

Assessing the palatability of five tree species in sheep

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ABSTRACT

Agroforestry for forage production could be a promising solution to provide additional tree-based forage and to compensate for drought-induced forage losses in permanent grasslands. We set up an indoor experiment in August 2024 to assess the palatability of five tree species in sheep. Tree leaves were fed to six sheep for one hour each morning, five days per week with a different species fed to the paired sheep each day. This setup was replicated for three weeks, with leaves harvested in the field at the beginning of each week and refrigerated. Tree leaves represented 20% of the sheep's daily dry matter intake. The remaining 80% was supplied with hay, 20% of which was given in the morning, at the same time as the leaves, and the remaining 60% in the evening. Overall, the leaves of all species had a good nutritive value (high protein and low fiber content) and were well consumed by the sheep. *Salix caprea* was the preferred species and was consumed in similar amounts to hay, showing the highest palatability index. *Morus alba*, *Fraxinus ornus* and *Tilia cordata* also had a high palatability index, whereas *Alnus cordata* was the least preferred species. Palatability was correlated with leaf nutritive value, with species having a higher fiber content being less preferred. Altogether, our findings highlight the potential of fodder tree leaves to provide good quality forage with high palatability in sheep.

INTRODUCTION

- **Climate change** is causing significant losses in forage yield and quality in permanent grasslands, particularly due to longer periods of **summer drought**.
- The **AgroForageTree** project aims to assess the potential of five tree species to provide additional forage in summer. As part of this project, a palatability trial of the five tree species was set up with sheep (Cantonal authorization 2024-14-FR).

METHODS

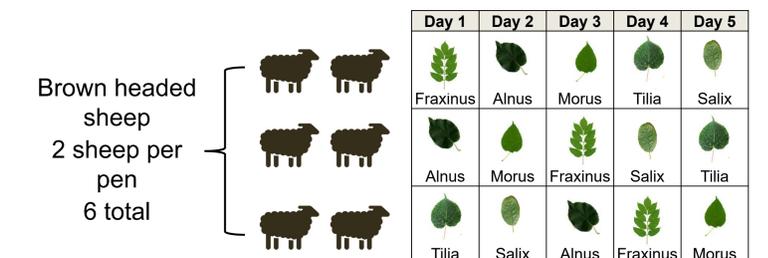
Tree species selection

- **Five tree species** were chosen in terms of their high potential yields, good nutritive values, resistance to drought and frost and regrowth after grazing and pruning:



Leaf collection and feeding

- Leaves were collected from the project's hedgerows, except for the leaves of *Tilia cordata* (Chésereux) and *Morus alba* (Hinterkappelen*), which were collected on adult trees.

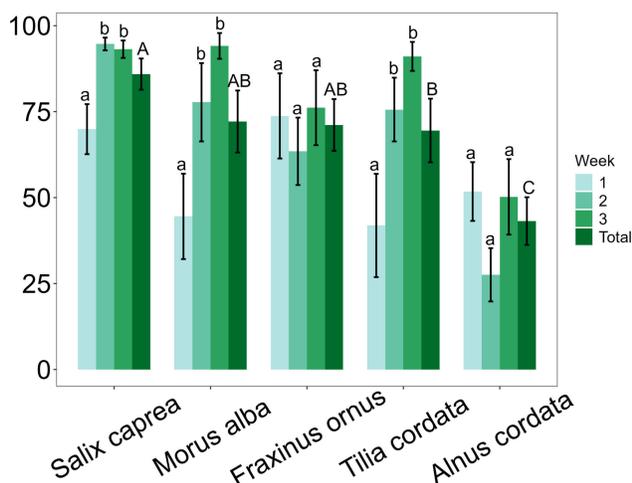


- The leaves were fed 5 days per week for 3 weeks, for one hour each morning.

RESULTS

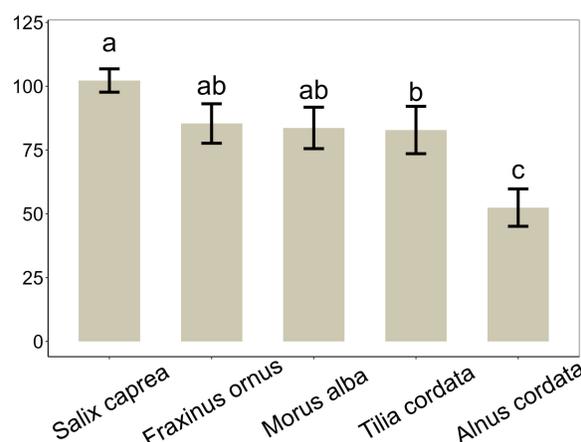
Intake of the five tree species by week

Percentage of daily leaf consumption per species (% DM, ± standard error).



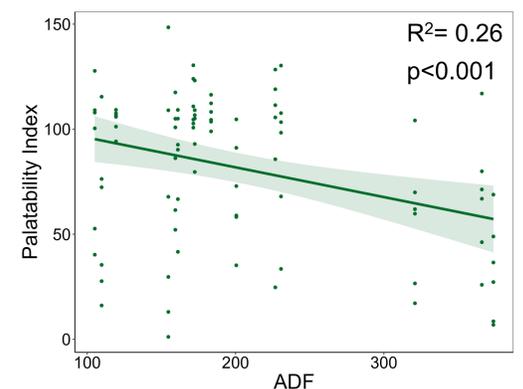
Palatability of the five tree species

Palatability index (% ± standard error) calculated for the five tree species ([g consumed leaves/ g offered leaves] / [g consumed hay/ g offered hay]).



Effect of fibers on palatability

The relationship between palatability and leaf acid detergent fiber (ADF) was tested using a linear-mixed-effect model with week nested in sheep as a random factor.



Average nutritive value for the five fodder tree species

| | Crude protein | NDF | ADF | ADL | Ca | P | K | Mg | Cu | Fe | Mn | Zn |
|-----------------------|---------------|-----|-----|-----|----|-----|----|-----|-----|-----|----|----|
| Units | g/kg | | | | | | | | | | | |
| <i>Alnus cordata</i> | 150 | 361 | 354 | 193 | 14 | 1.2 | 9 | 1.7 | 8.1 | 69 | 87 | 28 |
| <i>Fraxinus ornus</i> | 111 | 299 | 219 | 62 | 16 | 1.7 | 12 | 2.0 | 6.0 | 90 | 41 | 12 |
| <i>Morus alba</i> | 170 | 176 | 111 | 17 | 33 | 3.5 | 20 | 2.3 | 7.0 | 75 | 50 | 22 |
| <i>Salix caprea</i> | 141 | 250 | 172 | 81 | 14 | 2.1 | 14 | 1.4 | 6.5 | 68 | 54 | 39 |
| <i>Tilia cordata</i> | 140 | 265 | 163 | 59 | 30 | 2.0 | 13 | 3.5 | 6.5 | 169 | 15 | 21 |

- Leaf consumption increased over time for *Salix caprea*, *Morus alba* and *Tilia cordata*.
- *Salix caprea* had the highest palatability (100%), whereas *Alnus cordata* had the lowest (50%).
- Across tree species, the palatability index was negatively correlated with the ADF fraction in leaves.
- Overall, most species had high crude protein (>140 g/kg) and low fiber content.

DISCUSSION

The sheep consumed the leaves of all five fodder tree species. For *Salix caprea*, *Morus alba* and *Tilia cordata*, leaf consumption increased over the three weeks, indicating a gradual preference for these species. *Salix caprea* was the most palatable species in sheep, followed by *Fraxinus ornus*, *Morus alba* and *Tilia cordata*. *Alnus cordata* was the least palatable, likely due to its high fiber content, which significantly influenced palatability. These results are promising and show that tree leaves, which were sometimes as well consumed as hay, can provide a good forage supplement for livestock in summer.

* The leaves of the white mulberry were provided by the Bergfeld Hof farm which produces mulberry plants for sale (Bergfeldstrasse 5, 3032 Hinterkappelen, 079 436 85 53).