

Effects of maturity on yield, nutritive value and fermentability of whole-crop white lupins

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- silages from home-grown legumes with (ever) increasing importance
 - to meet the dietary protein demands of ruminants
 - to diversify crop rotations
 - to get access to (more) EU subsidies
- lucerne/clover - grown alone or in combination with grasses - most important legumes in temperate climates, but
 - land fixed over several years (3-4 years)
 - rather high weather dependency due to necessity to wilt
 - rather high costs due to needed technological actions, e.g. tedding/raking/swathing

Determination of feed value of whole-plant white lupin during the course of vegetation (and in silages produced therefrom)

Material and Methods (I)

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- white lupin (variety *Celina*) planted on March 25, 2024 at 292 kg/ha in Etingen, Saxony-Anhalt, Germany
- manual harvest of the forage at 10 cm cutting height, starting on June 19, 2024, at bi-weekly intervals
- 4 random sampling locations in the field selected; material from 2-4 m² harvested to determine yield per harvest
- after transport to Anhalt University, material chopped by stationary chopper to 30 mm theoretical length of cut (followed by processing through a garden shredder for the last two harvests)
- one silo packed with material from each of the sampling locations (4 reps/harvest), stored for 111-132 days at 20-22 °C

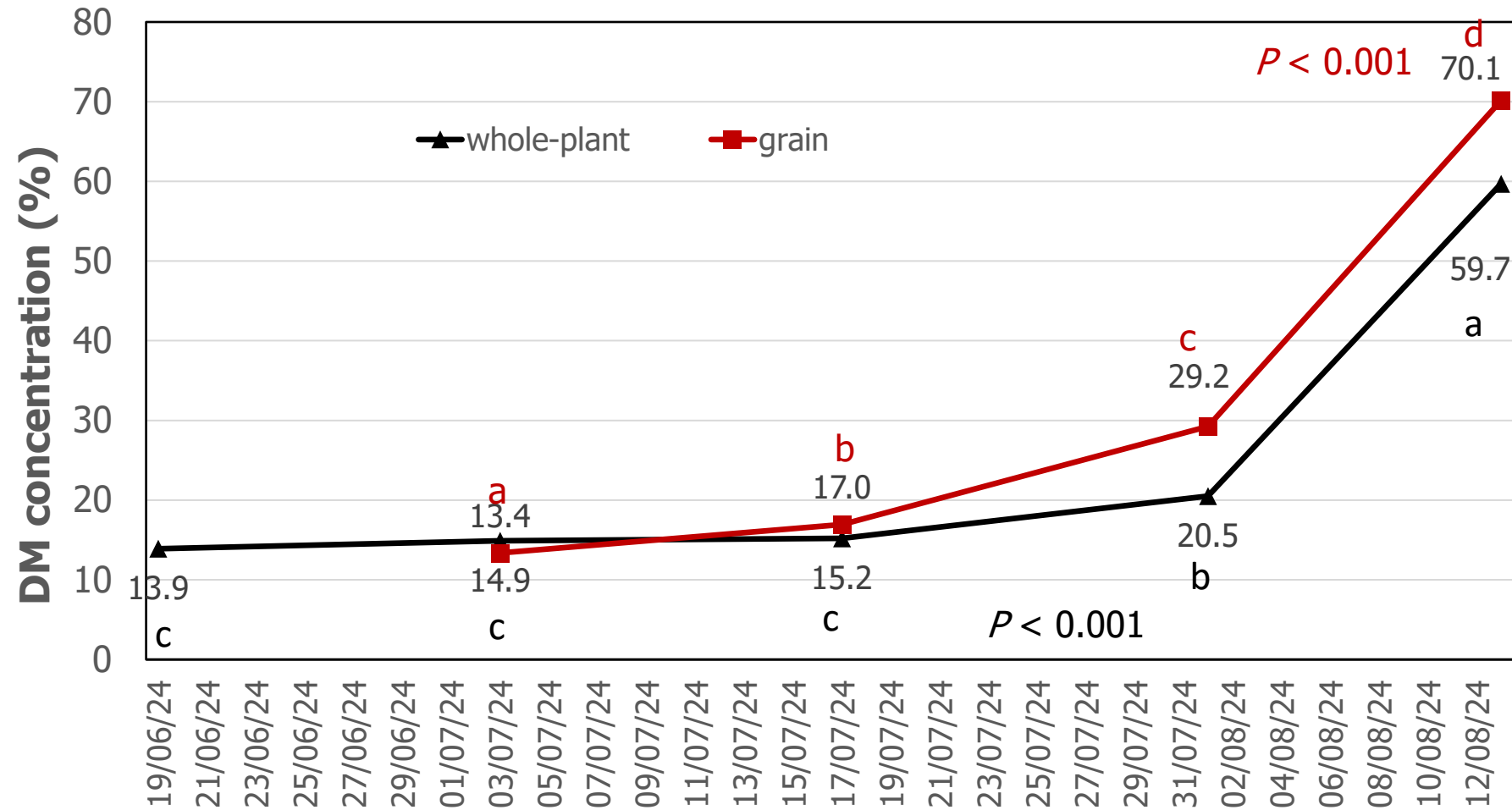
Material and Methods (II)

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- all analyses done by wet chemistry according to official methods of the German Feed Evaluation System (VDLUFA; GfE, 2023)
- DM losses during fermentation calculated according to Weissbach (2005)
- statistical analysis by SAS 9.4, GLM proc as completely randomized block design; REG used to describe relationship between DM concentration and DM losses during fermentation
- differences among LSmeans separated by Tukey test, significance declared at $P < 0.05$

DM development in whole-plant and grain

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Development of certain lupin traits over time

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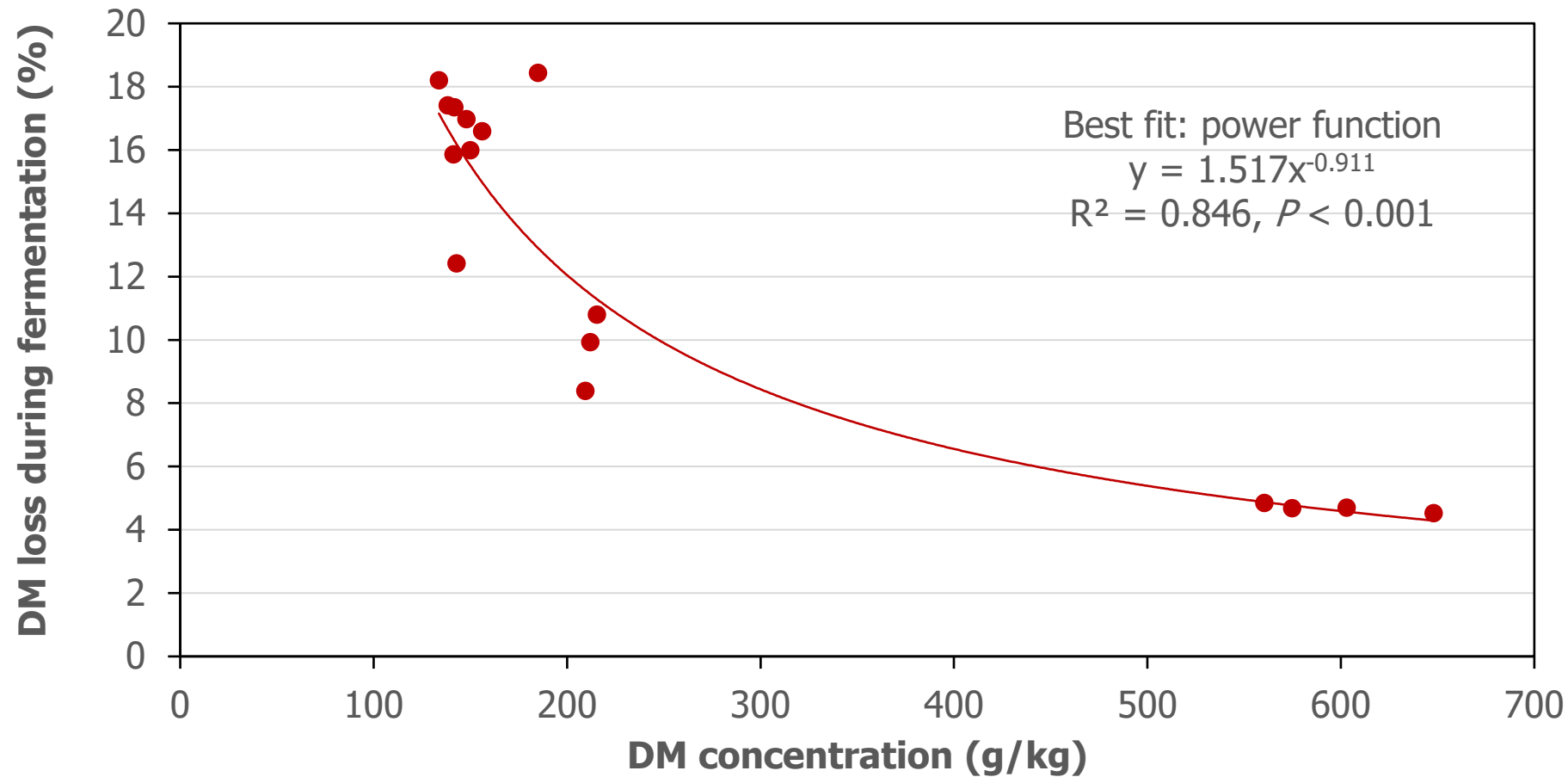
Trait	Harvest					SEM	P
	1	2	3	4	5		
Crude ash (g/kg DM)	61 ^a	48 ^b	45 ^c	46 ^c	49 ^b	0.4	<0.001
Crude protein (g/kg DM)	162 ^b	154 ^b	154 ^b	161 ^b	198 ^a	5.9	<0.01
Water-soluble carbohydrates (g/kg DM)	112 ^c	198 ^a	158 ^b	79 ^d	51 ^e	3.8	<0.001
Starch (g/kg DM)	100 ^e	103 ^d	189 ^c	192 ^b	203 ^a	0.4	<0.001
Fermentability coefficient	34 ^c	61 ^b	58 ^b	35 ^c	67 ^a	1.0	<0.001
OMD (%)	64.0 ^c	67.6 ^b	67.0 ^b	66.0 ^b	70.5 ^a	0.41	<0.001
GE ⁵ (MJ/kg DM)	19.6 ^b	19.2 ^c	19.2 ^c	19.8 ^b	20.4 ^a	0.05	<0.001
ME ⁶ (MJ/kg DM)	9.8 ^c	10.2 ^b	10.1 ^{bc}	10.3 ^b	11.3 ^a	0.09	<0.001
Yield							
DM (t/ha)	6.91 ^c	6.36 ^c	12.42 ^a	9.22 ^b	12.11 ^a	0.47	<0.001
Crude protein (t/ha)	1.11 ^c	0.98 ^c	1.91 ^a	1.48 ^b	2.38 ^a	0.07	<0.001
ME ⁶ (GJ/ha)	67.53 ^c	64.85 ^c	125.25 ^a	94.33 ^b	137.26 ^a	4.62	<0.001



Relationship between DM at ensiling and DM loss during fermentation

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Summary and conclusions

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1. Lupins undergo significant changes in chemical composition during the vegetation period.
2. High DM yields seem to be attainable with one cut (direct-cut), which are comparable to grass/lucerne in a multi-cut (3-4) system, but at lower technological costs.
3. Sufficiently high DM of the direct-cut forage needs to be attained (min. 30%) in order to avoid nutrient/energy losses by effluent production.
4. Harvest window seems to be rather narrow due to rapid maturation especially under hot and dry conditions.
5. More studies needed to enable comprehensive evaluation of the potential of whole-crop lupins as forage for silage production.
6. Feeding studies with dairy cows to be conducted to study the effect of lupin silage (replacing lucerne/clover/grass silage) on feed intake and milk yields.

Thank you very much for your attention!

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