

## NUTRIENT CHANGES IN AZOLLA AT DIFFERENT STAGES OF HARVEST IN *Kharif* SEASON

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**Abstract:** The present study was undertaken to evaluate the nutrient changes (chemical composition) of Azolla at different stages of harvest in *Kharif* season. The azolla cultivation was done in 0.91m × 0.60 m × 0.30 m tank covered with plastic sheets at different treatments T<sub>1</sub> (15<sup>th</sup> days of harvest), T<sub>2</sub> (17<sup>th</sup> days of harvest), T<sub>3</sub> (19<sup>th</sup> days of harvest) and T<sub>4</sub> (21<sup>th</sup> days of harvest). The azolla samples after harvesting were analyzed for chemical composition separately for each stage as per AOAC (2000). The percentage of DM, CP, CF, EE and TA were significantly higher in treatment 19<sup>th</sup> day of harvest (T<sub>3</sub>) than other treatments. The results conclusively indicated superior nutrient contents (%) in Azolla harvested at 19<sup>th</sup> day (T<sub>3</sub>) than other stages of harvest. It was concluded that azolla when harvested at 19<sup>th</sup> day was found superior and higher in nutrients than other stages of harvest, hence azolla should be harvested at 19<sup>th</sup> day in *kharif* season for ruminant feeding to get maximum benefit.

**Keywords:** Azolla, chemical composition, yield, harvesting stage.

### Introduction

Although India is largest producer of milk, there is acute shortage of feed and fodder for dairy animals. Hence, there is a need to identify and incorporate unconventional feeding resources. The search for alternatives to green fodder and concentrates led to a wonderful plant azolla, which holds the promise of providing a sustainable feed for livestock (Mathur *et al.*, 2013). Azolla a dichotomously branched free floating aquatic fern is naturally available mostly on moist soil, ditches, marshy ponds and is widely distributed in tropical belt of India. It is rich in protein (25 - 35%), minerals (10 - 15%), amino acids (7 - 10%), vitamins and growth promoting intermediates. It's nutrient composition makes it an efficient and ideal feed supplement for livestock, poultry, pigs and fish. Thus, azolla appears to be a potential source of nutrients and has a considerably high feeding value (Cherryl *et al.*, 2014).

### Materials and Methods

The chemical composition of azolla was studied under four different harvest stages of azolla in *kharif* season. The treatments comprised of different days of harvesting of azolla viz., 15<sup>th</sup>, 17<sup>th</sup>, 19<sup>th</sup> and 21<sup>st</sup> day after inoculation, each having five replications. About 20 gm

of fresh azolla seeds were inoculated into each tank of size 0.91×0.60×0.30 cm (LBD). Each tank was dosed with 50 g of superphosphate at 15 days interval. Complete harvesting of azolla was done as per treatments on 15<sup>th</sup>, 17<sup>th</sup>, 19<sup>th</sup> and 21<sup>st</sup> days after inoculation in all the replications. Immediately after harvesting, azolla was washed thoroughly with fresh water and dried in oven till constant weight was stabilized and was stored in plastic containers for laboratory analysis. The azolla samples after harvesting were analyzed for proximate principles separately for each stage as per AOAC (2000).

**Table 1. Chemical composition (% DM basis) of Azolla at different stages of harvest**

Particulars	Harvesting Stage				Mean	SE (m) ±
	15 <sup>th</sup> day	17 <sup>th</sup> day	19 <sup>th</sup> day	21 <sup>st</sup> day		
<b>Chemical composition (% DM basis)</b>						
Dry matter**	5.03 <sup>d</sup> ± 0.07	5.62 <sup>c</sup> ± 0.1	6.45 <sup>a</sup> ± 0.05	6.04 <sup>b</sup> ± 0.12	5.78	0.09
Crude protein**	23.64 <sup>d</sup> ± 0.11	24.82 <sup>c</sup> ± 0.03	25.78 <sup>a</sup> ± 0.03	25.39 <sup>b</sup> ± 0.02	24.90	0.06
Crude fibre**	13.55 <sup>d</sup> ± 0.08	14.52 <sup>c</sup> ± 0.09	15.75 <sup>a</sup> ± 0.03	15.19 <sup>b</sup> ± 0.04	14.75	0.07
Ether extract**	3.44 <sup>c</sup> ± 0.15	4.06 <sup>b</sup> ± 0.10	4.40 <sup>a</sup> ± 0.11	4.24 <sup>ab</sup> ± 0.03	4.03	0.09
Total ash**	14.67 <sup>d</sup> ± 0.05	15.16 <sup>c</sup> ± 0.07	16.62 <sup>a</sup> ± 0.10	15.84 <sup>b</sup> ± 0.04	15.57	0.05
Nitrogen free extract**	44.70 <sup>a</sup> ± 0.07	41.43 <sup>b</sup> ± 0.22	37.44 <sup>d</sup> ± 0.10	39.34 <sup>c</sup> ± 0.08	40.72	0.15

\*\* ( $P<0.05$ ) Means bearing abc differ significantly.

**Plate 1: Azolla cultivation under different experimental conditions**



## Results and Discussion

The significantly higher average dry matter (6.45 per cent) was obtained on 19<sup>th</sup> day of harvest followed by 21<sup>st</sup> day of harvest (6.04 per cent), 17<sup>th</sup> day of harvest (5.62 per cent) and least on 15<sup>th</sup> day of harvest (5.03 per cent). The results were in agreement with Sujatha *et al.* (2013). The significantly higher average crude protein (25.78 per cent) was obtained on 19<sup>th</sup> day of harvest followed by 21<sup>st</sup> day of harvest (25.39 per cent), 17<sup>th</sup> day of harvest (24.82 per cent) and least on 15<sup>th</sup> day of harvest (23.64 per cent). The findings of the present experiment corroborate well with the findings of Chatterjee *et al.* (2013), who revealed that crude protein content of azolla ranged from 22 to 26 per cent. The highest average crude fibre, ether extract and total ash content in azolla were obtained on 19<sup>th</sup> day of harvest (15.75, 4.40 and 16.62 per cent, respectively) followed by 21<sup>st</sup> day of harvest (15.19, 4.24 and 15.84 per cent respectively), 17<sup>th</sup> day of harvest (14.52, 4.06, 15.16 per cent respectively) and 15<sup>th</sup> day of harvest (13.55, 3.44 and 14.67 per cent respectively). The crude fibre content of azolla was in agreement with Sujatha *et al.* (2013) who reported crude fibre content of 14.6±0.54 per cent. The ether extract and total ash content of azolla in present study corroborated with the values reported by Indira *et al.* (2009) viz., EE: 2.73 to 4.6 per cent and TA: 14.80 to 15.30 per cent. The mean nitrogen free extract was maximum on the 15<sup>th</sup> day of harvest (44.70 per cent) followed by 17<sup>th</sup> day (41.43 per cent), 21<sup>st</sup> day (39.34 per cent) and 19<sup>th</sup> day of harvest (37.44 per cent). The NFE content of azolla in present study was slightly lower than Parashuramulu *et al.* (2013), who reported 47.30 per cent nitrogen free extract content. It was concluded that azolla when harvested at 19<sup>th</sup> day was found higher in nutrients than other stages of harvest, hence azolla should be harvested at 19<sup>th</sup> day in *kharif season* for animal feeding to get maximum benefit. Thus, azolla can serve as a potential alternative nutrient supplement in the rations of ruminants and non-ruminants.

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