

# WILLOW SILAGE

## EXPLORING ALTERNATIVE TECHNIQUES

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Wintertime is a major challenge in European zoos housing browsers. An inadequate supply of browse increases the risk of health issues, such as ruminal subacute acidosis and hoof problems, but also impairs natural behaviour and thus mental health in browsers. Moreover, many other animals, such as leaf eating primates, benefit from access to browse during winter.

### ALFALFA AS A NEW ADDITIVE IN DRUMS

Institutions who make browse silage mostly manually harvest browse which is then stored in drums with or without additives. This study compared the effectiveness of commonly used additives with alfalfa as a new additive. Alfalfa is currently the best alternative for browse and is known to preserve well as silage. In total, 2 tons of willow twigs (< 0.8 mm Ø, *Salix burjatica* x *S. viminalis*) were manually harvested in the beginning of June 2018. Two short rotation willow fields, intended for

biomass, were used as willow source. The willow was pressed into 30 L polyethylene drums with a self-developed automatic press machine to minimize the content of air.

Per additive, 3 drums were sampled at 9 weeks and 6 months



of storage and compared with blank drums (no additives). The nutritive value of willow did not significantly alter after ensiling regardless of the used additive (Table 1). The addition of alfalfa

however, resulted in an end product significantly lower in fibre. However, fibre fractions (NDF, ADF) were still much higher than pure alfalfa. Interestingly, willow ensiled in combination with alfalfa resulted in a significantly lower pH and higher content of lactic acid bacteria compared with the other additives and the blank, which indicates a better fermentation. Moreover, the addition of alfalfa succeeded, as only additive, in a complete disappearance of yeast and mould growth. This is an important advantage since zoos regularly have to remove the top layer of ensiled browse in drums due to the visible growth of fungi.



Table 1. pH and chemical composition of fresh willow and willow silage after 6 months

Field	Willow type	Treatment*	pH	DM %	% on dry matter basis				
					Protein	Fat	Fibre	NDF†	ADF†
1	Fresh		5.9	40.4	11.3	2.2	33.0	61.5	50.2
	Silage	Blank	5.6	31.9	13.5	1.5	30.1	68.9	54.2
		+Molasse+HFI	5.7	33.9	11.1	1.6	38.1	63.3	44.6
		Nitrogen flushing	5.7	34.9	10.2	1.6	39.3	61.3	56.1
2	Fresh		5.9	29.4	14.2	2.2	34.9	64.2	54.5
	Fresh (60%)	+Alfalfa (40%)	6.0	35.5	17.4	2.1	32.4	56.8	46.5
	Silage	Blank	5.5	29.1	12.2	1.7	37.8	68.6	55.7
		+Alfalfa (40%)	5.0	35.7	17.2	1.8	33.1	58.1	48.5

\*Molasse (4% of willow (DM)) + homofermentative silage inoculant (108 CFU/kg fresh browse); nitrogen (flushing drum with 2 bar, 1.5 minutes); †NDF = neutral detergent fibre, ADF = acid detergent fibre.

Our results indicate that the addition of alfalfa improves the quality of ensiled willow in drums compared with currently used additives.

A preference test with bongos (*Tragelaphus eurycerus*) was set up to evaluate whether the animals preferred willow ensiled with or without the addition of 40% alfalfa. Five bongo's housed at Antwerp Zoo and Planckendael were used for the trial. The two types of silage were simultaneously offered and first choice as well as the amount of consumed willow silage were monitored. There was no significant difference in preference and acceptance between willow ensiled with or without alfalfa.

### **WILLOW SILAGE IN BALES**

Although the production of browse silage is fairly cheap and easy, it remains labour intensive. Currently, the use of alternatives such as dried or frozen browse is not widespread due to relatively high costs or lack of storage capacity. Possibly, the commercialisation of browse silage could be a solution for many zoos. Yet, to allow a lucrative commercialisation of browse silage, automatic pruning and ensiling is required.

In June 2018, a pilot study was set up to explore if willow twigs could be wrapped in round bales. The bales weight around 500 kg and were successfully stored for 6 months before being fed to several animal species at Bellewaerde Park.

In June 2019, a collaboration was set up with a brushwood



company that owns 248 acre plantations of various *Salix* types. Willow (*S. viminalis* sp.) growing at the border of the plantation was automatically cut and directly wrapped in small round bales of 150 kg, which are better suitable for zoo settings. The bales will be analysed after 6 months of storage to evaluate the quality of preservation.

### **FURTHER EXPLORATION**

Commercialisation of the current quality of willow bales is however a risk for traders since the plastic can be punctured during transport. As such, a next trial will focus on making bales from younger willow that is not yet lignified. Our research focusses on ensiling complete branches of willow to stimulate oral manipulation in browsers and to allow the animals to be selective in what they eat.

However, the use of chipped



willow might be more suitable to commercialise in small bales without any risk of puncturing the packaging. Therefore, in cooperation with Kiezebrink®, small bales of chipped willow will be produced and evaluated after 6 months of storage.