

Materials and Methods
Production of Azolla
For present experiment, Azolla was produced in water troughs of size 12.5 m X 1.0 m X 0.40 m. The bottom of water trough was sealed with cement and maintained a uniform layer of water in the trough. (Plate)

A thin layer of about 10 cm of fine soil was spread and then water trough was filled with water and maintained the constant level of water. About 2-2.5 kg of cow manure was dissolved in 3.5 liters of water and spread evenly in the water trough. At Azolla unit, there was total eighteen water troughs in which Azolla was produced. Fresh Azolla seeds were inoculated in water troughs at 0.5kg/m^2. Azolla was spread all over trough within 15 days and build up a thick met like structure. To sustain the production of Azolla, 50mg of superphosphate and around 2-2.5 kg of cow manure was included once every 15days. Around 30% water was replaced with fresh water once every 15 days to preventover abundance nitrogen collection. Water troughs were cleaned and the water and soil was replaced periodically. Azolla was harvested and washed for three times to avoid the superfluous material before feeding to kids.

Plate 1: Water Trough of Azolla *(Azolla pinnata)* at Azolla Unit of CVAS Navania, Udaipur

Samples of green *Azolla (Azolla pinnata)* were analyzed for proximate constituents as per AOAC (2016) [1]. Estimation of ether extract and crude fibre in *Azolla pinnata* was done with the help of Socs Plus and Fiber Plus respectively (Pelican Equipments). The total nitrogen content of *Azolla pinnata* was determined following standard Kjeldahl's method using Kel Plus, Semi Automatic Nitrogen Analyzer (Pelican Equipments). For estimation of dry matter and total ash, standard conventional procedures were followed. The Weende's method was followed for calculation of nitrogen free extract. The VonSoest method was followed for calculation of NDF, ADF and HC. The method of Talptra et al. (1940) [19] was used for the determination of calcium and phosphorus.

Results and Discussion

The Azolla (*Azolla pinnata*) contained 23.45% crude protein, 3.10% ether extract, 12.45% crude fibre, 40.60% NFE, 20.40% total ash, 42.29% NDF, 31.22% ADF and 11.07% hemicellulose. The calcium and phosphorus contents were 1.66% and 0.47% respectively on dry matter basis.

The CP content on % dry matter basis in *Azolla pinnata* found to be 23.45%. Similar findings were reported by Cherryl *et al.* (2014) [4], Khare *et al.* (2014) [10], Rawat *et al.* (2015) [17], Anitha *et al.* (2016) [2], Kumar *et al.* (2018) [11] and Chandewar *et al.* (2018) [3]. On the other hand, Tamizhkumaran *et al.* (2012) [20] and Kathirvelan *et al.* (2015) [8] reported higher CP content in Azolla than the present study. Kumari *et al.* (2018) [12] and Gupta *et al.* (2018) [6] observed somewhat less CP content in Azolla than the present study.

The Ether extract (% on DM) content in *Azolla pinnata* was found to be 3.10% in present study. Similar finding were reported by Khare *et al.* (2014) [10], Kumari *et al.* (2018) [12] and Gupta *et al.* (2018) [6]. However, lower values of EE in Azolla were noted by Parashuramalu *et al.* (2013) [15] and Kumar *et al.* (2018) [11]. The higher ether extract values were observed by Anitha *et al.* (2016) [2] and Chandewar *et al.* (2018) [3] than the present study.

The values of crude fibre content in *Azolla pinnata* (% on DM) (12.45%) recorded in present study was similar to that of reported by Parashuramalu *et al*. (2013) [15] and Kumari *et al.* (2018) [12]. Lower CF content in Azolla has been reported by Kumar *et al.* (2018) [11]. However, higher values of CF content of Azolla were observed by Anitha *et al.* (2016) [2] and Chandewar *et al.* (2018) [3], than the present study.

The NFE in *Azolla pinnata* in present study was 40.60%. Similar findings were reported by Rawat *et al.* (2015) [17], Kavya *et al.* (2015) [9] and Anitha *et al.* (2016) [2].

In the present investigation total ash content of *Azolla pinnata* was found to be 20.40%. Similar findings were reported by of Samanta and Tamang (1995) [18], Kumari *et al.* (2018) [12] and Gupta *et al.* (2018) [6].

In the present study neutral detergent fiber values of *Azolla pinnata* was found to be 42.29% which was similar to that of Kumari *et al.* (2018) [12] and Gupta *et al.* (2018) [6] recorded higher NDF in Azolla than the present study.

In the present study acid detergent fiber content of *Azolla pinnata* was found to be 31.22%. Parashuramalu *et al*. (2013) [15] and Kumari *et al.* (2018) [12] reported lower ADF content in Azolla than present study whereas Gupta *et al.* (2018) [6] reported higher ADF in Azolla than present study.

Hemicellulose content of *Azolla pinnata* recorded in the present investigation was 11.07%. Similar findings were reported by Gupta *et al.* (2018) [6]. Samanta and Tamang (1995) [18] observed higher hemicellulose in Azolla than present study.

The Calcium content in *Azolla pinnata* was found to be 1.66%. Similar findings were observed by Samanta and Tamang (1995) [18], Gowda *et al.* (2015) [5], Anitha *et al.* (2016) [2] and Kumari *et al.* (2018) [12]. Cherryl *et al.* (2014) [4] and Rawat *et al.* (2015) [17] reported higher Calcium content in Azolla than present investigation.

The Phosphorus contented in *Azolla pinnata* was found to be 0.47%. Similar findings were reported by Rawat *et al.* (2015) [17]. However, Gowda *et al.* (2015) [5] reported higher Phosphorus content in Azolla than the present investigation. Lower Phosphorus content in Azolla were reported by Samanta and Tamang (1995) [18], Cherryl *et al.* (2014) [4], Anitha *et al.* (2016) [2] and Kumari *et al.* (2018) [12].

Table 1: Chemical Composition of green Azolla (*Azolla pinnata)* (% DM basis)

Particulars	DM	OM	CP	EE	CF	NFE	TA	NDF	ADF	HC	Ca	P
Azolla	90.20	79.60	23.45	3.10	12.45	40.60	20.40	42.29	31.22	11.07	1.66	0.47

Conclusion

The Azolla (*Azolla pinnata)* contained 23.45% crude protein, 3.10% ether extract, 12.45% crude fibre, 40.60% NFE, 20.40% total ash, 42.29% NDF, 31.22% ADF, 11.07% hemicellulose, 1.66% calcium and 0.47%, phosphorus on DM basis. On the basis nutritive value of *Azolla pinnata* it is

concluded that Azolla *(Azolla pinnata)* can be considered as potential unconventional feed for livestock and poultry.

Acknowledgments
We gratefully acknowledge the help offered by Dean, College of Veterinary and Animal science, Navania, Udaipur and O/I LFC and O/I Azolla unit College of Veterinary and Animal science, Navania, Udaipur for Providing infrastructure and necessary facilities to conduct the research.

References

1. AOAC. Official method of analysis, 15th Edn., Association of official analytical chemists, Washington, D.C., U.S.A, 2016.
2. Anitha KC, Rajeshwari YB, Prasanna SB, Shree JS. Nutritive evaluation of Azolla as livestock feed. Journal of Experimental Biology and Agricultural Sciences. 2016;4(6):670-674.
3. Chandewar DW, Rathod KD, Mohale DD. Effect of Green Azolla (*Azolla pinnata*) Feeding on Productive Performance of Crossbred Cows. 2018;11(6):745-747.
4. Cherryl DM, Prasad RMV, Jagadeeswara Rao S, Jayalaxmi P, Srinivas Kumar D. A study on the nutritive value of *Azolla pinnata*. Livest. Res. Int. 2014;2(1):13-15.
5. Gowda NKS, Manegar A, Verma S, Vallesha NC, Maya G, Pal DT, *et al*. Azolla (*Azolla pinnata*) as a green feed supplement for dairy cattle–An on farm study. Animal Nutrition and Feed Technology. 2015; 15(2):283-287.
6. Gupta SK, Chandra R, Dey D, Mondal G, Shinde KP. Study of chemical composition and mineral content of sun dried *Azolla pinnata*. Journal of Pharmacognosy and Phytochemistry. 2018;7(6):1214-1216.
7. Hossiny H, Setoudeh M, Rokni H, Dehghanzadeh H, Cheraghcheshm M. Using of silage Azolla in Guilan male calves nutrition. In Proceedings of Third National Congress of Recycling and Reuse of Reneweable Organic Resources in Agriculture Islamic Azad University, Khorasgan branch (Isfshan) Agricultural faculty, waste and water research centre, 2008.
8. Kathirvelan C, Banupriya S, Purushothaman MR. Azolla-An Alternate and Sustainable Feed For Livestock. Int. J Sci., Environ. and Tech. 2008, 2015;4 (4):1153-1157.
9. Kavya K, Prabhu TM, Gloridoss RG, Singh KC, Gowda NKS. Evaluation of Azolla (*Azolla pinnata*) and Its Supplementary Effect on *In Vitro* Digestibility and Metabolizability of Crop Residues. Indian Journal of Animal Nutrition. 2015;32(1):52-56.
10. Khare A, Baghel RPS, Gupta RS, Nayak S, Khare V, Patil A, et al. Milk production of indigenous cattle fed supplements of mustard oil cake or azolla meal (*Azolla filiculoides*). Livestock Research for Rural Development. 2014;26(4):65.
11. Kumar M, Dhuria RK, Jain D, Sharma T, Nehra R, Prajapat UKA. Nutritional evaluation of Azolla (*Azolla pinnata)* as feed supplement. Veterinary Practitioner. 2018;19(1):132-133.
12. Kumari R, Dhuria RK, Patil NV, Sawal RK, Singh S. Chemical composition and pellet quality of *Azolla pinnata* grown in semi-arid zone of India. International Journal of Chemical Studies. 2018;6(3):2031-2033.
13. Lumpkin TA. Assessing the potential for Azolla use in the humid tropics. International Rice Commission news. 1984;33:30-33.
14. Pannaerker S. Azolla as a livestock and poultry feed. Livestock Advisor. 1988;13:22-26.
15. Parashuramulu S, Swain PS, Nagalakshmi D. Protein Fractionation and *in vitro* Digestibility of Azolla in Ruminants. Online J of Anim. And Feed Res. 2013;3(3):129-132.
16. Pillai PK, Premalatha S, Rajamony S. Azolla-A sustainable feed substitute for livestock. Leisa India. 2002;4(1):15-17.
17. Rawat N, Kumari K, Singh F, Gilhare VR. Effect of Azolla-supplemented feeding on milk production of cattle and production performance of broilers. Applied Biological Research. 2015;17(2):214-218.
18. Samanta G, Tamang Y. Feeding value of azolla (*Azolla pinnata*) in goats. In Annales de zootechnie. 1995;44(1):62.
19. Talapatra SK, Ray SC, Sen KC. The analysis of mineral constituents in biology material. Estimation of phosphorus, chloride, calcium, magnesium, sodium and potassium in food stuffs. Journal of Veterinary Sciences. 1940;10:273.
20. Tamizhkumaran J, Rao SVN. Why Cultivation of Azolla as Cattle Feed Not Sustainable? Indian Journal of Dairy Science. 2012;65(4):348-353.
21. Van Soest PJ, Robertson JB, Lewis BA. Methods of dietary fiber, neutral detergent fiber and non-starch polysaccharides in relation to animal nutrition. Journal of Dairy Science. 1991;74(10):3583-3597.