Effect of feeding Azolla on performance and blood parameters of ruminant livestock: a systematic review

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Introduction

- Poor quality feed limits ruminant husbandry in arid & semi-arid regions
- Azolla is a fast-growing, protein-rich aquatic fern (Fig.1)
- It can replace costly feed in ruminant diets

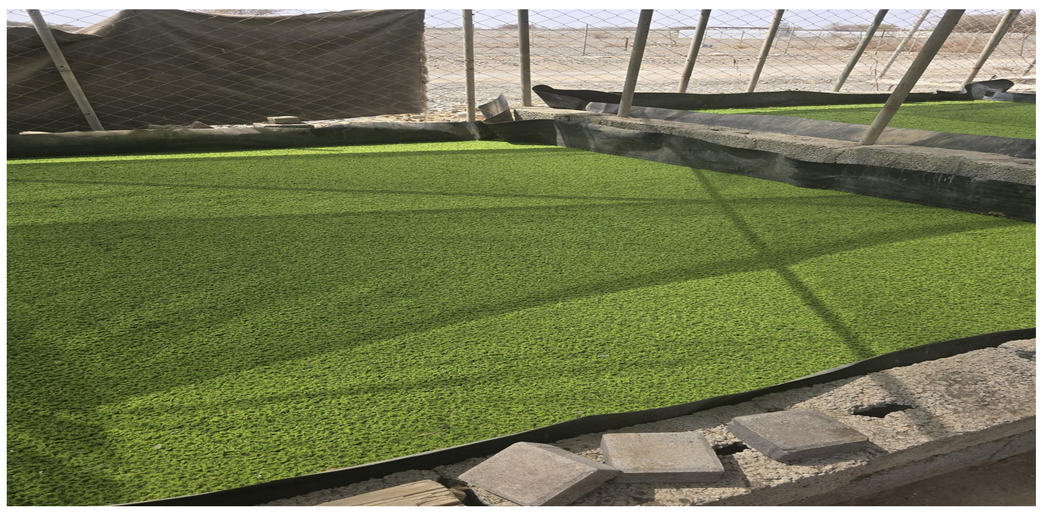

Fig 1. Azolla growing in cement–lined ponds under controlled shade conditions in Oman

Research question

What is the impact of feeding Azolla on ruminant performance in arid and semi-arid regions?

Methodology

A meta-analysis (Fig. 2) was performed to answer the research question.

1. **Databases searched:**
   - Scopus, Web of Science, Google Scholar
2. **Search period:**
   - 2000–2023
3. **Inclusion criteria:**
   - Language, animal species, region, study type
4. **Exclusion criteria:**
   - unclear methods, irrelevant animal species
5. **Included articles:**
   - 12 peer-reviewed studies

Fig 2. Flow-chart illustrating the sequence of research steps

Highlights

- ✓ Moderate dietary Azolla inclusion boosts feed intake, growth, and blood health
- ✓ Recommended inclusion levels are ≤100 g/kg feed dry matter (DM) for sheep, and ≤250 g/kg DM for goats

Results

- **12 studies:** Azolla improves growth & blood health
- **Sheep:** including 60–100 g/kg DM → ↑ feed intake & weight (Tab. 1)
- **Goats:** including 150–200 g/kg DM → ↑ feed intake & weight
- **Cattle & buffalo:** few studies → positive effects at low levels
- **Blood:** improved protein level

Tab 1. Effect of dietary Azolla inclusion on growth performance and blood parameters in different ruminant species

Species	Azolla inclusion (g/kg DM)	Effect of Azolla inclusion on			
		FI	DWG	Alb	TP
Sheep	60 - 100	↑	↑	↑	↓
Goat	150 - 250	↑	↑	↑	↑
Cattle	50	NA	↑	↑	NA
Buffalo	250	↑	↑	↑	↑

FI = Feed intake (g/kg live weigh); DWG = Daily weight gain (g/day); Alb = Albumin (g/dl); TP = Total protein (g/dl); NA = Not available due to limited data; ↑ = Increase; ↓ = Decrease

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