

A NUTRITIONAL EVALUATION OF AZOLLA (*AZOLLA PINNATA*) AS FEED SUPPLEMENT[#]

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ABSTRACT

Received on: 19.10.2017

Accepted on: 18.01.2018

Azolla is a small aquatic fern which floats on the water surface. The name is referred to conjugation of two Greek words, azo (to dry) and allyo (to kill) because the fern is killed by drought. *Azolla pinnata* can be used as unconventional high potential feed resource as it contains 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. In view of the above facts, the nutritive value of *Azolla pinnata* as a feed supplement was explored. Azolla was cultivated, harvested and dried under shed. Dried Azolla sample was analyzed for proximate principles. The dry matter (DM) content of sun dried Azolla meal was 91.78 per cent. It contained 74.50 per cent organic matter, 22.25 per cent crude protein, 11.19 per cent crude fibre, 2.45 per cent ether extract, 25.50 per cent total ash, 38.61 per cent nitrogen free extract (NFE) and 7.94 per cent acid insoluble ash. The chemical analysis revealed that Azolla is rich in crude protein content and could be used as a potential unconventional natural protein source in livestock and poultry feeds.

Key words: Azolla, proximate, composition

Introduction

In the modern world, the changes in the life style, nature of work and food habits increases the incidents of serious diseases like coronary heart diseases, obesity and diabetes. Phyto-genic feed additives have gained increased interest in animal feed to avoid the residual effects of synthetic drugs. This situation apparently demands for the search for medicinally active as well as nutritionally rich and cheap non-conventional feed resources. Feeds of plant origin, as the green plants are recognized as excellent sources of protein, fat and pharmacologically active secondary metabolites. Recent study reveals that the aquatic plants are good sources of primary and secondary metabolites. Aquatic plants are gaining much interest in food and biomedical research, resulting from its broad range of uses such as human food, animal feed and bio-fertilizers.

Azolla is a free floating fresh water fern belonging to the family *Azollaceae* and order *Pteridophyta*. It is a common bio-fertilizer in rice crop. It grows in association with the blue-green. *Anabaena azollae*, is considered to be the most promising because of the ease of cultivation, high productivity and good nutritive value (Singh and Subudhi, 1978; Prabina and Kumar, 2010). The higher crude protein content (above 20%) and presence of essential amino acids (high lysine content), vitamin A precursor beta-carotene, vitamin B₁₂ and minerals like iron calcium, phosphorous, potassium and magnesium made Azolla useful feed supplement for livestock, poultry and fish. rural poultry integrated with in situ Azolla cultivation was able to provide sustainable livelihood security as well as income for diversifying the livelihood of the farmers. It is also found to contain probiotics and biopolymers (Pillai *et al.*, 2002). Thus, Azolla appears to be a potential source of nutrients and has a considerably high feeding value.

Materials and Methods

The Azolla had been cultivated at Livestock Feed Resource

Management and Training Centre, Rajasthan University of Veterinary and Animal Sciences, Bikaner. Several methods of Azolla production had been explored in the institute i.e. in grounded pits, Azolla beds. A shady place, preferably under a tree, with sufficient sunlight should be chosen for the Azolla production unit. Direct sunlight should be avoided. Each bed is having the dimensions 4 m X 2 m (8 m²) with 0.3 m depth. About 40-50 kg fertile soil was spread uniformly in bed. About 5 kg two to three-day-old cow dung was dissolved in 15 litres of water was added into each bed with thorough mixing such that the mixture was spread evenly throughout the area. Water is filled in bed up to the level of 10-15 cm. All corners of the pit should be of the same level so that the water level can be kept uniformly. Each bed was inoculated with 2 kg of fresh and pure culture of Azolla and water was sprinkled over it. pH of the bottom organic matter and the top water were tested regularly. After 15-20 day, everyday 1 kg of Azolla can be harvested from each bed. To obtain continuous growth of Azolla and to avoid nutrient deficiency 50 mg super phosphate and 2-2.5 kg cow dung is mixed once in every month. About 30 per cent water was replaced with fresh water once every 15 days to prevent excess nitrogen accumulation. Replacement of water and soil should be followed by fresh inoculation of Azolla, once in six months.

Collection and storage of Azolla

After 15-20-day Azolla multiplied rapidly and filled the beds within 7 days. Every fortnight about 10 Azolla samples were collected from beds. Harvested Azolla was washed thoroughly in clean water, weighed and dried for 2 to 3 days under shed so that it becomes crispy while green colour still retained in the dried Azolla. Dried Azolla was collected, packed in air tight bags and stored until further use. The chemical composition of the plant gives its potential nutritive value hence in the assessment of the quality of plant to proximate principle are first determined by AOAC (2007).

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Table 1: Proximate composition of Azolla on dry matter basis

Nutrient	% DM
Dry matter (DM)	91.78
Organic matter (OM)	74.50
Crude protein (CP)	22.25
Crude fiber (CF)	11.19
Ether extract (EE)	2.45
Nitrogen free extract (NFE)	38.61
Total ash (TA)	25.50
Acid insoluble ash (AIA)	7.94

Results and Discussion

The values of proximate composition of dried Azolla sample used in the experiment are presented in (Table 1). The dry matter (DM) content of dried Azolla meal was 91.78 per cent. Azolla contained 74.50 per cent organic matter (OM), 22.25 per cent crude protein (CP), 11.19 per cent crude fiber (CF), 2.45 per cent ether extract (EE), 38.61 nitrogen free extract (NFE) 25.50 per cent total ash (TA) and 7.94 per cent acid insoluble ash (AIA).

The chemical composition of dried *Azolla pinnata* sample as presented in (Table 1) revealed that the dry matter content was 91.78 per cent which was in close agreement with the results of Tamang and Samanta (1993), Basak *et al.* (2002), Balaji *et al.* (2009) Kumar *et al.* (2012) and Ali and leeson, (1995). The crude protein level of Azolla was found 22.25 per cent. The result was close to crude protein level found by the Sreemannaryana *et al.* (1993), Singh and Subudhi, (1978) and Alalade and Iyayi, (2006) but higher than the result obtained by Tamang and Samanta (1993) and Ali and leeson, (1995). Ether extract content of Azolla was 2.45 per cent. Though the composition may vary but corroborate favorably with the result obtained by Tamang and Samanta (1993), Ali and leeson, (1995) and Sreemannaryana *et al.* (1993) but ether extract value reported by Ali and Lesson (1995) was 1.60 per cent. Crude fibre level in Azolla meal was 15.71 per cent. The results are

similar to the earlier observation of Tamang and Samanta (1993) and Balaji *et al.* (2009) for *Azolla pinnata*. Nitrogen free extract (NFE) content of Azolla sample was 38.61 per cent. The result is comparable with the observation of Balaji *et al.* (2009). The result is lower than the observation of Tamang and Samanta (1993) and Alalade and Iyayi, (2006). Ash content of Azolla was 25.50 per cent. The results are in accordance with Tamang and Samanta (1993), Balaji *et al.* (2009) and Alalade and Iyayi (2007) of ash in *Azolla pinnata* but in Azolla meal it was 36.10 per cent in result obtained by Ali and leeson, (1995).

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