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Effects of feeding fresh white clover on digestibility and methane emission in lambs

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Research background

- White clover is the most common legume in temperate grasslands
- Offer opportunities for sustainable pasture-based production systems
  - increasing pasture yield
  - substituting inorganic N fertilizer inputs with symbiotic N_2 fixation
  - increasing the nutritive value of pasture
  - raising the efficiency of conversion of pasture to animal protein

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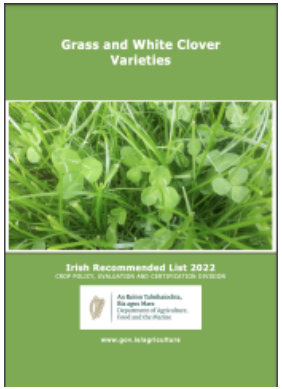
Research background

- DAFM and DAERA produce recommended lists of white clover varieties with leaf sizes from small to very large for farmers to use in ROI and NI
    - Do not give any guided information on nutritive values of these recommended varieties or differences in nutritive values among those varieties



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Objectives

- The main objectives are:
  - to develop a novel feeding value database for white clover of different varieties and an evaluation system for prediction of nutritive values of fresh white clover
  - to evaluate the effects of white clover varieties on voluntary feed intake, nutrient digestibility, N utilization and methane emission of zero grazing animals

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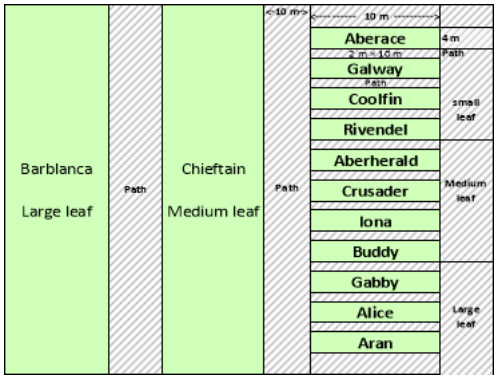
Materials and Methods

- Thirteen varieties of white clover were selected from recommendation lists in ROI and NI
  - 4 large leaf sizes
  - 5 medium leaf sizes
  - 4 small leaf sizes
- White clover swards (2) and plots (11) were established (5 acres) in 2019



Variety Name	Leaf Size*	Breeder
Large leaf size		
Alice	Large (0.73)	IBERS
Aran	Large (0.73)	Teagasc
Barblanca	Large (0.76)	Barenbrug
Gabby	Large (0.73)	RAGT
Medium leaf size		
Aberherald	Medium (0.55)	IBERS
Buddy	Medium (0.58)	Teagasc
Chieftain	Medium (0.68)	Teagasc
Crusader	Medium (0.56)	Barenbrug
Iona	Medium (0.56)	Teagasc
Small leaf size		
Aberace	Small (0.26)	IBERS
Coolfin	Small (0.51)	Teagasc
Galway	Small (0.36)	Teagasc
Rivendel	Small (0.43)	DLF

*Values in brackets indicate leaf size compared to the variety 'Aran' (i.e. Aran = 1.00), based on data from UK D.U.S. tests.

Materials and Methods

- Experimental design – animal study
  - 3 (diet) x 3 (period) Latin Square design, 3 periods with 3 wks/period
    - 2 week for adaption and gaseous exchange
    - 1 week for nutrient digestibility

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Materials and Methods

- Animal
  - 12 ewe hoggets (Texel), 12 months old, average 63.1 kg of live weight
- Diets
  - Con: Grass (100%) + Conc. (158 g DM)
  - MLS: Grass (70%) + white clover (30%, Chieftain) + Conc. (158 g DM)
  - LLS: Grass (70%) + white clover (30%, Barblanca) + Conc. (158 g DM)
  - Harvested daily and chopped to a length of 5 cm
  - Totally mixed (for MLS and LLS) and offered for *ad libitum* twice a day

Materials and Methods

- Measurement
  - Feed intake and BW
  - Gaseous exchange (CH_4, CO_2, O_2 and H_2) using a GreenFeed unit
  - Total collection of faeces and urine
  - Collection of rumen samples at the final day of each period (plus at the commencement of the first period)

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Main results

- Intake, BW and digestibility

	Treatment			SED	P-value
	Grass	MLS	LLS		
DM intake (kg/d)	1.33	1.45	1.46	0.031	0.101
Final BW (kg)	68.5	68.6	68.8	1.03	0.967
DM Digestibility (g/kg)	790	788	783	9.6	0.821

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Main results

- Gaseous exchange

	Treatment			SED	P-value
	Grass	MLS	LLS		
CH_4 emissions					
g/d	35.6	37.6	37.0	1.90	0.140
g/kg BW	0.52	0.55	0.54	0.021	0.877
g/kg DMI	27.3	26.5	25.7	1.21	0.445
H_2 (g/d)	56.0^{b}	68.3^{a}	76.1^{a}	0.004	<0.001

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Main results

- N utilisation

	Treatment			SED	P-value
	Grass	MLS	LLS		
N intake and output, g/d					
N intake	44.4	44.5	43.8	0.94	0.738
Fecal N output	10.2	11.0	11.8	0.66	0.079
Urinary N output	20.3	25.1	22.2	1.91	0.057
Total N output	30.5	36.1	34.0	4.55	0.053
N utilisation efficiency, g/g					
Faecal N : N intake	0.235	0.253	0.268	0.0171	0.177
Urinary N : N intake	0.454^{b}	0.558^{a}	0.497^{ab}	0.0347	0.023
Total N : N intake	0.689^{b}	0.811^{a}	0.766^{a}	0.0440	0.037
Urinary N : Total N	0.661	0.682	0.648	0.0152	0.104

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Conclusion

- Feeding white clover had no significant effect on feed intake, methane emissions or DM digestibility
- Feeding white clover (medium leaf size) may increase the N excretion in urine

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THANKS

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