

# Exploring the Fermentation Quality of Alfalfa (*Medicago sativa*) Ensiled with Mugwort

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**Keywords:** alfalfa; silage; mugwort; fermentation; lactic acid bacteria

**Introduction:** Alfalfa (*Medicago sativa*) is widely used for animal feed in the world due to its high protein content. However, alfalfa could be hard to ensile owing to undesirable fermentation with the growth of *Clostridium* and *Enterobacter*. Mugwort (*Artemisia argyi* L.) belongs to the Asteraceae family, the fresh buds and leaves have been traditionally consumed as food supplements. Besides, researchers have studied the antibacterial activity of the bioactive substances in mugwort, which could inhibit the microbial growth. Therefore, the mugwort could be potentially used as an agent for adjusting the fermentation of alfalfa silage.

**Materials and Methods:** The harvested alfalfa was cut into 1-2 cm and divided into four treatments: (i) untreated control (CK); (ii) application of  $1 \times 10^6$  cfu/g lactic acid bacteria (LAB); (iii) application of 8% mugwort (M); (iv) combination of  $1 \times 10^6$  cfu/g LAB and 8% mugwort (LAB+M). Approximately 500 g of chopped alfalfa material or supplemented with mugwort was mixed homogeneously with additives and packed manually into polyethylene bags and vacuumed tightly. After 60 days of ensiling, three samples per treatment were opened to evaluate their fermentation end products and chemical composition.

**Results:** The alfalfa used in this study had the dry matter of 19.90%, crude protein of 237.02 g/kg DM, water-soluble carbohydrate of 34.15 g/kg DM. The neutral detergent fiber and acid detergent fiber contents were 331.88 and 176.56 g/kg DM, respectively. After 60 days of ensiling, the LAB or mugwort additives accelerated lactic acid fermentation, resulting in a lower pH compared with the CK group ( $P < 0.01$ ), and enhanced the lactic acid fermentation greater in the LAB+M group. Higher  $\text{NH}_3\text{-N}$  and butyric acid contents ( $P < 0.01$ ), as well as coliform bacteria were detected in the CK compared with other groups. Silage treated with LAB+M had better fermentation quality compared with other groups, indicated by lower pH and  $\text{NH}_3\text{-N}$  content and higher lactic acid.

**Discussion:** Generally,  $\text{NH}_3\text{-N}$  is regarded as a typical product of amino acid deamination and decarboxylation, and the activity of Coliform and plant proteolytic enzymes may lead to  $\text{NH}_3\text{-N}$  accumulation. As mentioned in the results, the combined addition of LAB and mugwort had lower  $\text{NH}_3\text{-N}$  contents than other treatments. The synergy effect of LAB acidification and the bioactive substances in mugwort could contribute to improving silage quality.

**Conclusion:** Ensiling alfalfa with Mugwort could improve fermentation quality especially co-addition with LAB, which would be a potential method for enhancing the fermentation quality of alfalfa silage.

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