Influence of lupins and canola supplements on plasma amino acids, wool fibre diameter and liveweight in genetically divergent first cross Merino lambs

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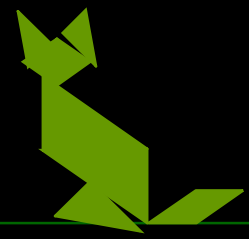
Introduction

- **Crossbreeding exploits hybrid vigour to blend:**
  - Wool
  - Growth
  - Carcass quality



- **In Australia:**
  - Border Leicester has been major maternal breed for 80yrs
  - Now, National flock is predominantly Merino crosses
  - 40% are F_1 progeny from terminal sires on Merino ewes
  - More recently, Dorset, White Suffolk, Coopworth, Texel

- **Research Need**: Evaluation of breed combinations for growth, wool & carcass quality for target markets

Introduction

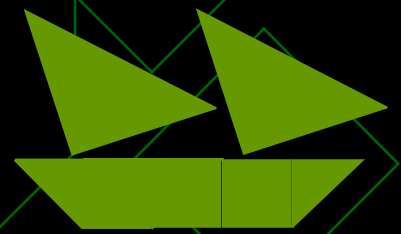
- **Growth and Wool Fibre synthesis:**
  - Highly digestible protein and energy feeds
  - Highly efficient nutrient retention of absorbed amino acids
- **Research Questions:**
  - Is sire breed a major source of variation in wool, liveweight, amino acids, protein and energy digestibility in F_1 progeny?
  - Interactions: Sire breed, supplement and feeding level?
  - Correlations between plasma amino acids and wool traits?
- Study's Objective:
  - The influence of lupins and canola supplements on wool traits, plasma amino acids and liveweight in F_1 crosses

Materials and methods

- 500 F_1 weaner lambs from Merino dams sired by:
  - Texel
  - Coopworth
  - White Suffolk
  - Dorset
  - East Friesian
- 40 lambs BWT at weaning = 26.8 ± 3.2 kg selected
- Randomly assigned to 4 treatment groups in a 5 x 2 x 2 x 2 factorial experimental design
- Lambs individually housed in 0.6mx1.2m metabolic crates, daily basal diet of barley, molasses-treated straw and mineral mix and *ad libitum* access to water

Materials and methods

- Feeding trial lasted 6 weeks. The supplements were
  - Canola Meal
  - Cracked Lupins
- Feeding levels were:
  - 1% of body weight
  - 2% of body weight
- Gender:
  - Wether lambs
  - Ewe lambs
- 21 days of adjustment to feed prior to data collection
- Last 7 days of faecal collection for digestibility trial



Materials and methods

- Daily routine:
  - Emptying of faecal collection trays and cleaning
  - Weighing of residual feed and fresh feed for the day
- Weekly routine:
  - Body weight and body measurement data
  - Body condition scores
- Beginning and end of feeding trial:
  - Wool sample clips for fibre diameter measurements
  - Blood samples by jugular venipuncture
- ME,CP, FD Data analysis – Factorial ANOVA (SAS)
- Regression analysis – PROC REG (SAS)

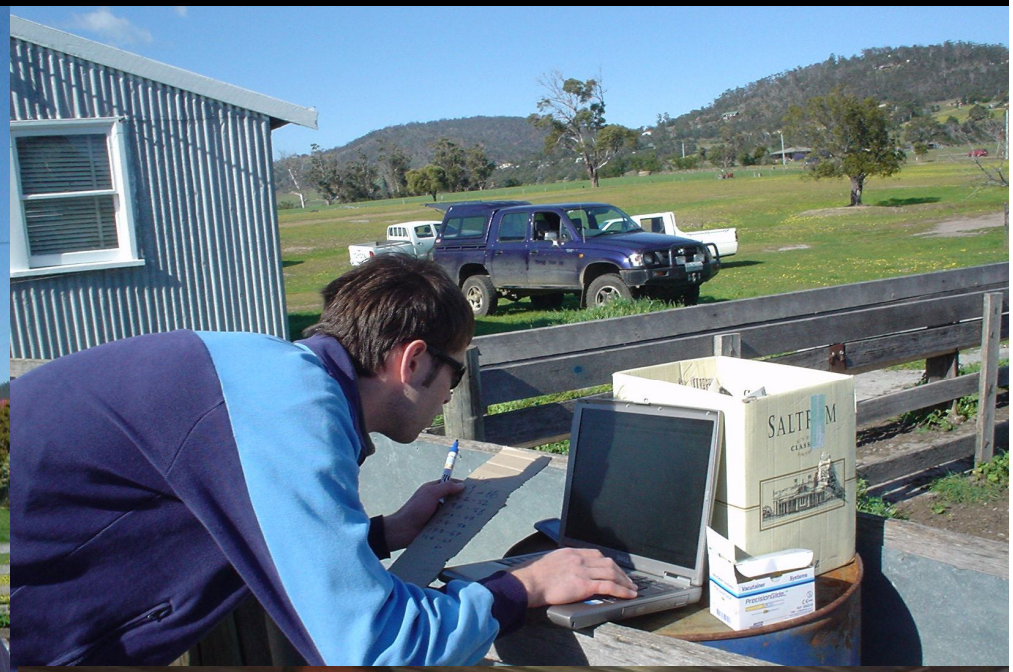
The breeding rams

Semen collection and quality evaluation

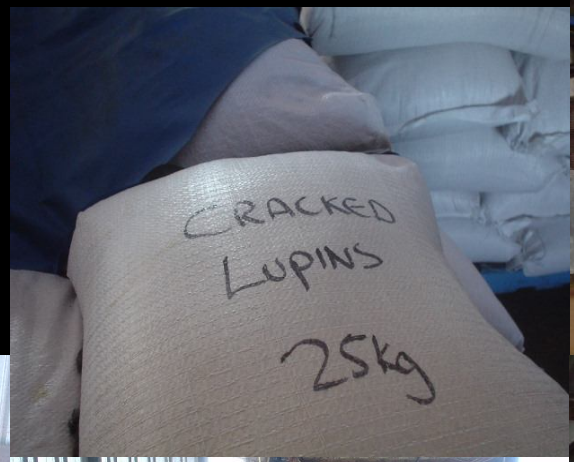
The F_1 progeny

Progeny marking and data recording

Progeny marking and data recording



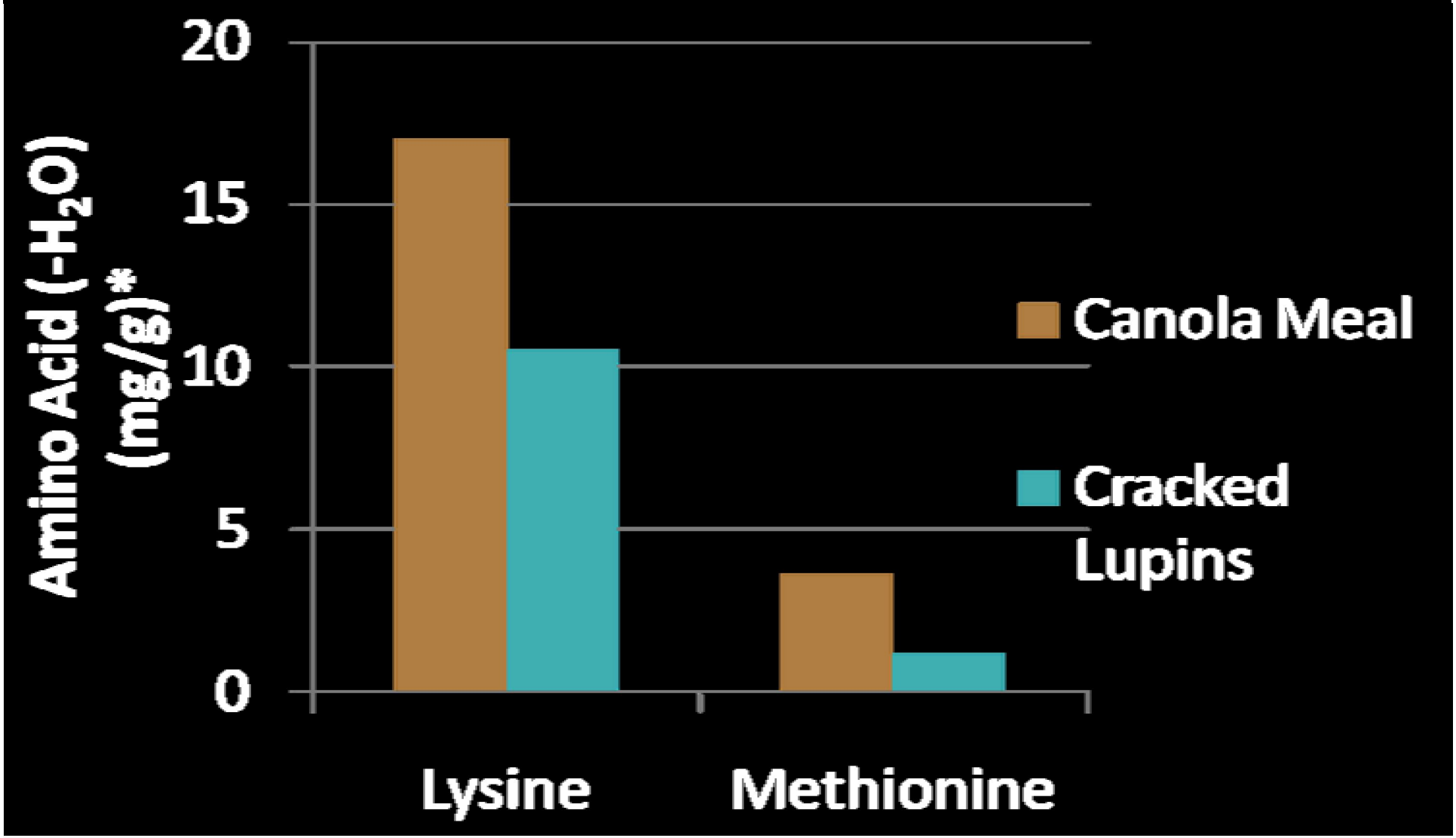
Materials and methods

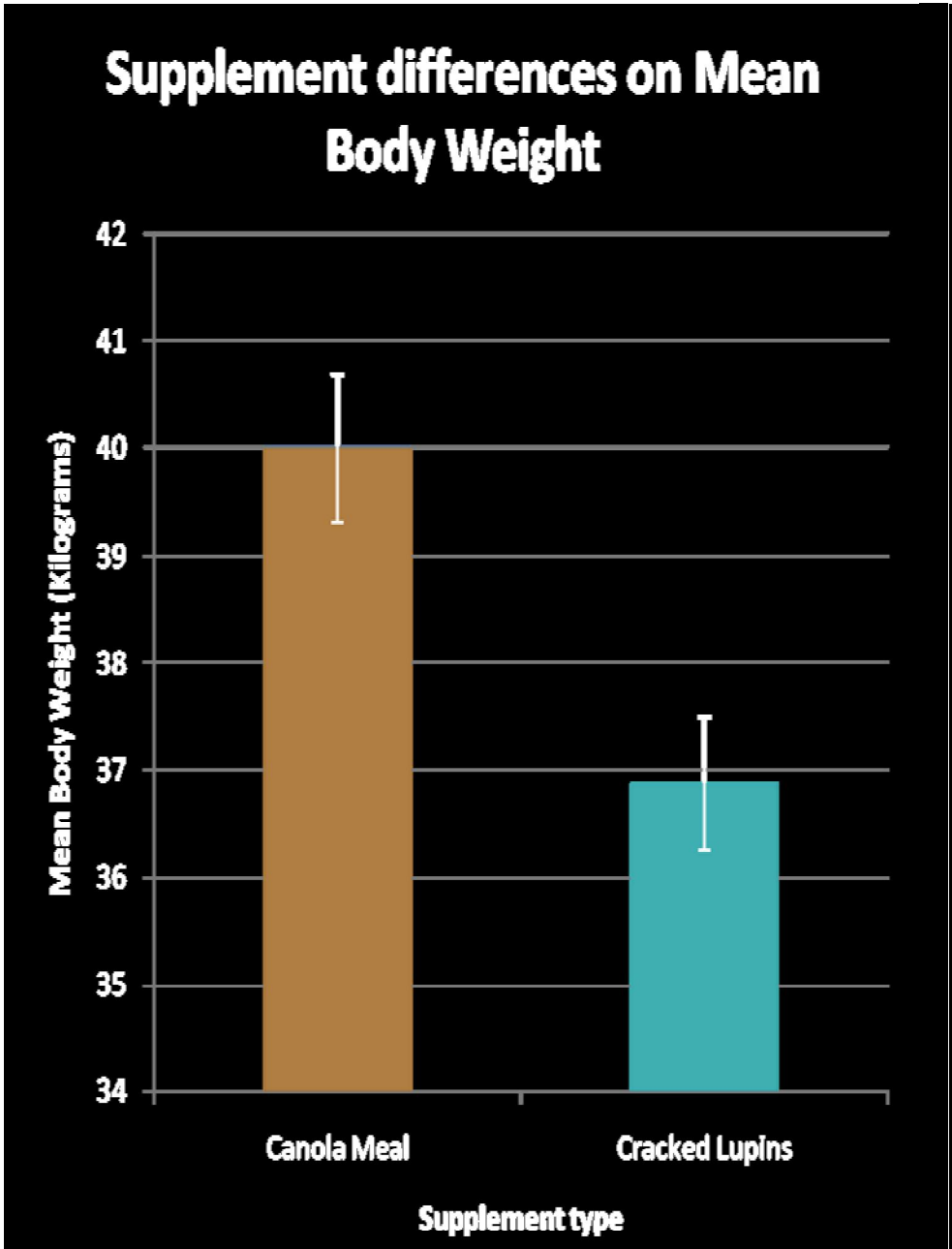


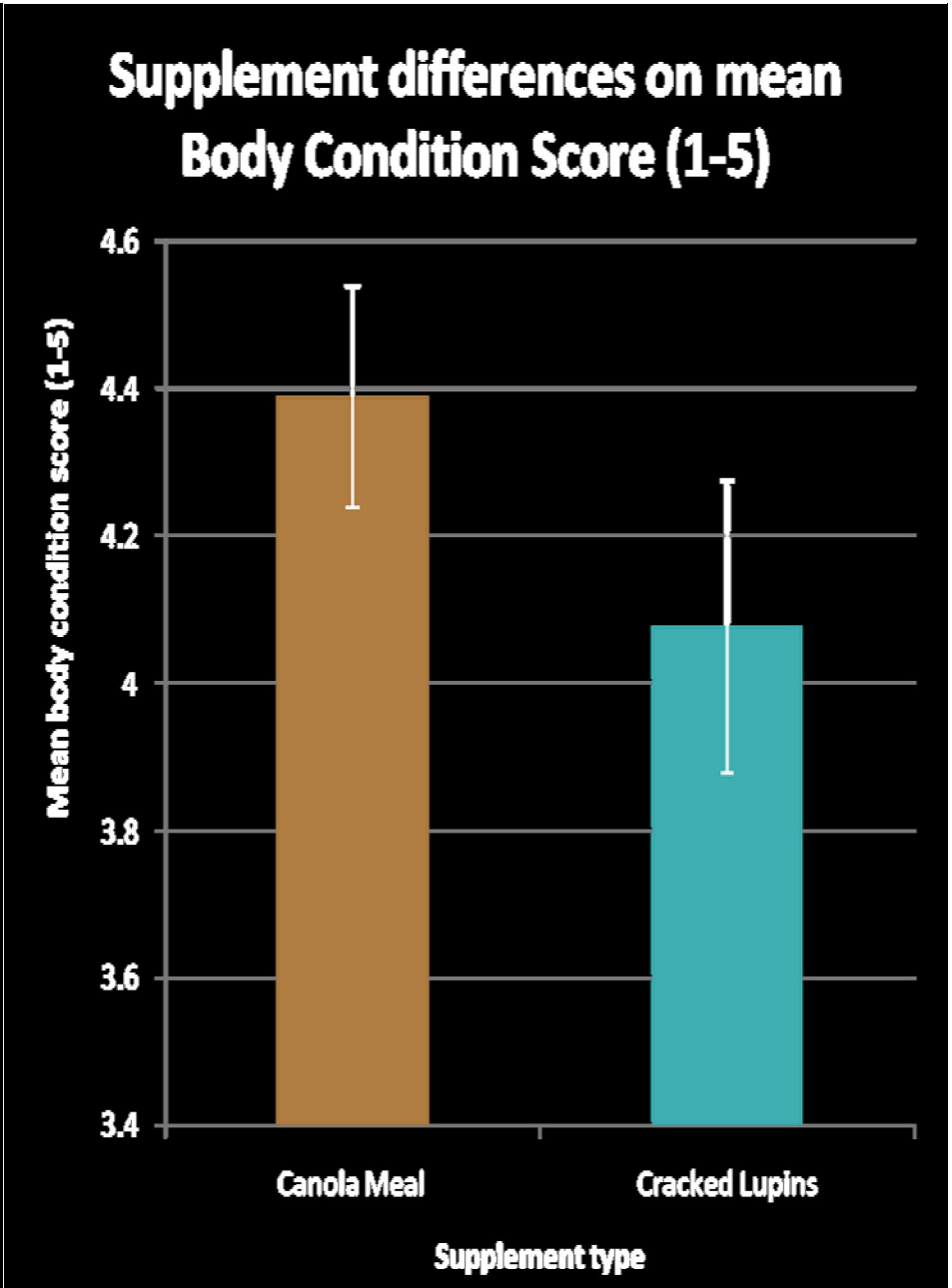
Nutrient composition of the experimental diet

Nutrient	Canola	Lupins	Barley	Straw
DM (%)	96.3	93.3	92.0	92.5
CF (%)	13.8	15.7	4.6	41.3
NDF (%)	18.9	25.0	14.4	66.4
ADF (%)	15.9	20.9	5.5	43.4
ME (MJ/kg)	14.9	12.2	13.2	7.3
DE (MJ/kg)	277.3	183.7	213.3	62.3
Digestibility (%)	60.0	40.0	60.0	20.0
CP (%)	33.3	30.1	10.4	6.2
Fat (%)	15.8	6.0	2.3	1.0
Ash (%)	5.9	2.7	2.5	9.6

Lysine and methionine amino acid levels in the experimental diets

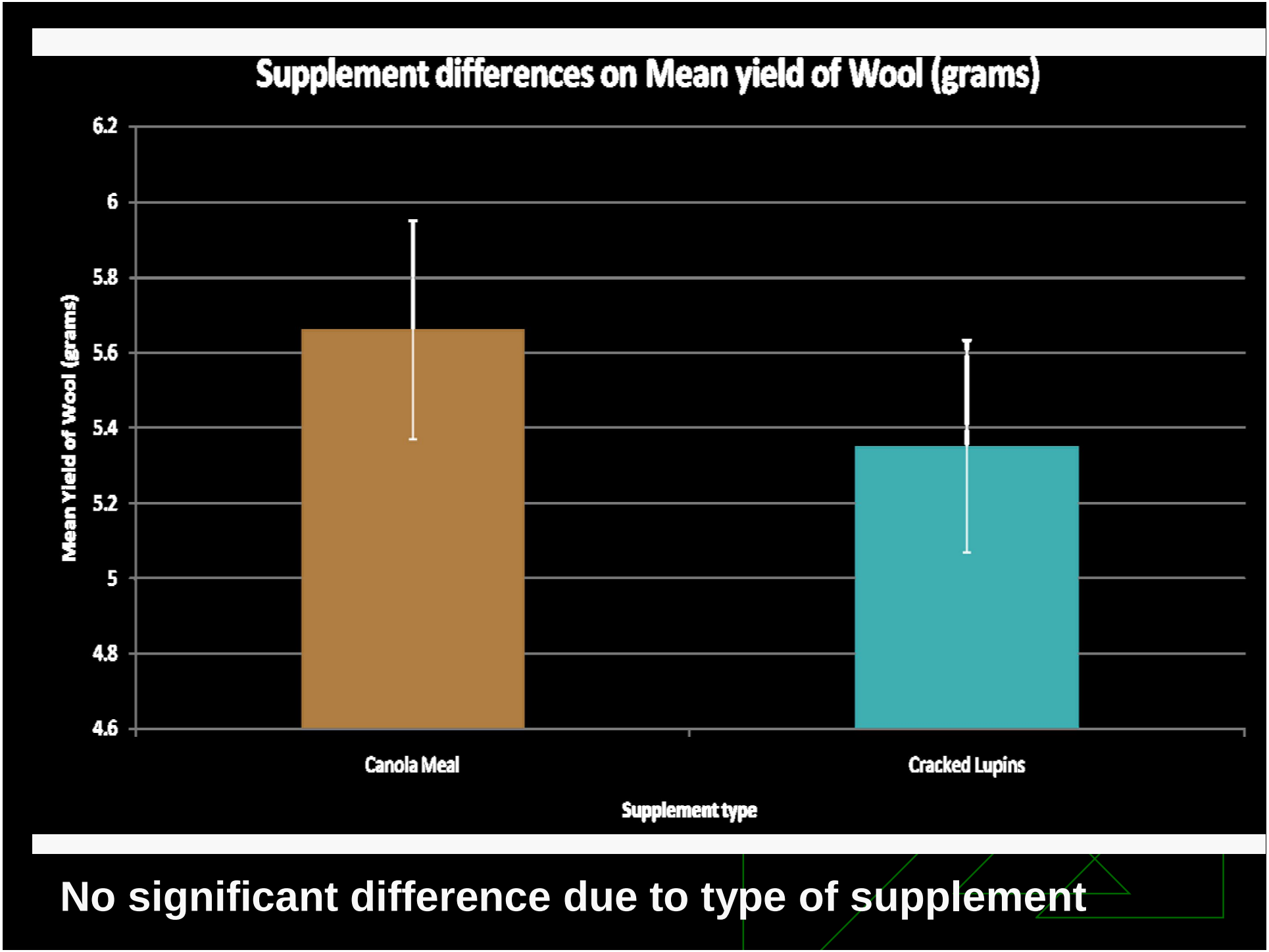




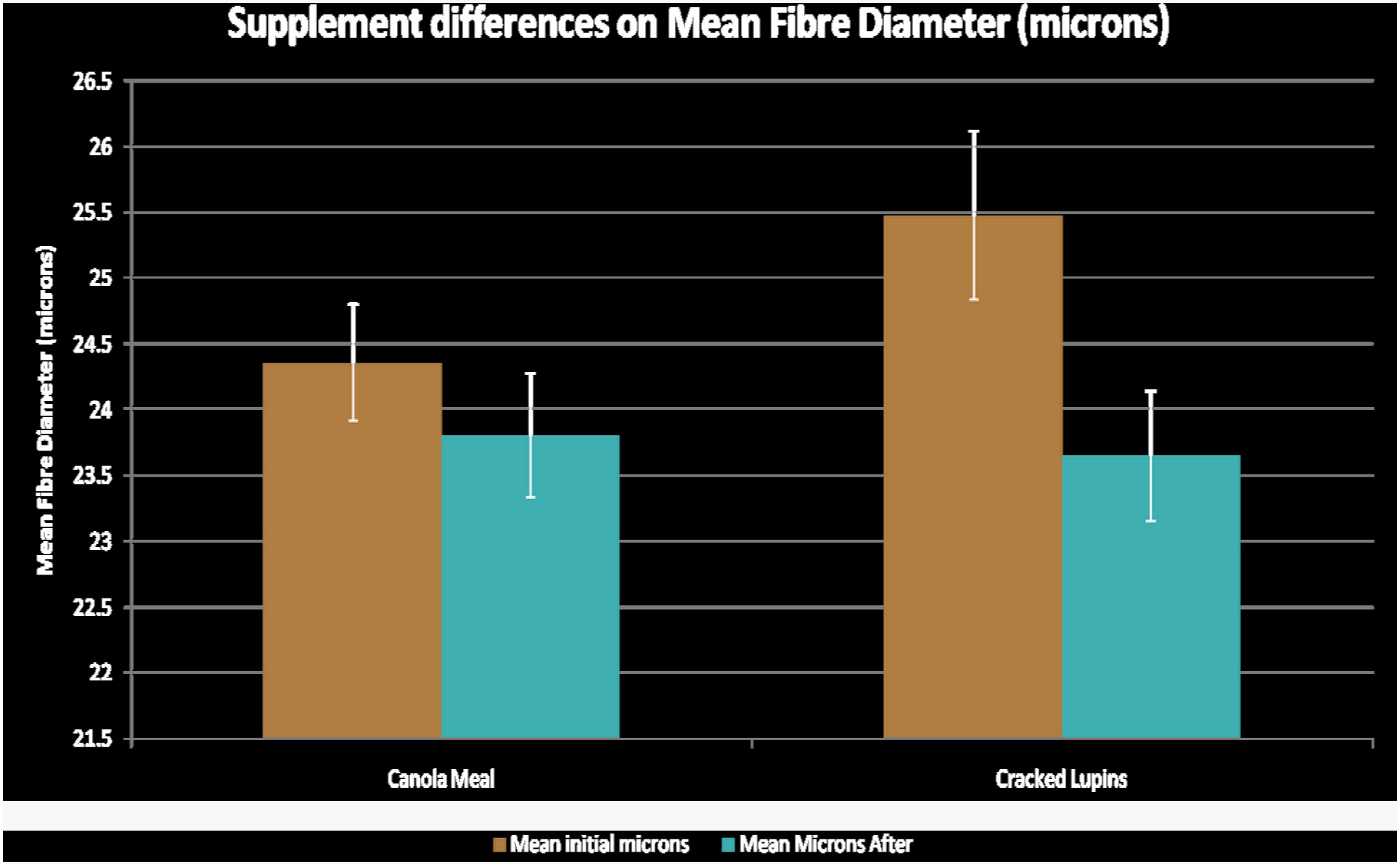


Significant difference in Weight

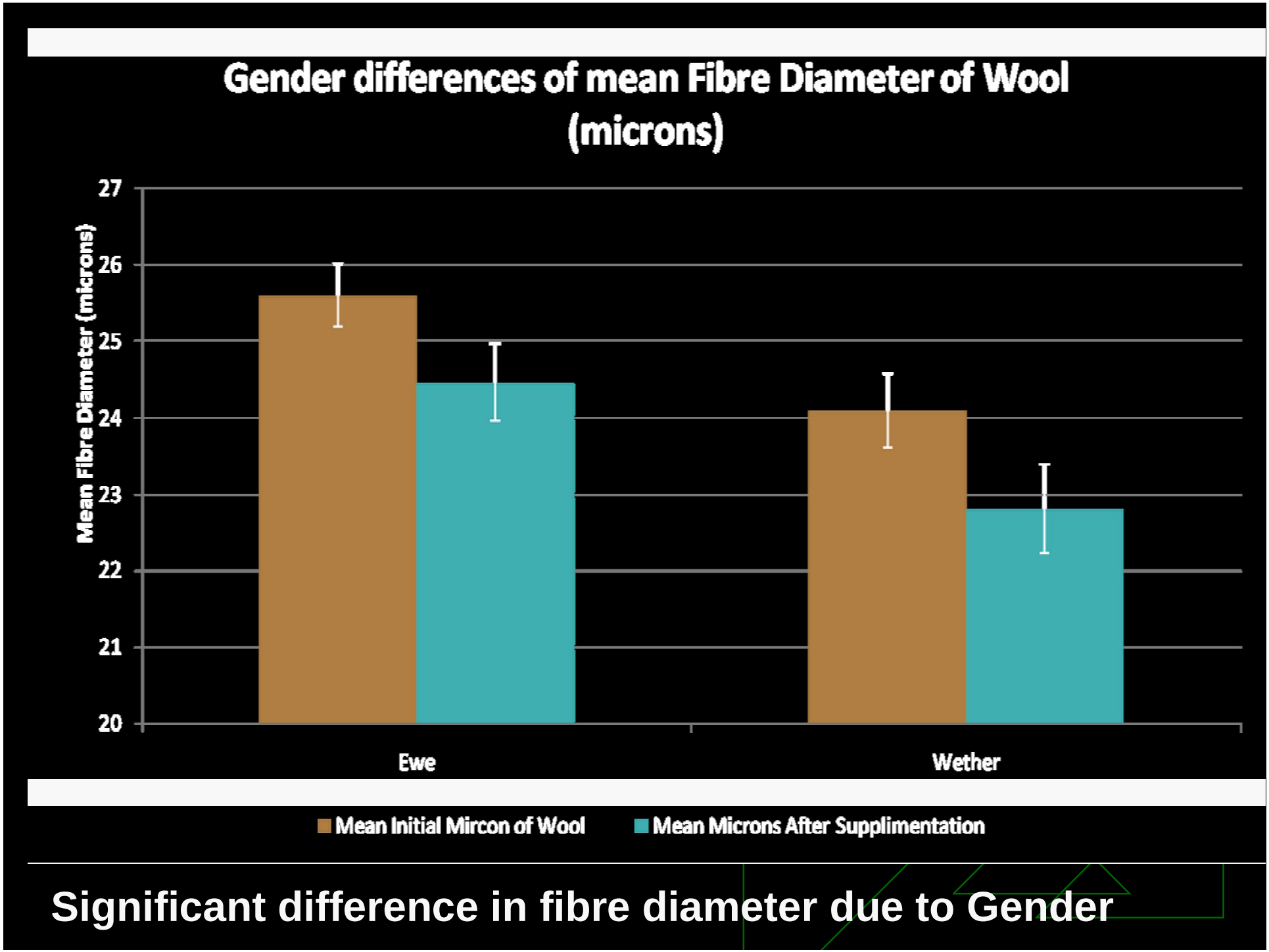
No difference



No significant difference due to type of supplement

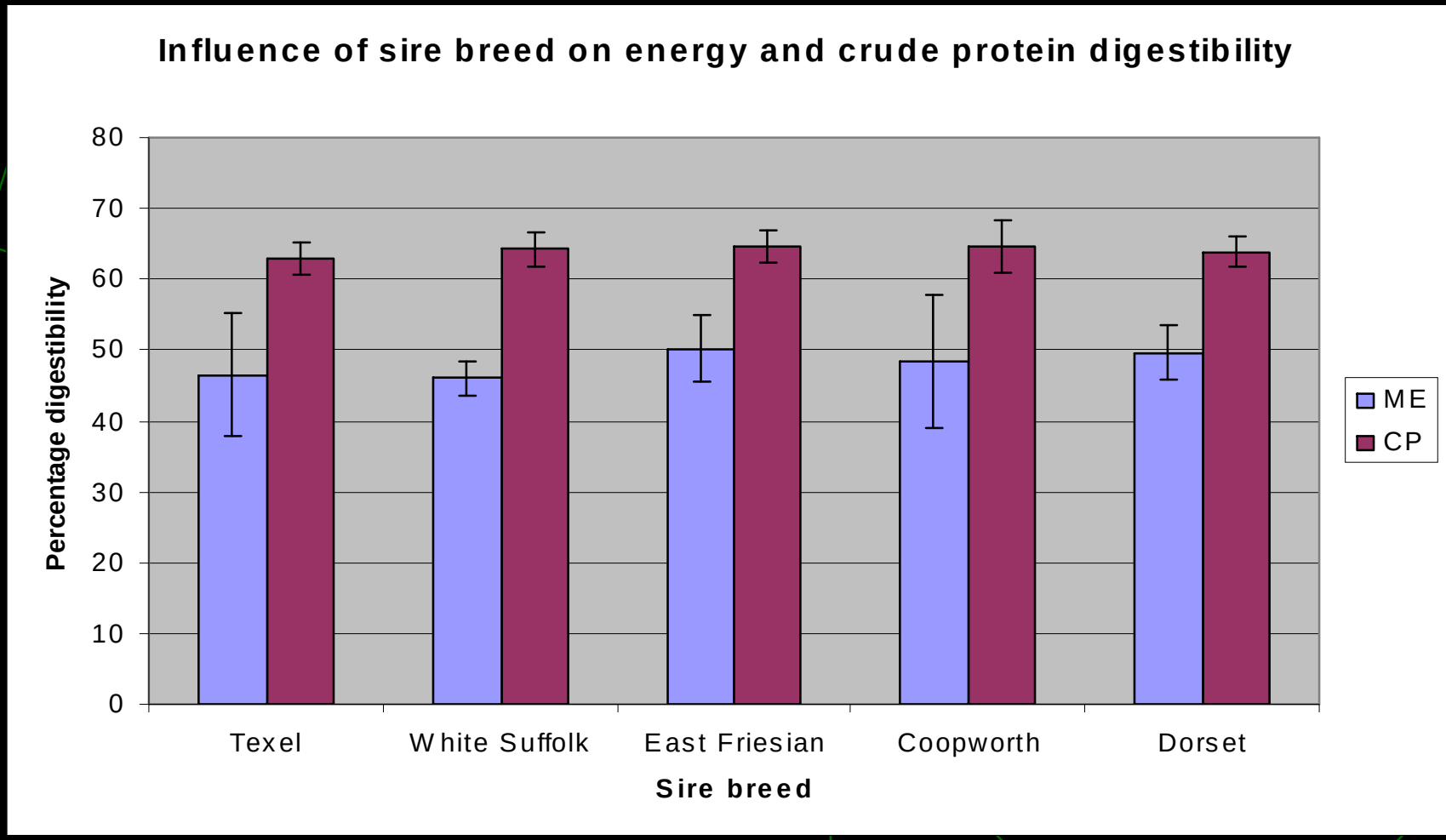


Significant reduction in fibre diameter due to supplementation, but no difference between supplements



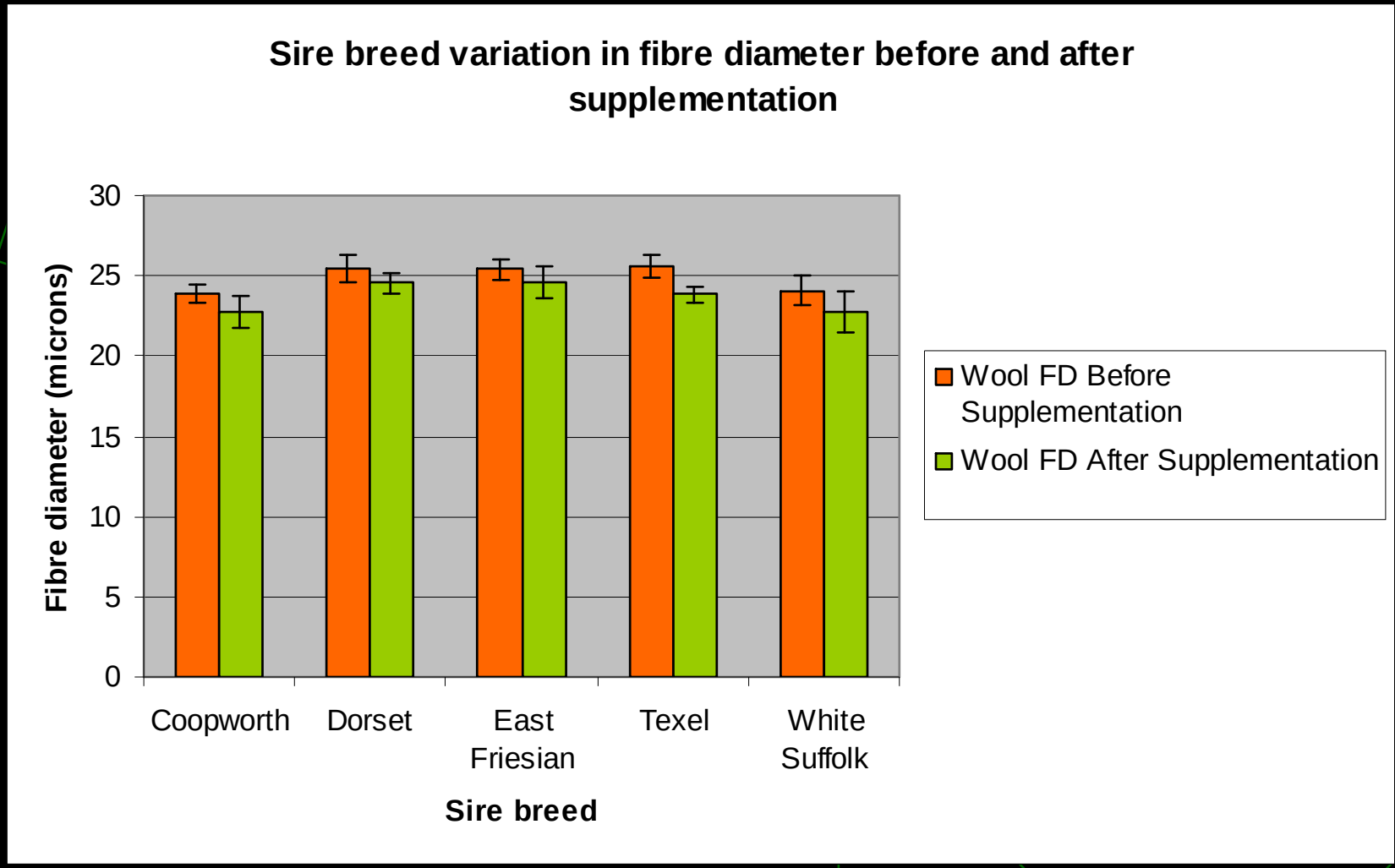
Significant difference in fibre diameter due to Gender

Results



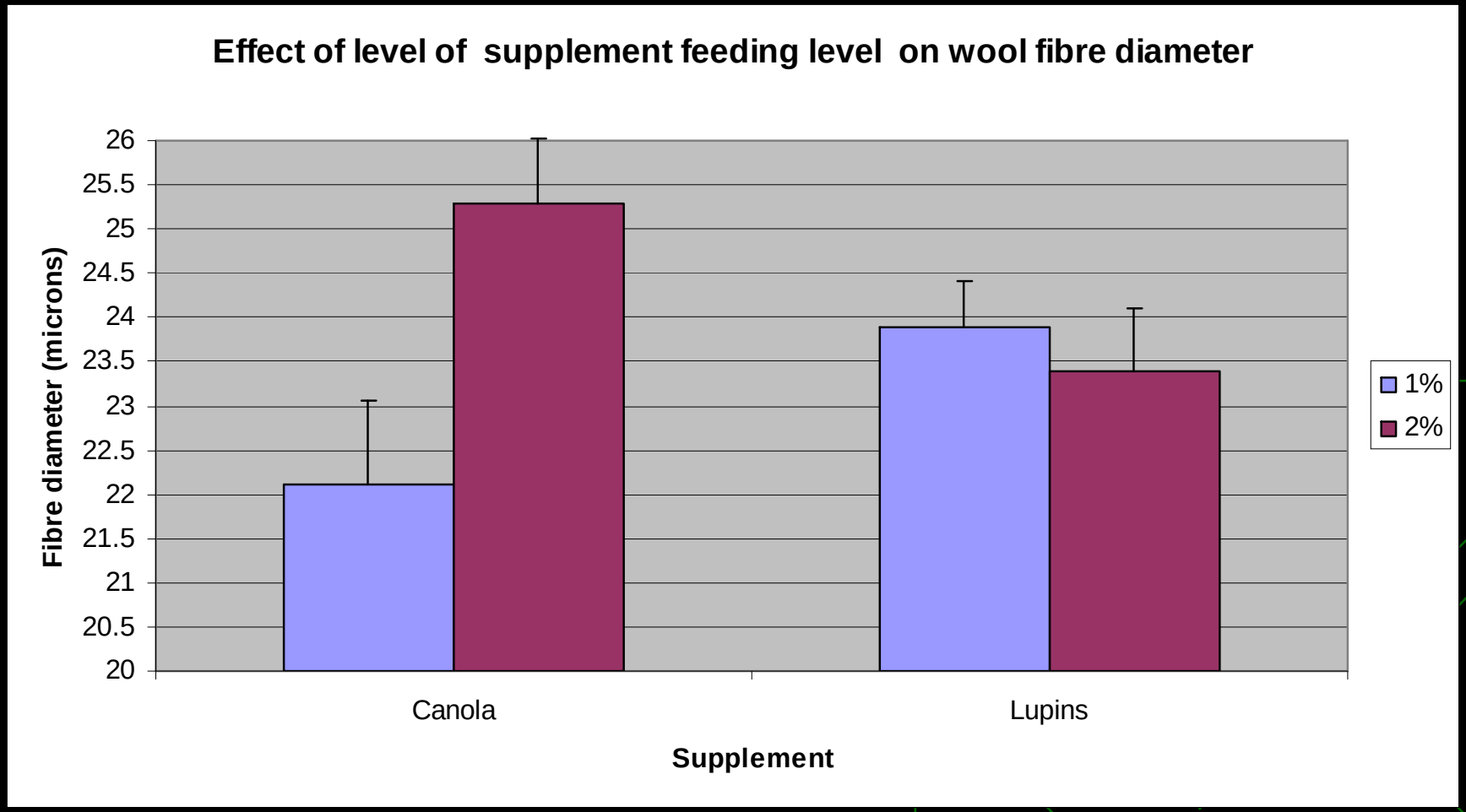
- Protein higher than ME digestibility in all sire breeds
- Sire breed digestibility differences negligible ($P>0.05$)

Results



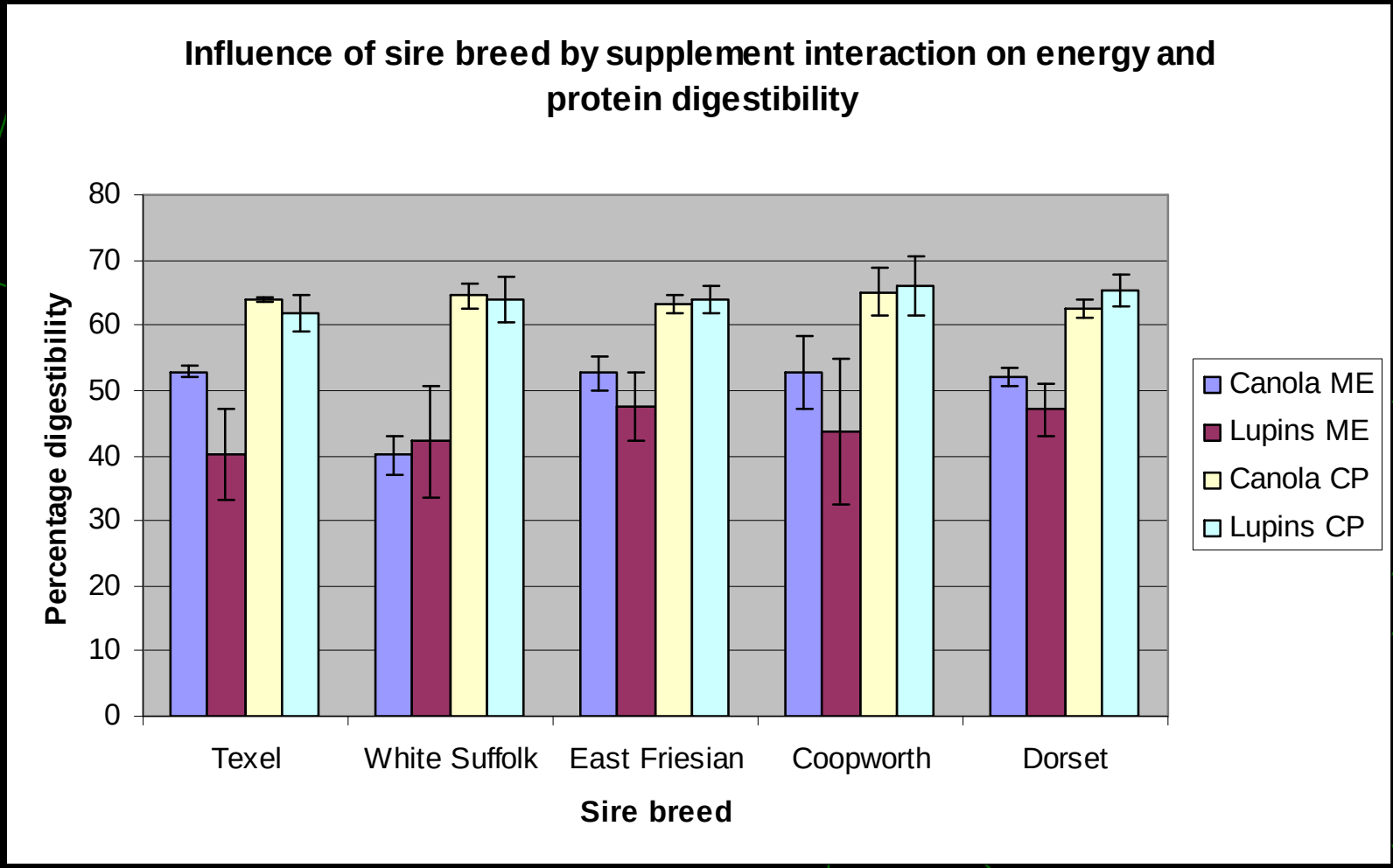
- Slight FD decrease after supplementation
- Sire breed differences in FD insignificant (P>0.05)

Results

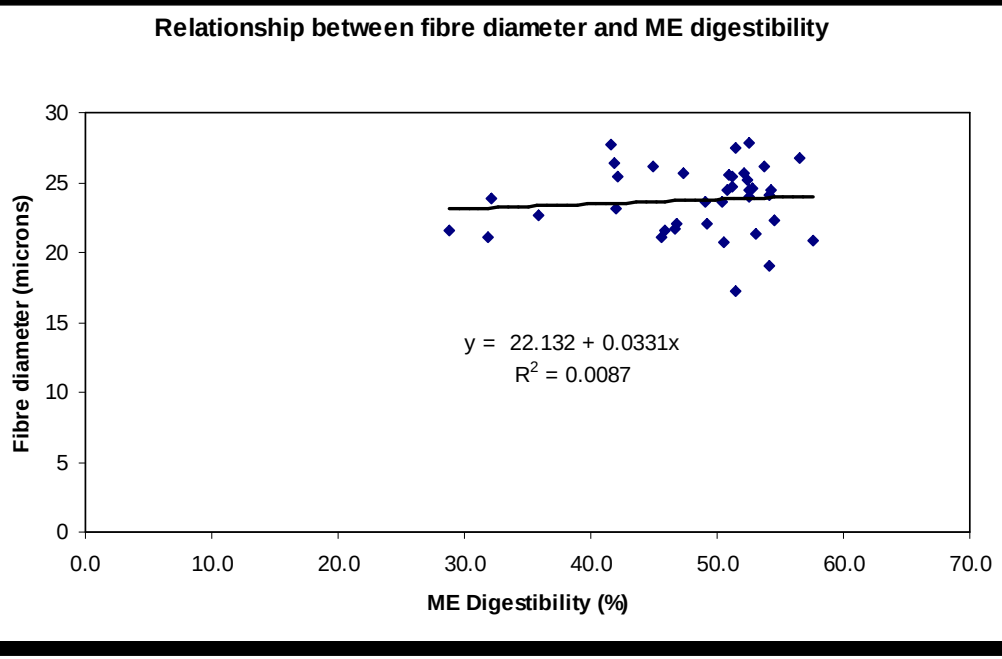


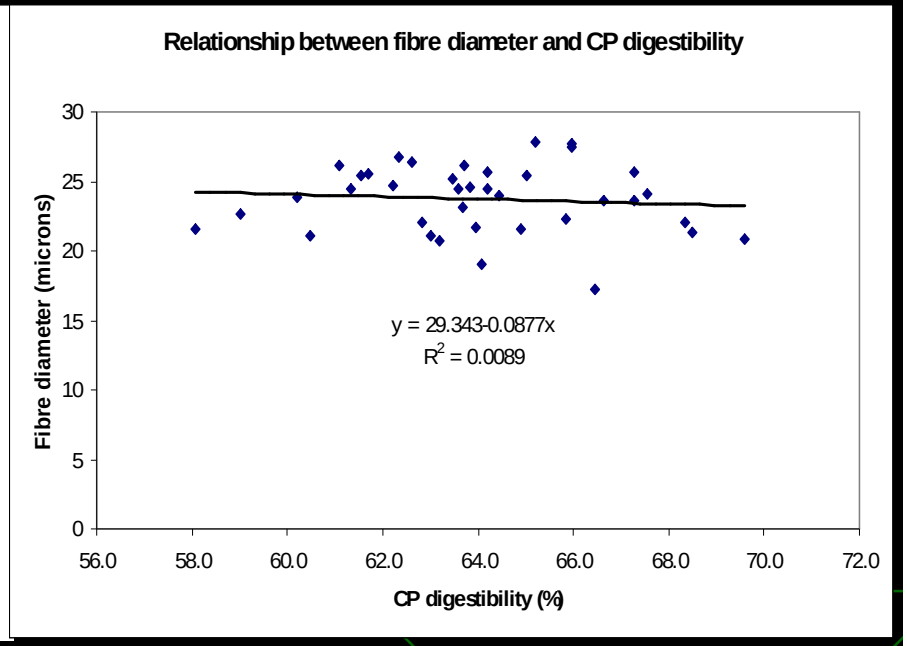
- Significant interaction between supplement and level
- Canola meal @ 1%BW = Best FD reduction

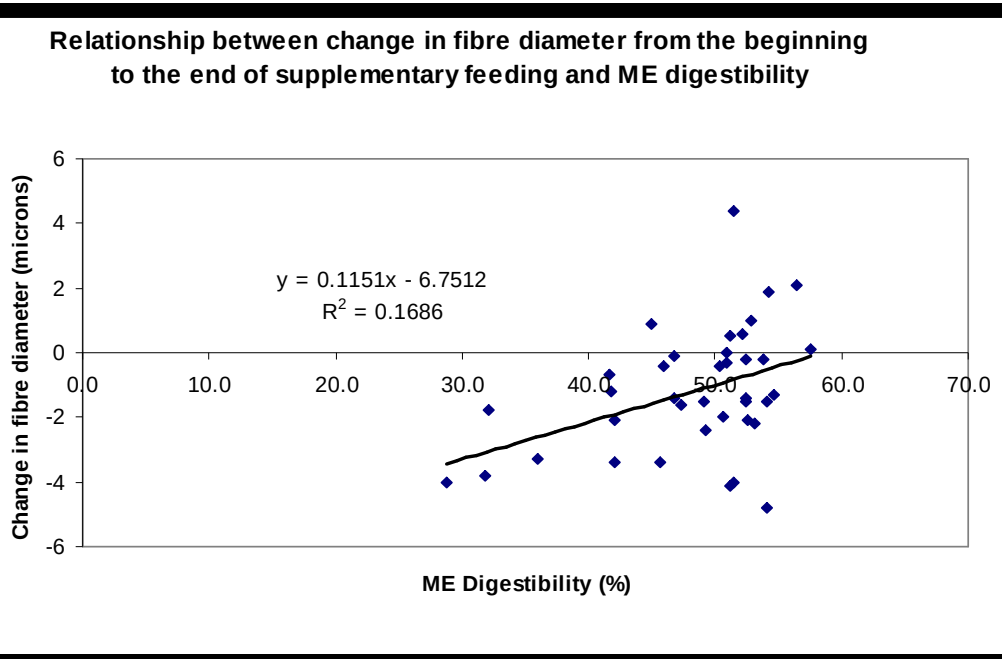
Results

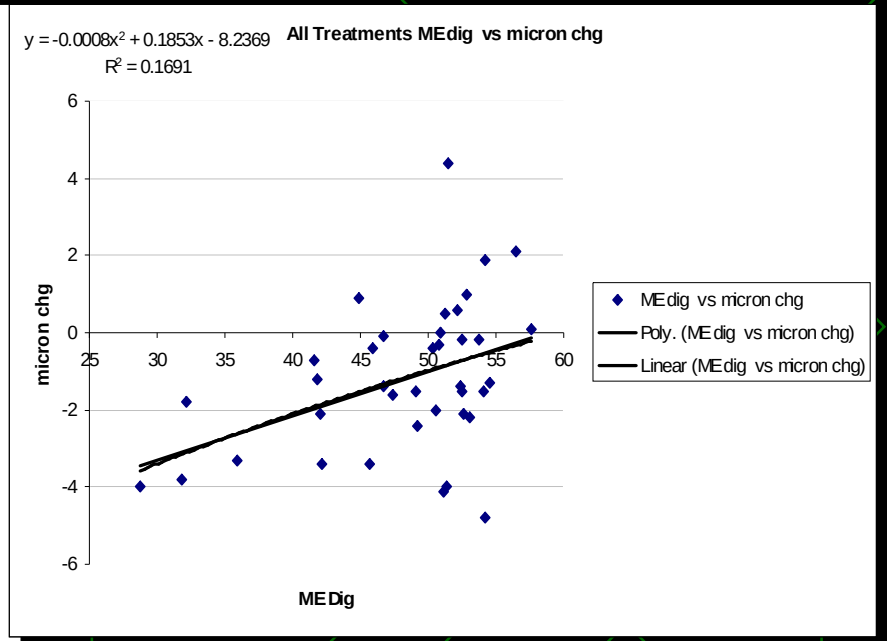


- Significant interaction between suppl & sire breed
- Protein digestibility higher than energy in all breeds









- Very low prediction accuracy – linear and polynomial

Correlations between wool and growth parameters in crossbred sheep

Trait	Wool Growth per day	Initial FD	Final FD	Change in FD Microns	Live Weight	BCS
Wool Growth per Day		0.13	0.35*	0.30	0.34*	0.33*
Initial FD (Microns)	0.13		0.64***	-0.24	0.04	0.32*
Final FD (Microns)	0.35*	0.64***		0.59***	0.21	0.25
Change in FD	0.30	-0.24	0.59***		0.22	-0.02
Live Weight	0.34*	0.04	0.21	0.22		0.65***
Condition Score	0.33*	0.32*	0.25	-0.02	0.65***	

*=P<.05, **=P<.01, ***=P<.001

Plasma Amino Acid	Wool Yield and Growth per day	Microns (initial)	Microns (end)	Change in Microns	Body condition score	Liveweight
Histidine	0.058	-0.153	0.151	0.353*	-0.009	.426**
Asparagine	-0.034	0.161	0.257	0.154	0.039	.207
Serine	-0.397	0.221	0.141	-0.054	-0.185	-0.188
Glutamine	-0.214	0.195	0.035	-0.161	-0.233	-0.269
Arginine	-0.061	0.017	0.200	0.234	0.054	.269
Glycine	-0.108	0.042	0.110	0.094	-0.017	.108
Glutamic acid	-0.141	-0.073	0.086	0.186	-0.174	.180
Threonine	-0.10	0.048	0.189	0.188	0.056	.139
Alanine	0.008	0.067	0.098	.053	-0.100	.181
Proline	-0.042	0.162	0.221	0.109	0.112	.229
Lysine	0.041	0.029	0.316*	0.368*	0.138	.402
Tyrosine	0.010	0.158	0.289	0.198	0.169	.207
Methionine	0.066	-0.158	0.07	0.260	-0.165	.172
Valine	-0.003	0.312*	0.271	0.012	0.165	.230
Isoleucine	-0.004	0.165	0.175	0.047	-0.018	.110

Implications of findings

- **In terms of energy and protein digestibility:**
  - A sheep is a sheep, regardless of sire genetics
  - Crossbred sheep from sires with high EBV for feed efficiency do not necessarily digest feed more efficiently
- **FD prediction from CP and ME digestibility:**
  - Very low accuracy; unreliable
  - Not useful indicator of sire merit
- **Interaction between sire genetics and nutrition more important than sire breed alone**

Summary and Conclusion

- Supplementing sheep @ 1% cheaper & better
- Fat lamb production: Canola best growth
- Wool production: Canola or Lupins OK
- Increased plasma histidine = heavier lambs
- Increased plasma lysine = better wool growth

Summary and Conclusion

- Crossbreds important dual purpose sheep
- Sire genetics alone irrelevant to digestibility
- Genetics matched with good supplements
- Coopworth sired F_1 sheep suppl @ 1% best
- Prediction of FD from digestibility unreliable

Acknowledgements

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