

SilaToast pea / field bean

Combined fermentation & thermal treatment



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Aim of the project

- Investigation of **decentralized** grinding & ensiling of fresh or re-moistened grain legumes (approx. 70% TM) as a **processing, preservation and storage method**
- **Improvement of feed value & feeding** in dairy cattle & monogastric nutrition through the **combination of silage & heat treatment**
- **Reduction of ruminal CP degradation (50-70%) & antinutritives** (tannins, lectins, Vicin, Phytat-P)
- **Increased digestibility & starch resistant to ruminal degradation**
- **Establish the combined treatment process** (silage + heat treatment) for grain legumes produced on-farm

Background of the feed value

Classics vs. pea / field bean – analytic & literature



Hoffmann & Steinhöfel, 2010

		SES	RES	IGE-Monitoring	
				field beans	peas
Dry matter	g / kg	880	880	882	875
Crude ash	g / kg DM	67	77	36	32
Crude protein	g / kg DM	510	399	297	240
Protein solubility	% des CP	35	37	61	67
Lysine	% des CP	5,9	5,0	6,0	7,2
Methionine	% des CP	1,3	2,0	0,7	0,9
Crude fiber	g / kg DM	67	131	75	60
Crude fat	g / kg DM	15	25	23	23
Total sugar	g / kg DM	108	80	42	52
Starch	g / kg DM	69	0	445	528

SES = Soybean meal, RES = Rapeseed meal

Substance	Connection	Effect	Rating		Countermeasure	
			Pea	Field bean	Ruminant	Monogastrid
Alkaloids	Bitters	Feed intake Liver damage	0	0	no	no (only lupine)
Polyphenols	condensed tannins	Feed intake Protein solubility	colorful flowering + white flowering 0		no	white flowering sorts use restrictions
Proteins	Lectins	Digestion disorders Immune defense	+	++	no	thermal treatment use restrictions
	Protease inhibitors	Inhibition of trypsin Inhibition of Chymotrypsin	++	++	no	thermal treatment
Glucosids	Vicin, Convicin	Fat metabolism	0	++	no	Breed restrictions (poultry)
	Saponins	Hemolysis Anti-Vit D	(+)	(+)	no	no
	Galactosids	Digestion disorders Fermentation gas bilding	+	+	no	enzyme supplements restrictions
Chelating agent	Phytin	Mineral utilization	++	++	no	Phytat supplements

Investigations in the project SilaToast

Varieties

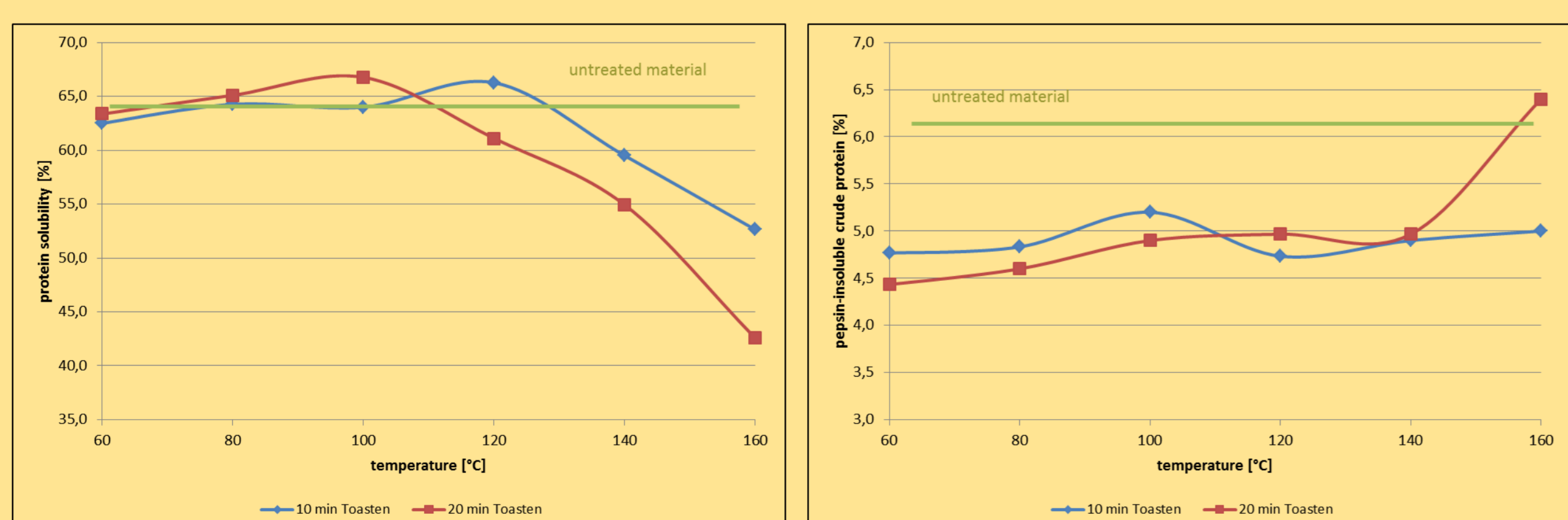
pea & field bean

(white-/colourful flowering / poor / rich in tannin)



Heat treatment

Time of thermal treatment & temperature ranges



Example: Change of protein properties of silicified peas as a function of temperature and duration of the heat exposure

Stages of maturity

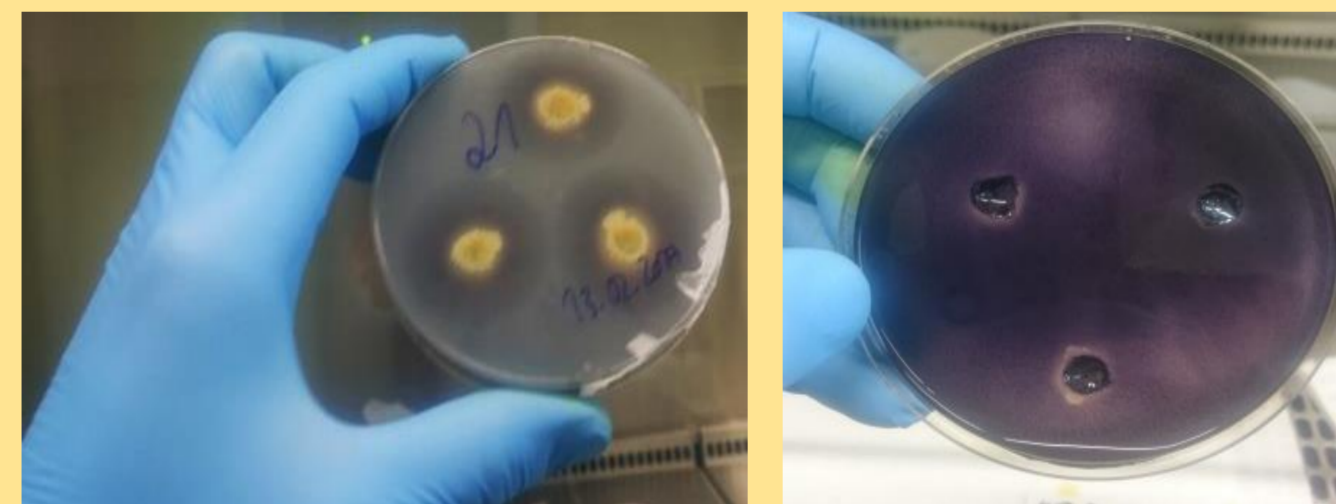
(70 % DM & > 88 % DM)



Silage additive

Lactic acid bacteria

(with increased / low amyolytic activity)



Technical trials on ensiling, heat treatment & feeding

(LfULG/LVG Köllitsch & Democompanies)



molecular Genetics

(Mikrobiom)

Laboratory analysis

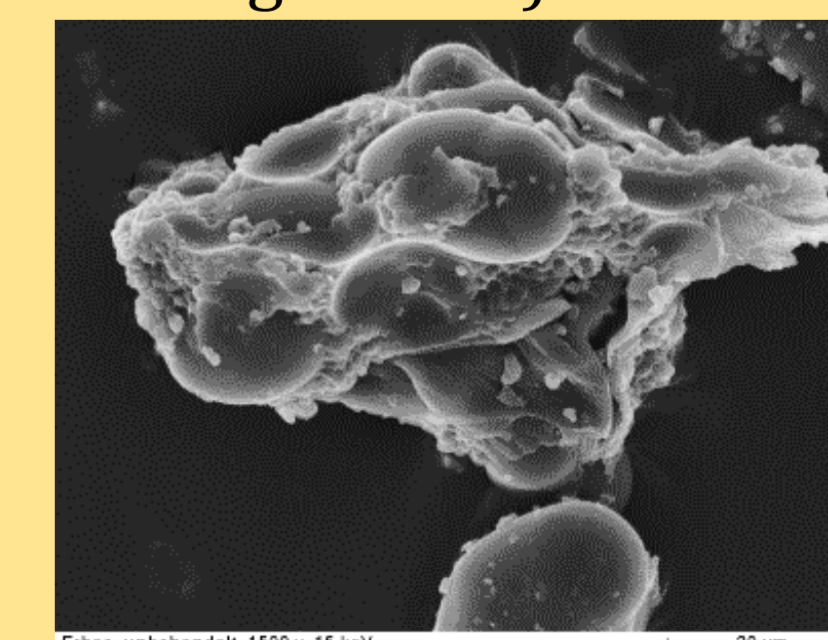
(Fiber / Protein fractions, Starch, Sugar, HFT, HFTmod., Fermentation acids, Alcohols, Phytin-P, Tannins, Antinutritiva)

in vitro - gas formation

(Gas production, fermentability)

molecular electron microscopy

(morpho-metric characterization of starch granules)



Digestibility trial (sheep)

(Acceptance, digestibility, energy content)