

Feed value of selected leaves

Which ones do cattle prefer?

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Center for Free Range Livestock

PROJECT ROBUST

Nordic Network Meeting for

Organic cattle advisors

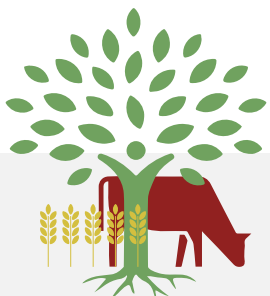
Tuesday the 5th of september 2023



Feed value of leaves - Project ROBUST

Samples of leaves collected in the project

		2021		2022	
		29. Maj- 29. juni- 27. Juli- 31. august		5. juli	
Tree species	English	Located	# samples	Located	# samples
Bævreasp (<i>Populus tremula</i>),	Common aspen	Funder	4	Funder	1
Engriflet tjørn (<i>Crataegus monogyna</i>)	Common hawthorne	Funder	4	Funder	1
Sargents æble (<i>Malus sargentii</i>)	Sargents crapapple	Funder	4	Funder	1
Alm. Røn (<i>Sorbus aucuparia</i>)	Rowans	Ejstrupholm	4	Funder	1
Gråpil (<i>Salix cinerea</i>)	Grey sallow/willow	Ejstrupholm	4	Funder	1
<i>Sibirisk ærtetræ (Caragana arborescens)</i>	Siberian Pea-tree	Funder	1	Funder	1
Dunbirk (<i>Betula pubescens</i>)	Downy/hairy Birch		0	Funder	1



Bævre asp

Høstet 29. maj



Høstet 29. juni



Høstet 31. august



Tjørn

Høstet 29. juni



Høstet 31. august



Gråpil

Høstet 29. juni



Høstet 27. juli



Sargent's æble

Høstet 31. maj



Høstet 31. august



Alm. Røn

Høstet 29. juni



Høstet 27. juli

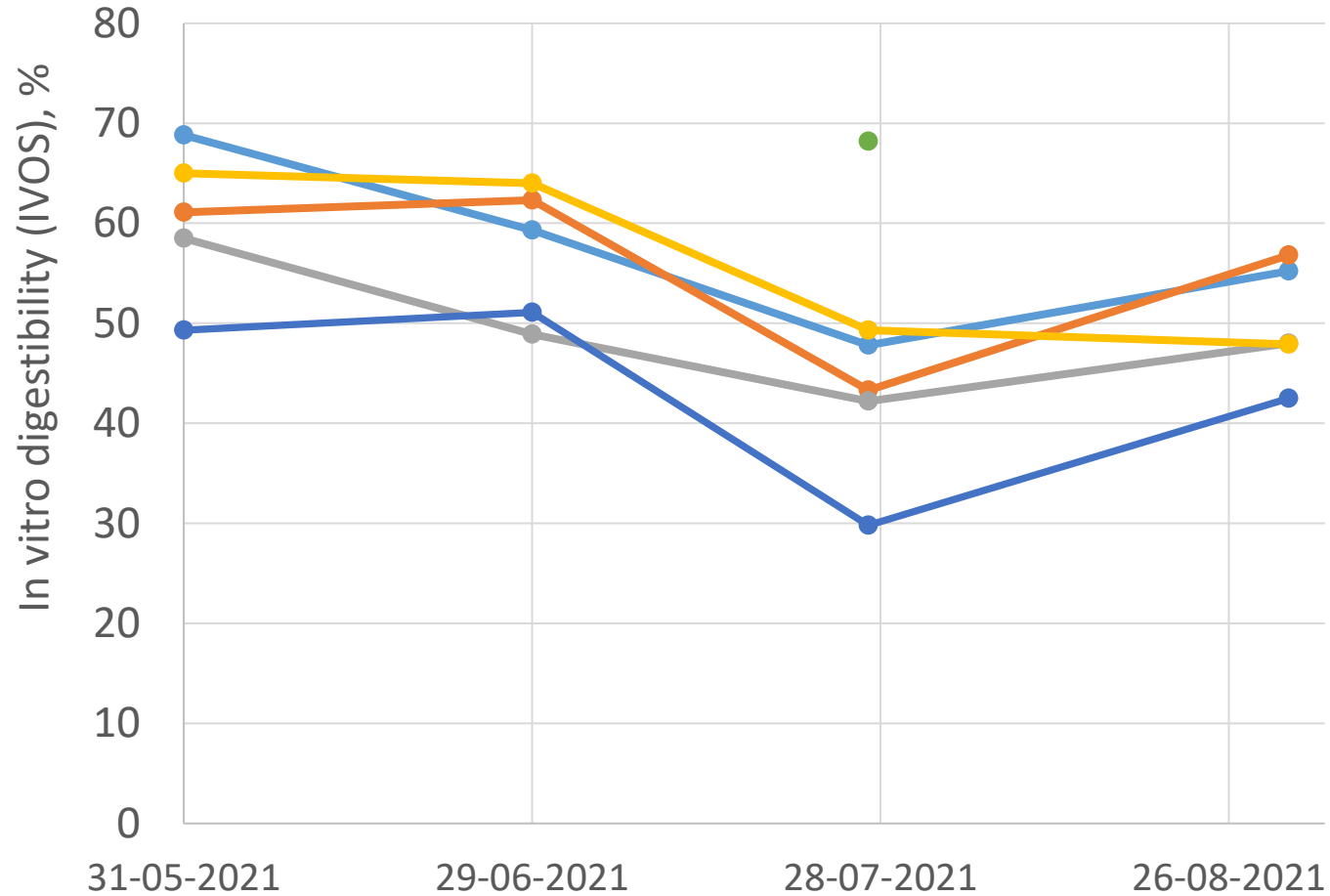


Sibirisk ærtetræ

høstet 5. juli



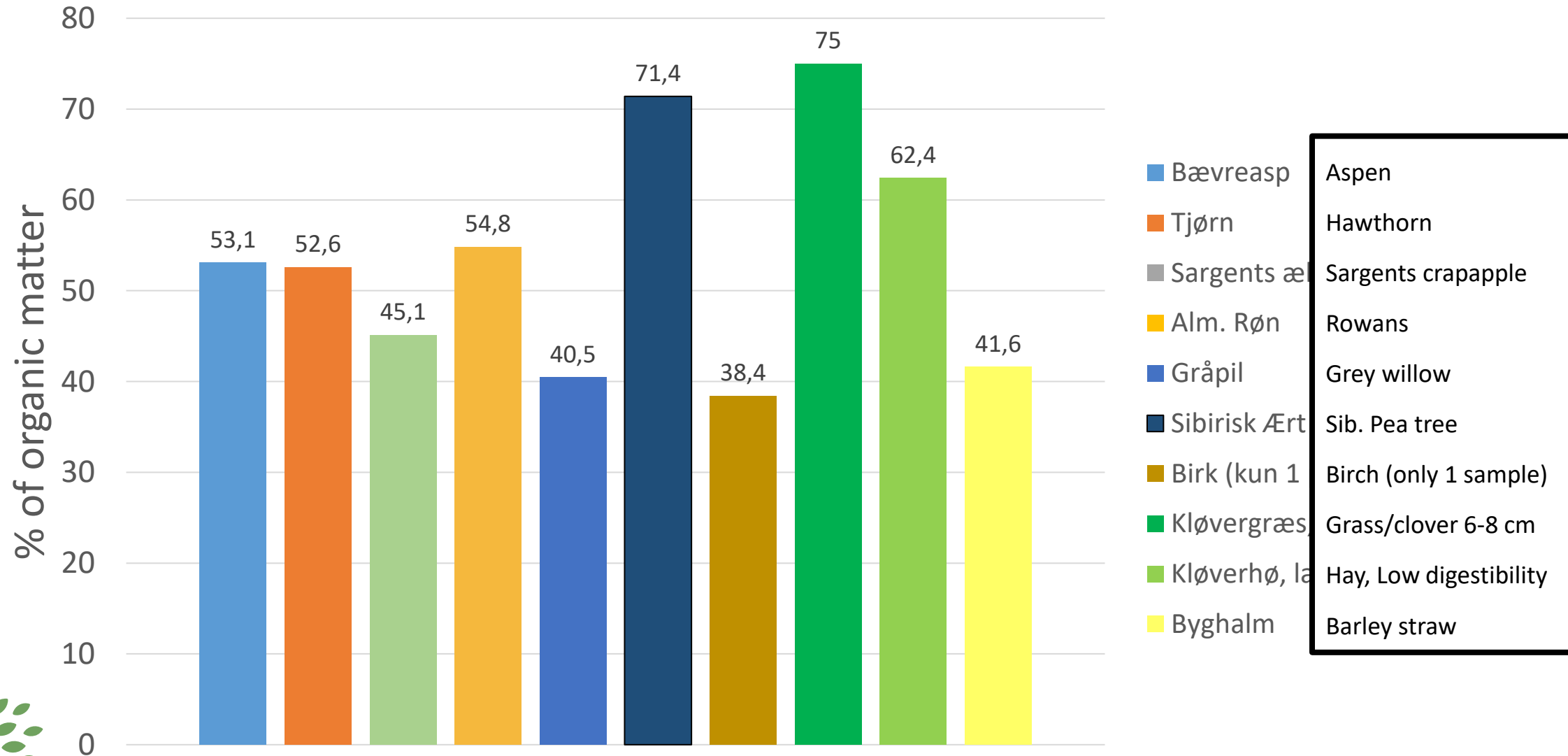
Results - *in vitro* digestibility



- Bævreasp Aspen
- Tjørn Hawthorn
- Sargent's æble Sargents crapapple
- Alm Røn Rowans
- Gråpil Grey willow
- Sibirisk Ærtetræ Blade Leaves of Sib. Pea tree



Average *In vitro* digestibility of OM (IVOS)



Content of crude protein

Species	# samples	Crude protein % of DM
Aspen-Bævreasp	4	14,2 ± 0,5
Hawthorn-Tjørn	4	13,5 ± 1,1
Sargents crapapple -S. æble	4	12,3 ± 0,8
Rowan-Alm. Røn	4	10,8 ± 1,8
Grey willow-Gråpil	4	18,0 ± 0,7
Sibirisk pea tree- Sib. Ært	2	25,7 ± 1,2
Birch- Birk	1	13,4
Grass/clover - Kløvergræs, 6-8 cm		19-25,5
Hay Low qual.- Kløverhø, lav FK		11
Barley straw-Byghalm		4
Requirement, dairy cow		15-17
Requirement, maintenance		12

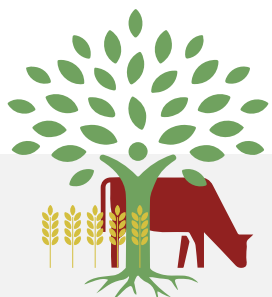
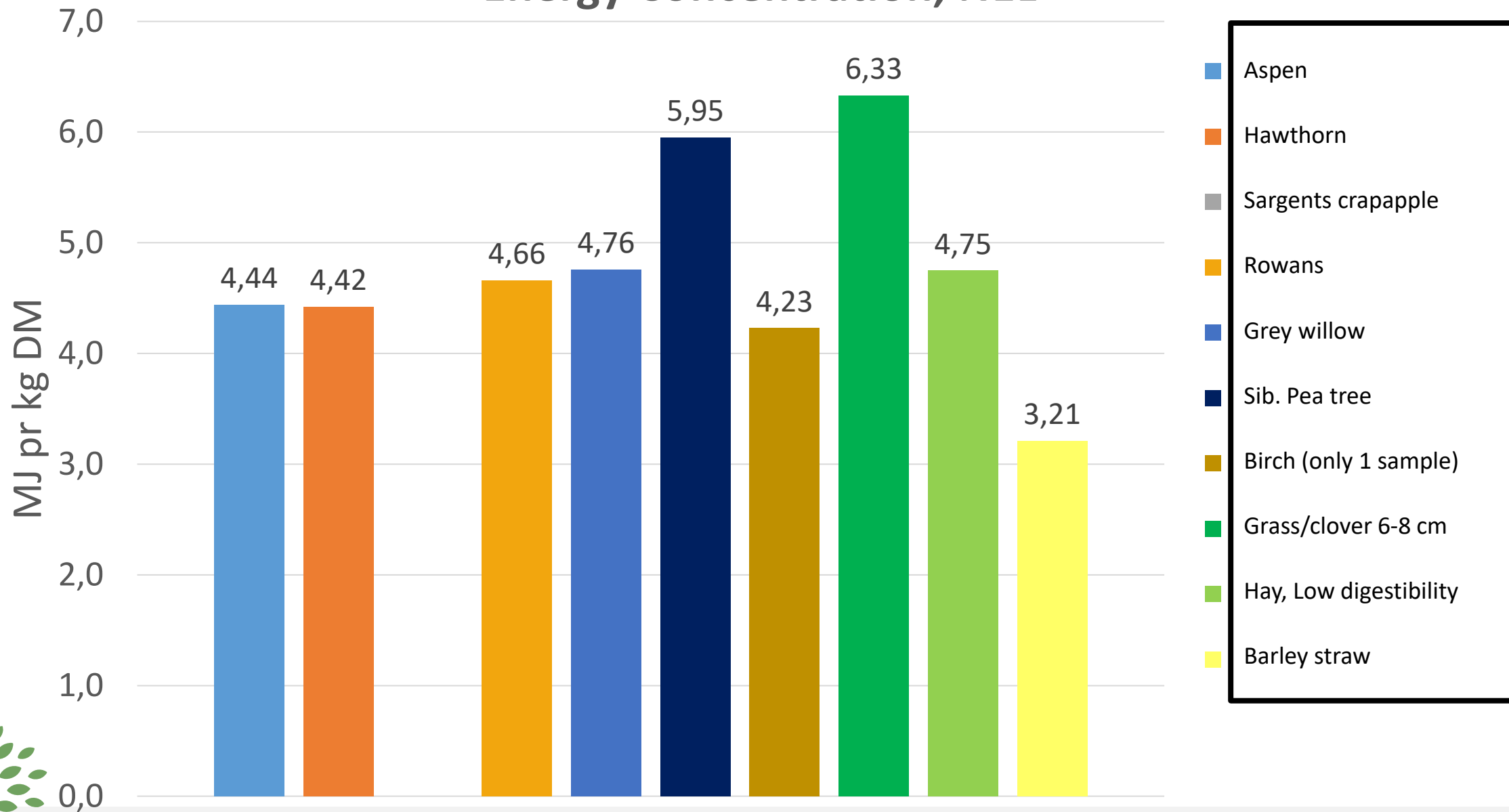


Content of crude protein

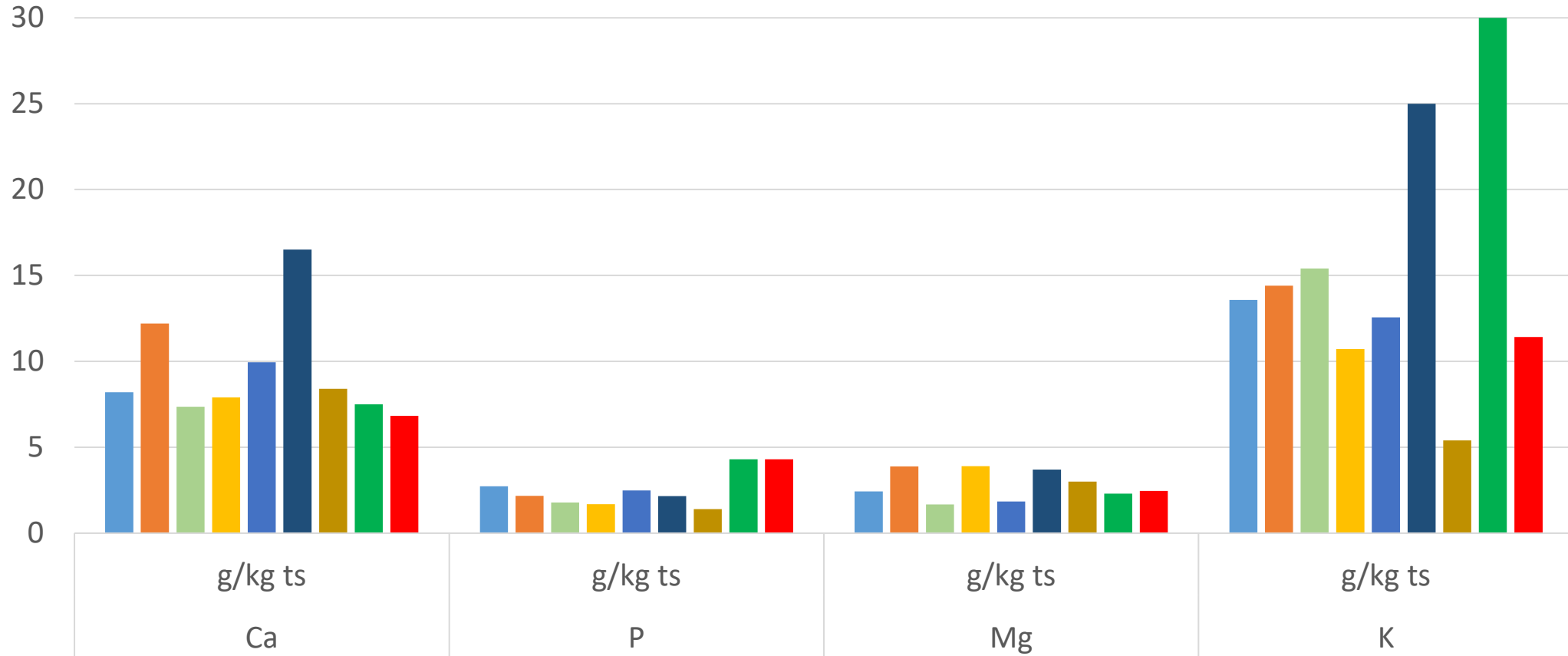
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Hawthorn-Tjørn	4	13,5 ± 1,1
Sargents crapapple -S. æble	4	12,3 ± 0,8
Rowan-Alm. Røn	4	10,8 ± 1,8
Grey willow-Gråpil	4	18,0 ± 0,7
Sibirisk pea tree- Sib. Ært	2	25,7 ± 1,2
Birch- Birk	1	13,4
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Energy Concentration, NEL



Calcium, phosphorus, magnesium og potassium, gram per kg DM



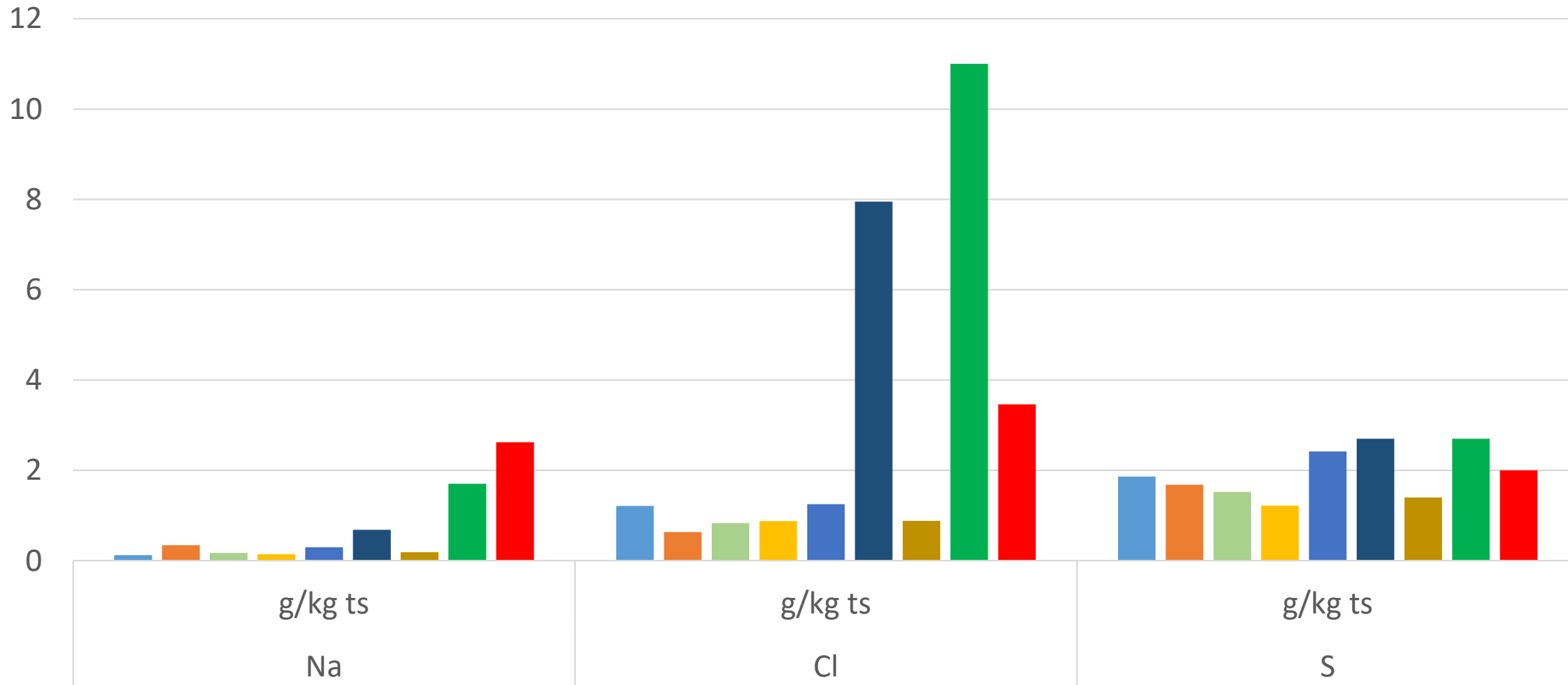
- Bævreasp
- Sargent's æble
- Gråpil
- Birk
- Behov Malkekøer

- Aspen
- S. Crapapple
- Grey willow
- Birch
- Requir. Dairy

- Tjørn
- Alm Røn
- Sibirisk Ærtetræ
- Frisk Kløvergræs

- Hawthorn
- Rowan
- Sib. pea tree
- Grass/clover 6-8 cm

Sodium, chloride og sulphur, gram per kg DM



Bævreasp

Sargent's æble

Gråpil

Birk

Behov Malkekøer

Aspen

S. Crapapple

Grey willow

Birch

Requir. Dairy

Tjørn

Alm Røn

Sibirisk Ærtetræ

Frisk Kløvergræs 6-8 cm

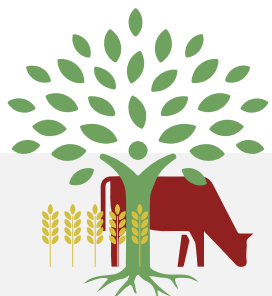
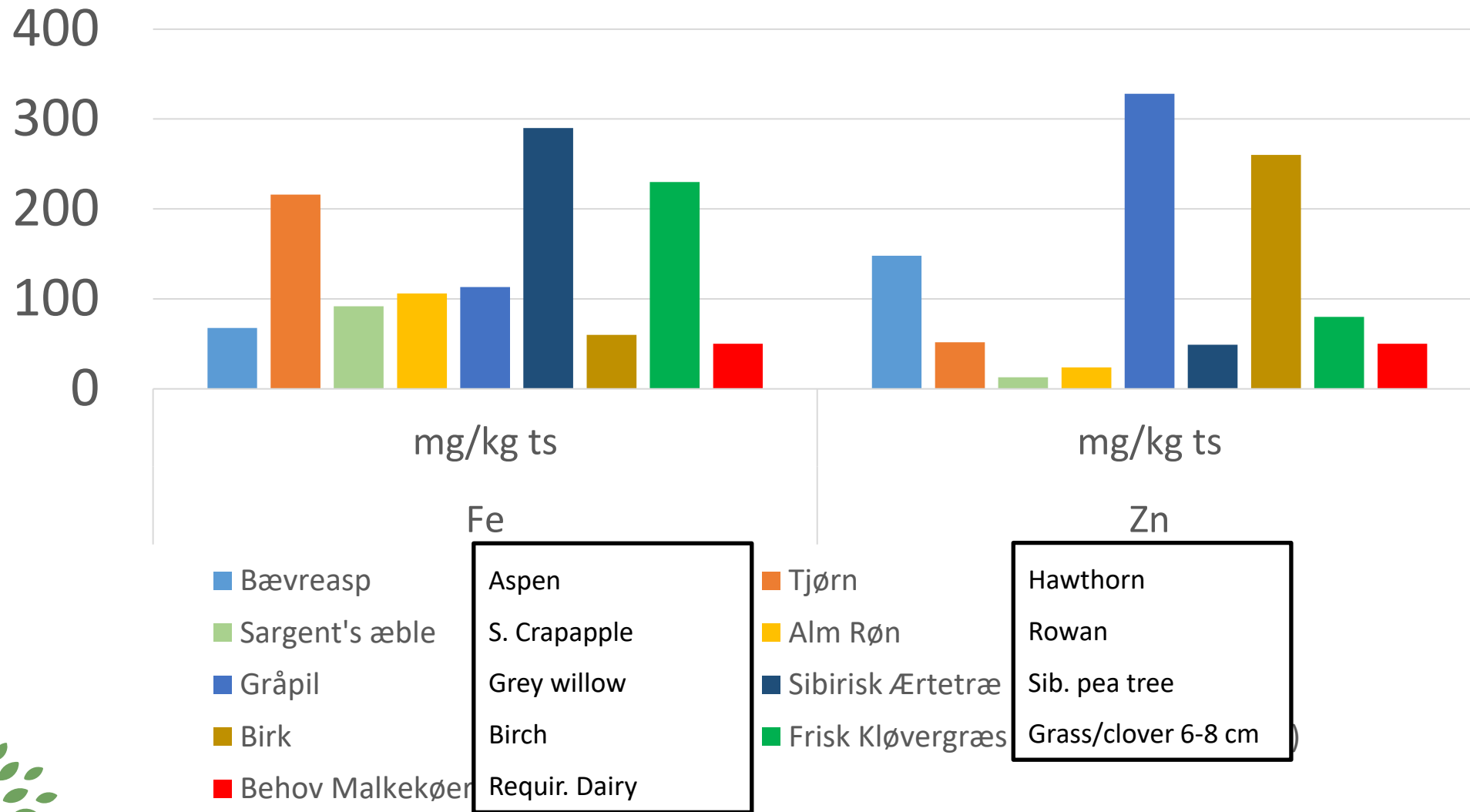
Hawthorn

Rowan

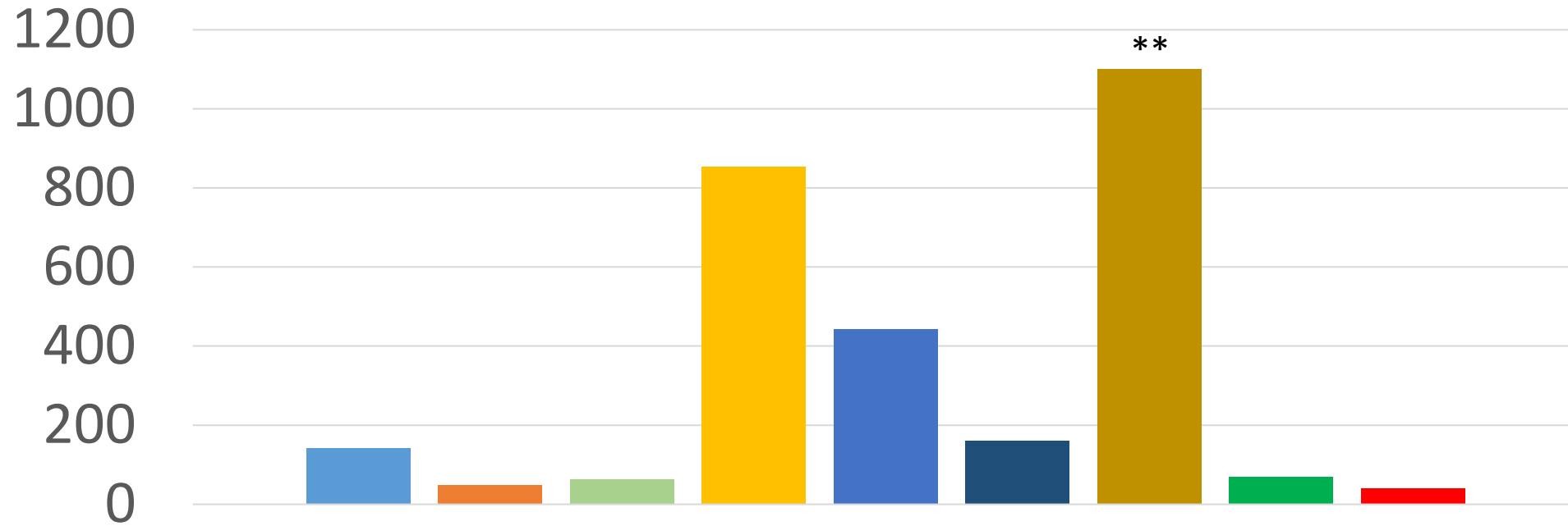
Sib. pea tree

Grass/clover 6-8 cm

Iron og zinc, mg per kg DM

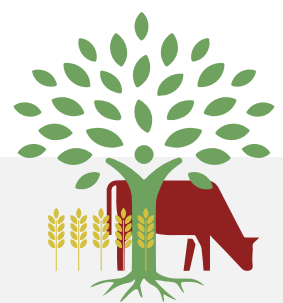


Manganese, mg per kg ts

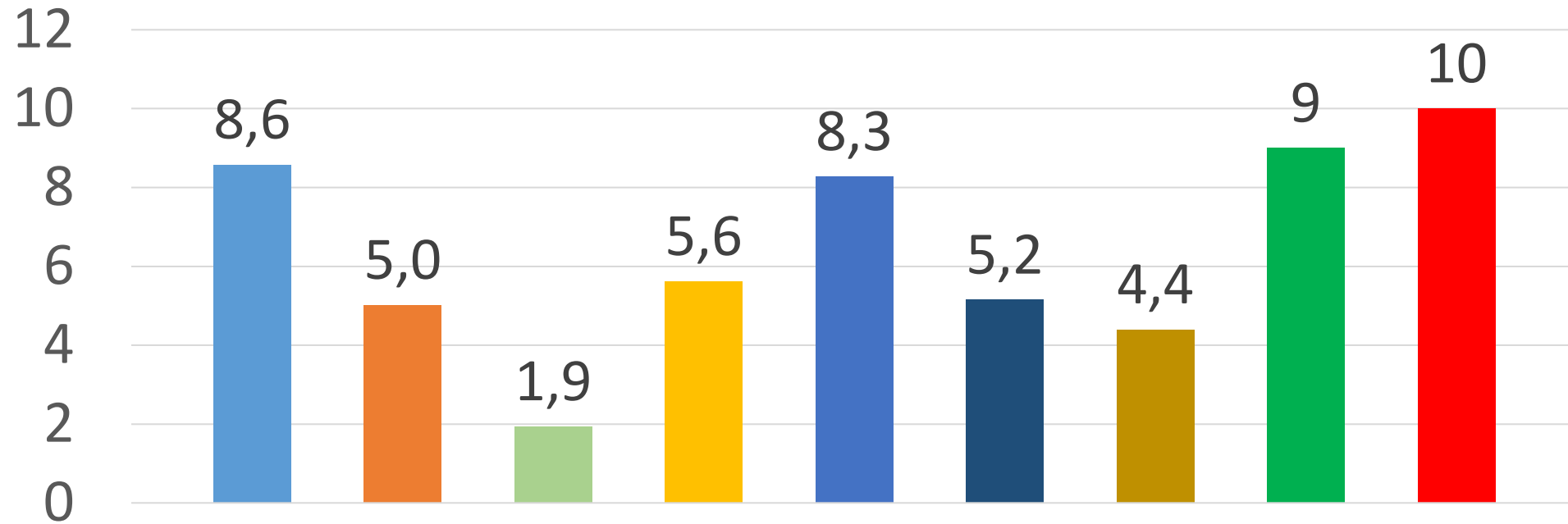


Mn

- | | | | |
|------------------|-----------------|--------------------|-----------------------|
| ■ Bævreasp | ■ Aspen | ■ Tjørn | ■ Hawthorn |
| ■ Sargent's æble | ■ S. Crapapple | ■ Alm Røn | ■ Rowan |
| ■ Gråpil | ■ Grey willow | ■ Sibirisk Ærtetræ | ■ Sib. pea tree |
| ■ Birk | ■ Birch | ■ Frisk Kløvergræs | ■ Grass/clover 6-8 cm |
| ■ Behov Malkekø | ■ Requir. Dairy | | |



Copper, mg pr kg ts



mg/kg ts

■ Bævreasp

■ Sargent's æble

■ Gråpil

■ Birk

■ Behov Malkekø

Aspen

S. Crapapple

Grey willow

Birch

Requir. Dairy

■ Tjørn

■ Alm Røn

■ Sibirisk Ærtetræ

■ Frisk Kløvergræs

Hawthorn

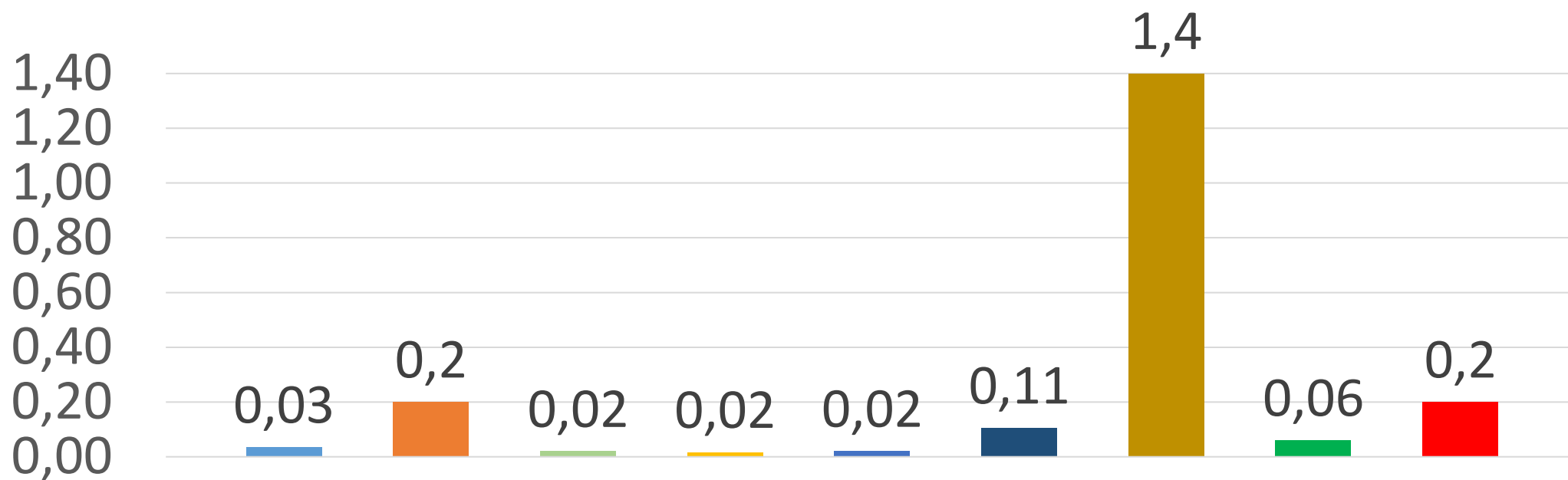
Rowan

Sib. pea tree

Grass/clover 6-8 cm



Selenium, mg pr kg ts



mg/kg ts

■ Bævreasp

■ Sargent's æble

■ Gråpil

■ Birk

■ Behov Malkeko

Aspen

S. Crapapple

Grey willow

Birch

Requir. Dairy

■ Tjørn

■ Alm Røn

■ Sibirisk Ærtetræ

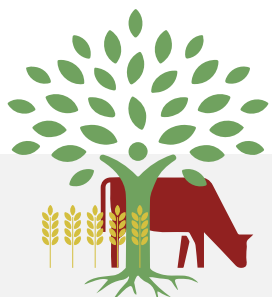
■ Frisk Kløvergræs

Hawthorn

Rowan

Sib. pea tree

Grass/clover 6-8 cm



Feed value Leaves

- Energy-conc. too low for dairy cows
- Could be a feed supply for far-off dry cows or other with lower energy requirements
- Contributes with protein and minerals
- Protein: Grey willow and Sibirian pea tree have particularly high contents
- Certain minerals: Hawthorn, grey willow, rowan and sibirian pea tree had higher contents
- Birch leaves seemed to be extremely high in manganese and selenium – but only 1 sample!



In vitro digestibility of DM and content of crude protein in leaves (Emilé et al., 2016)

Tree species	Latin	English name	In vitro digestibility of DM (IVDMD), %	Crude protein, % af DM
Hvid morbær	Morus alba	White mulberry	89	24,0
Rødel	Alnus glutinosa	Black alder	77	19,7
Ask	Fraxinus excelsior	Ash	75	14,5
Storbladet lind	Tilia platyphyllos	Large leaf lime	70	21,1
Hjertebladet el	Alnus Cordata	Italian alder	69	17,0
Kastanje	Castanea sativa	Chestnut	68	11,8
Småbladet elm	Ulmus monor x resista	Field elm	67	14,5
Navr	Acer campestre	Field Maple	64	13,4
Rødeg	Quercus rubra	Red oak	61	14,2
Hassel	Corylus avellana	Hazel	53	14,4
Alm. Robinia/uægte akacie	Robinia pseudoacacia	Black locust	49	20,4

Considered high enough for french high-yielding dairy cows

...repeated next year: Only ash and white mulberry came out with high enough dig. for high-yielding dairy cows



Minerals

- Similar results- e.g willow high zinc content
- Large variations between species – also at the same location
- E.g Selenium content is more dependent on locality than on tree species
- Seasonal variation- this also differs between the minerals – since some of them accumulate during the season- others are decreasing



Cattle preferences

- Browsing
- Results from our preference test Project ROBUST
- Other results

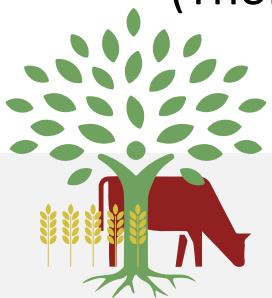


Heifer has been trained to eat canadian thistle, Foto: Kathy Voth



Browsing

- 10-15 % of diet is woody plants selected by forestgrazing cattle (Buttenschön, 2007)
- Dairy cows browsing a hedge row only had a daily intake of willow leaves which was 0,5 % of DMI – however contributing with 2-9 % of their requirements for certain minerals (Na, Zn, Mn, Fe) (Luske et al., 2017)
- Year-round grazing cattle at DK ‘Mols Laboratory’ fecal DNA show that leaves from shrubs and trees contributed to 20-35 % of the DNA in the sommer months and > 90 % in the winter months (Thomassen et al., 2023)

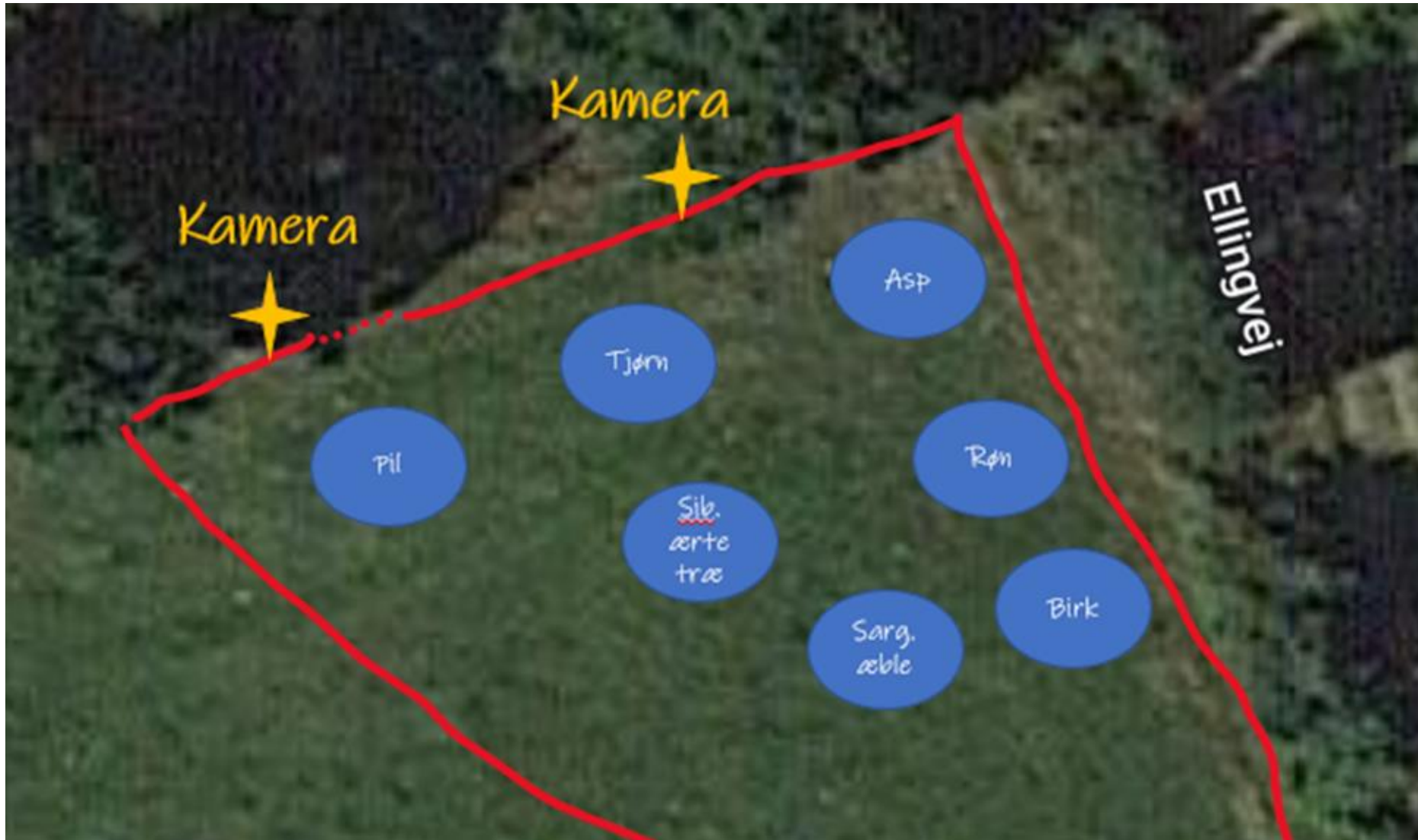


Preference test

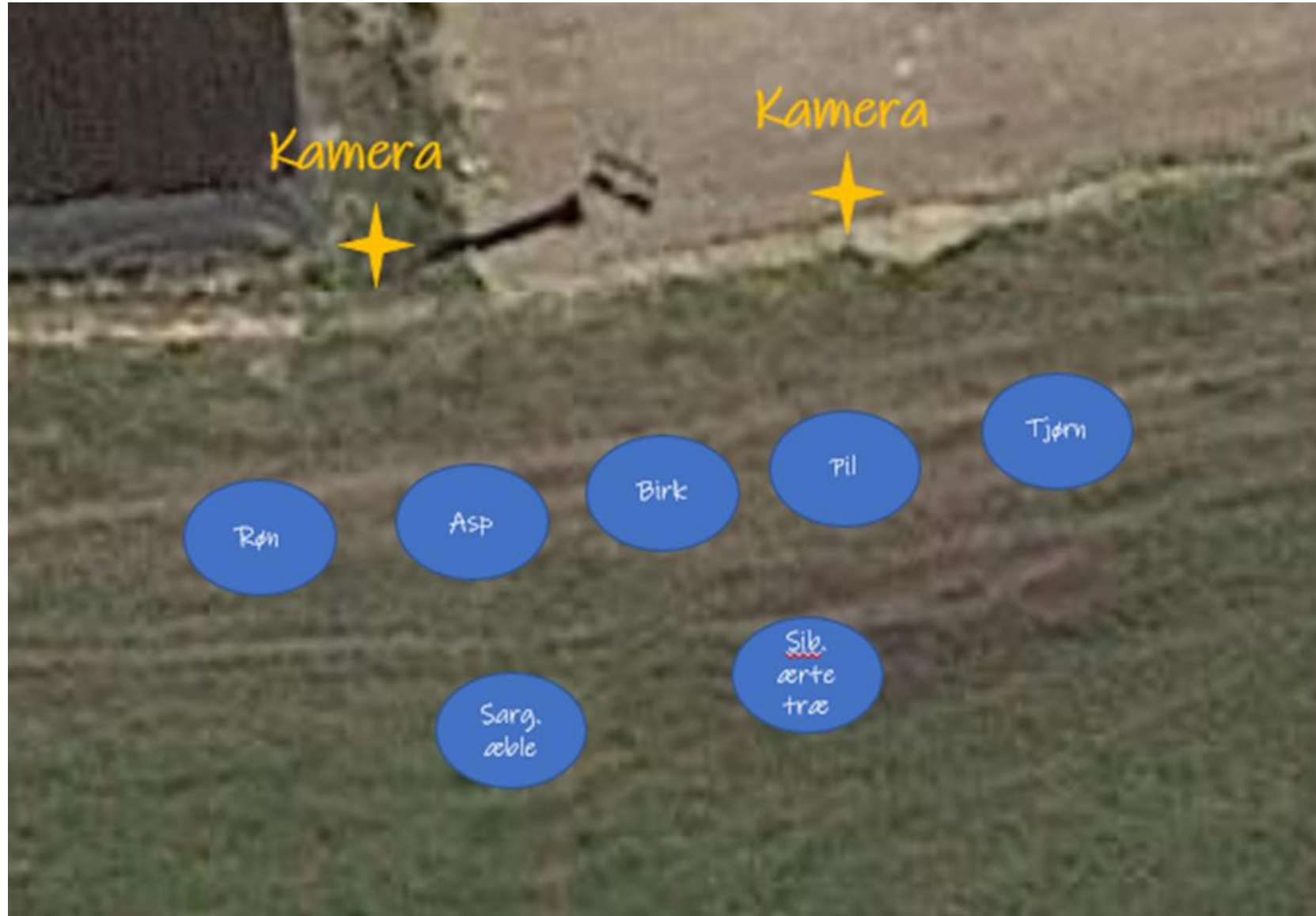
Which ones do
cattle prefer to eat?



Preference test Ellinglund



Preference test Sommerbjerg



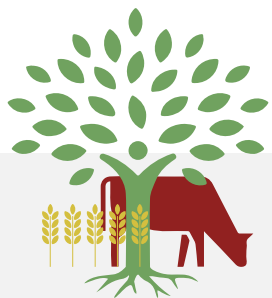
Preference test

- Their interest were very different: Nursery cows ate from the beginning (hungry and used to eating leaves?). Dairy cows ignored the branches in the beginning, but ate from the leaves later on (more interested in grazing- time budget under pressure?)

Assessing the palability:

- 1) Willow (pil)+ Hawthorn (Tjørn)
- 2) Sib. pea tree (Sibirisk ært) + Rowan (Alm. Røn)
- 3) Aspen (Bævreasp) + Birch (Birk)
- 4) Sargent's crapapple (Sargents æble)

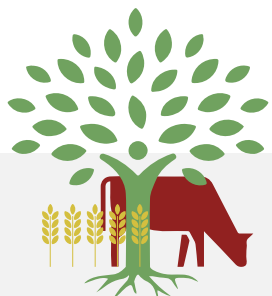
Other results



Palatability of different leaves from Scottish farms. 1= highest palatability (Source: [Scottish Forestry](#))

Arter markeret med * har været med i præferencetesten i Projekt ROBUST

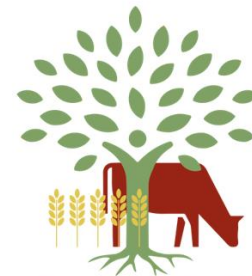
Palatabilitet	Træ art	
1	Aspen*, Willow*	
2	Ash, Rowan*	
3	Hazel, Oak	
4	Scots Pine, Juniper, Holly	- mest foretrukne om vinteren, da de er stedsegrønne- dog ædes de unge skud af kristtjørn gerne i foråret
5	Birch, Hawthorn*	- nævner at tjørn muligvis er undervurderet
6	Beech*	
7	Alder	



Ranging 9 leave species by palatability based on observations on grazing heifers in a silvopasture areal with access to hedge rows from the pasture field (Vandermeulen et al., 2018)

Ranging	Leave species
1: Most palatable	<p>Hawthorn/Tjørn (<i>Crataegus monogyna</i>)</p> <p>Common Dogwood/Rød kornel (<i>Cornus sanguinea</i>)</p> <p>Hazel/Hassel (<i>Corylus avellana</i>)</p> <p>Hornbeam/Avnbøg (mostly spring) (<i>Carpinus betulus</i>)</p>
2	<p>Maple/Sycamore/Ahorn (mostly early summer) (<i>Acer pseudoplatanus</i>)</p> <p>Black poplar/Poppel (not spring, more early summer, most late summer) (<i>Populus nigra</i>)</p> <p>Field Maple/Navr (mostly early summer) (<i>Acer campestre</i>)</p>
3	<p>Ash/Ask (not spring) (<i>Fraxinus excelsior</i>)</p> <p>Oak/Eg (not spring or early summer) (<i>Quercus robur</i>)</p> <p>Elder/Hyld (only spring) (<i>Sambucus Nigra</i>)</p>
4: NOT EATEN	<p>Black locust/Robinia (<i>Robinia pseudoacacia</i>)</p>





ROBUST

SKOVLANDBRUG

– et bæredygtigt landbrugssystem for planteavl og mælkeproduktion