

# **A Nutritional Evaluation of Common Barley Varieties Grown for Silage by Beef and Dairy Producers in Western Canada**

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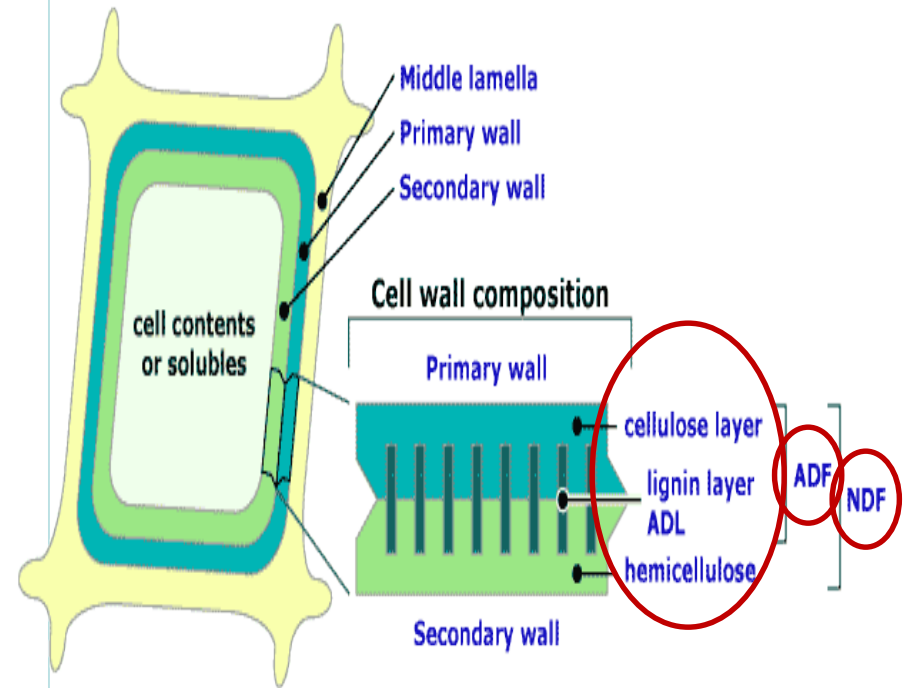
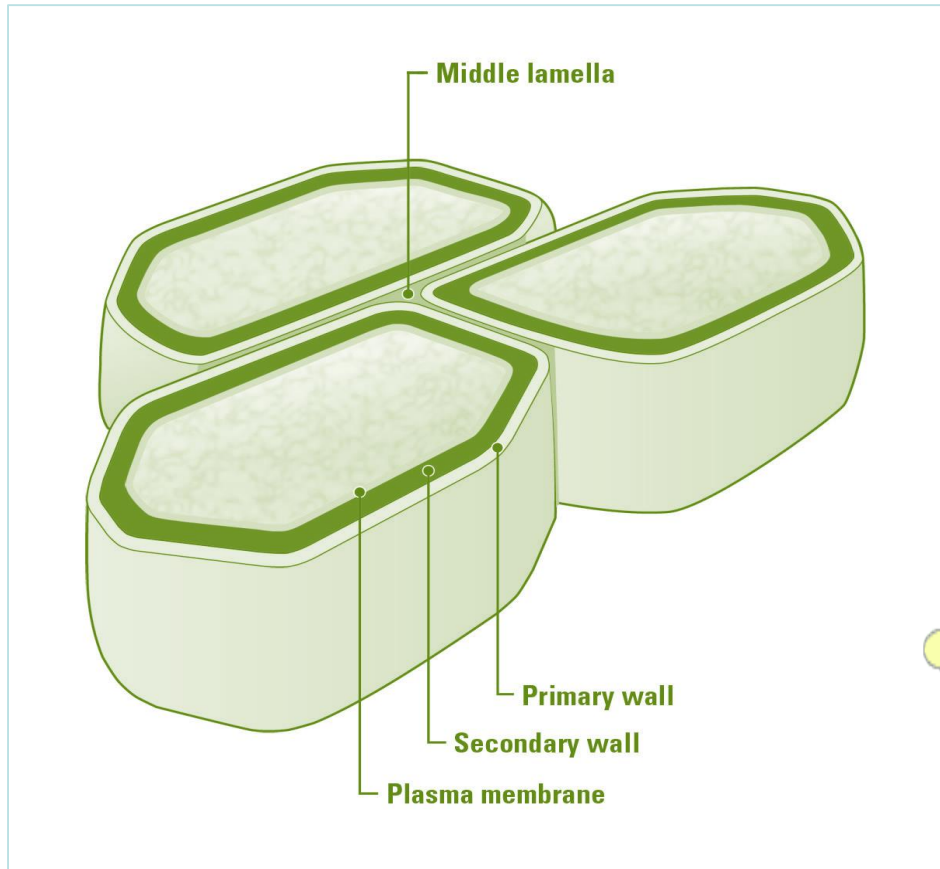
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# Background

- >250 barley varieties grown for silage
- Known agronomic traits
- Is the forage quality known??
  - Intake
  - Digestibility
  - Availability

# Plant cell wall



# Acid and Neutral Detergent Fiber

- Neutral detergent fiber (NDF)
  - Represents cell wall components of forages
  - Includes cellulose, hemicellulose and lignin
  - Relates to voluntary feed intake of ruminants
- Acid detergent Fiber (ADF)
  - Represent least digestible portion of cell wall
  - Includes cellulose and lignin
  - Forages with high ADF has low digestible energy

$$\text{DMI \%} = 120 / \text{NDF\%}$$

$$\text{Legume TDN} = 88.875 - (\text{ADF\%} \times 0.812)$$

# Barley Neutral Detergent Fiber

- Barley Neutral detergent fiber content
  - <40% to >60%
- Neutral detergent fiber digestibility (NDFD) – highly variable
  - Stage of maturity
  - Environment
  - Variety
  - Variety × maturity

# Why care about Neutral detergent fiber digestibility??

## Forage 1

NDF = 50%

NDFD = 40%

Kg fed = 10 kg

NDF digested = 4 kg

End up in manure = 6 kg

## Forage 2

NDF = 50%

NDFD = 60%

kg fed = 10 kg

NDF digested = 6 kg

End up in manure = 4 kg

Higher digestibility



greater energy

Increased feed intake

Increased milk yield

More forage in the diet

# Objectives








- Evaluate nutrient composition
- Evaluate Neutral detergent fiber digestibility
- Evaluate proportion of digestible and indigestible Neutral detergent fiber content

of common barley varieties grown for silage by beef and dairy producers in western Canada

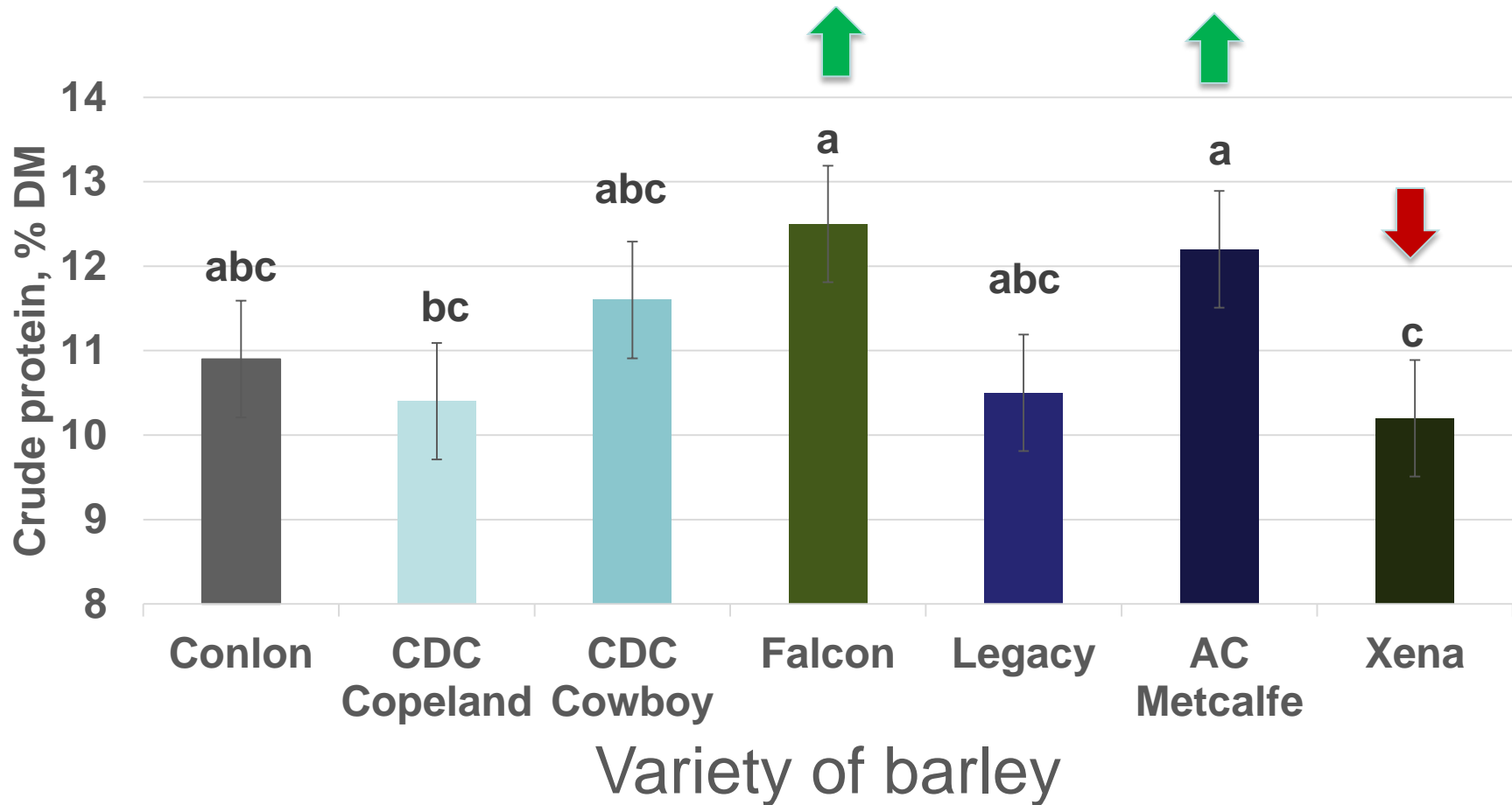
# Materials and methods

- Collected 135 barley silage samples over 2 crop years (2013 and 2014)
- Selected 80 samples harvested at mid-dough stage
  - 7 varieties with  $\geq 3$  samples each year
- Analyzed for chemical and nutrient composition

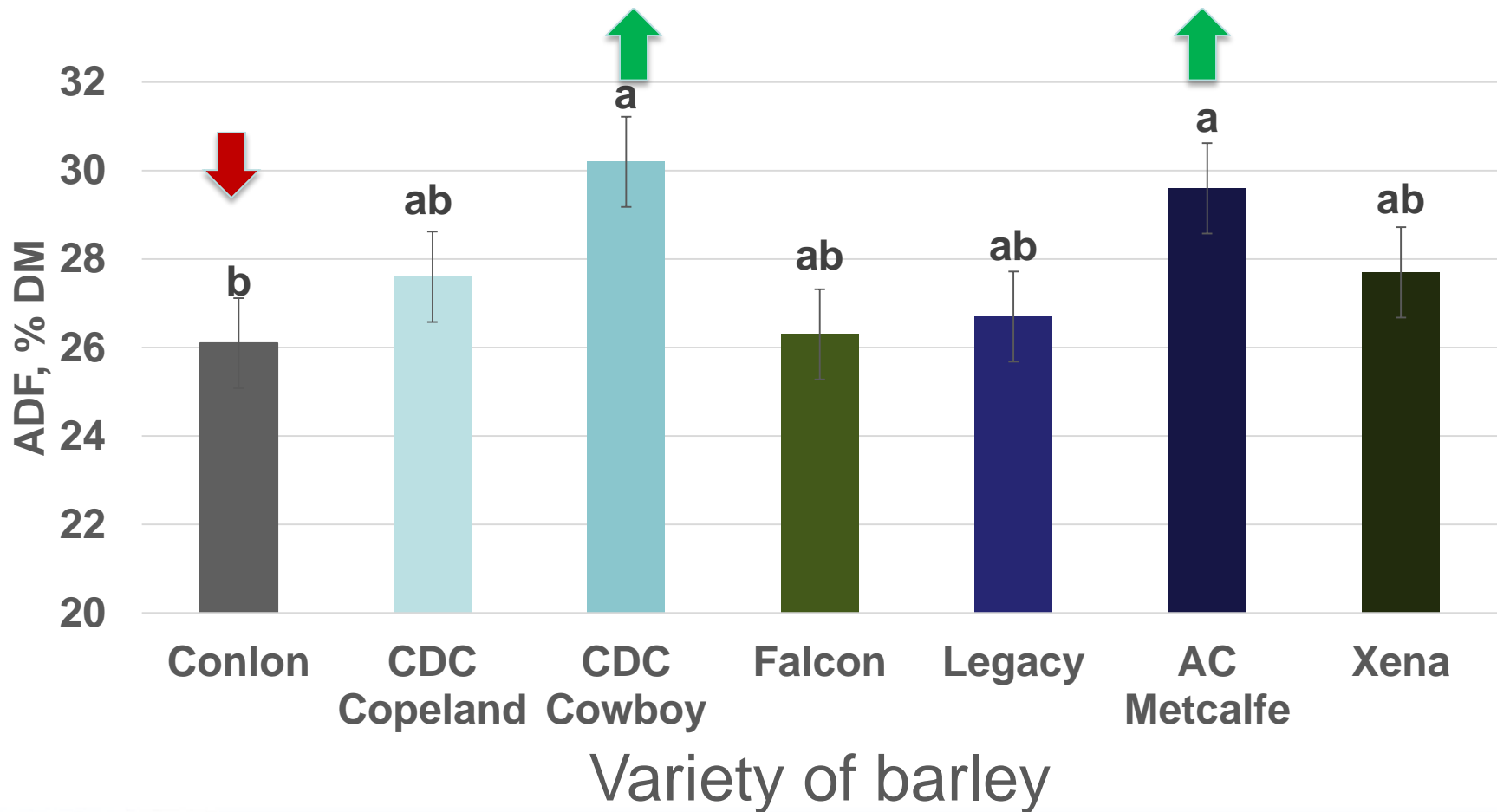


Conlon	CDC Copeland	CDC Cowboy	Falcon	Legacy	AC Metcalfe	Xena
						
2 row	2 row	2 row	6 row	6 row	2 row	2 row
Smooth awn	Rough awn	Rough awn	Smooth awn	Smooth awn	Rough awn	Rough awn
Feed and malting type	Malting type	Feed type	Feed type	Malting type	Malting type	Feed type

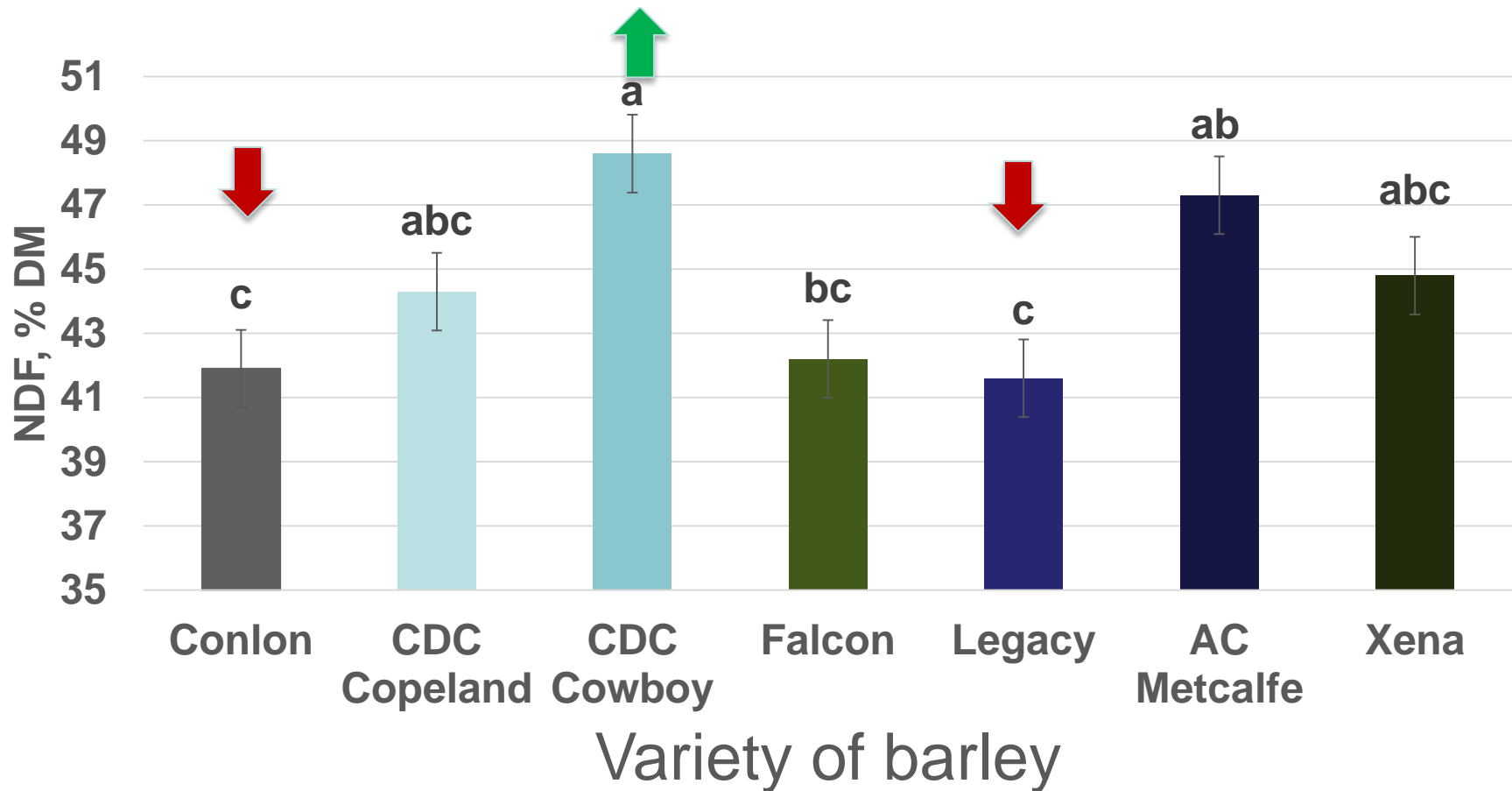
## Effect of variety of barley for silage on Crude protein (CP) content ( $P < 0.01$ )



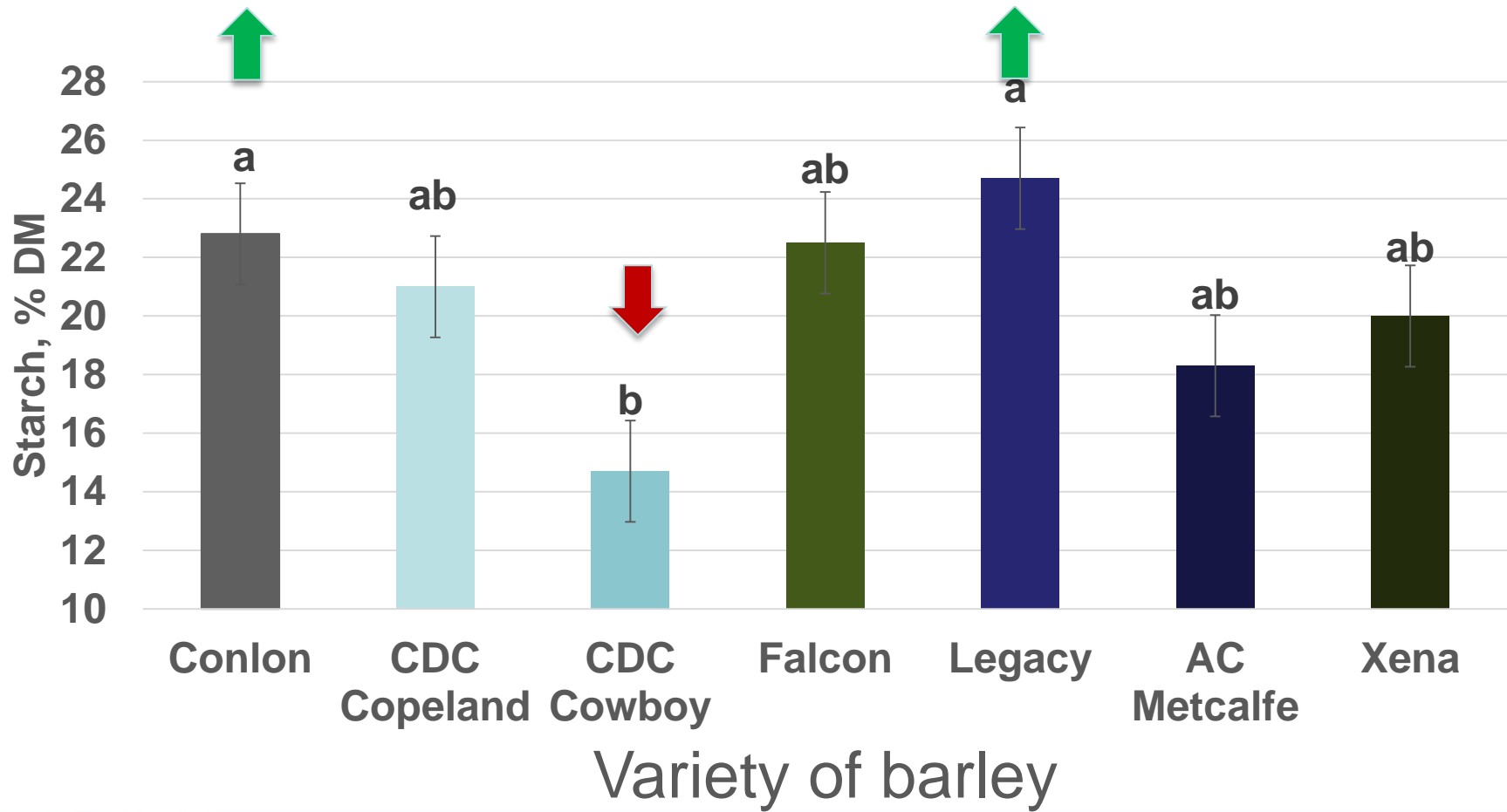
## Effect of variety of barley for silage on Acid detergent fiber (ADF) content ( $P < 0.01$ )



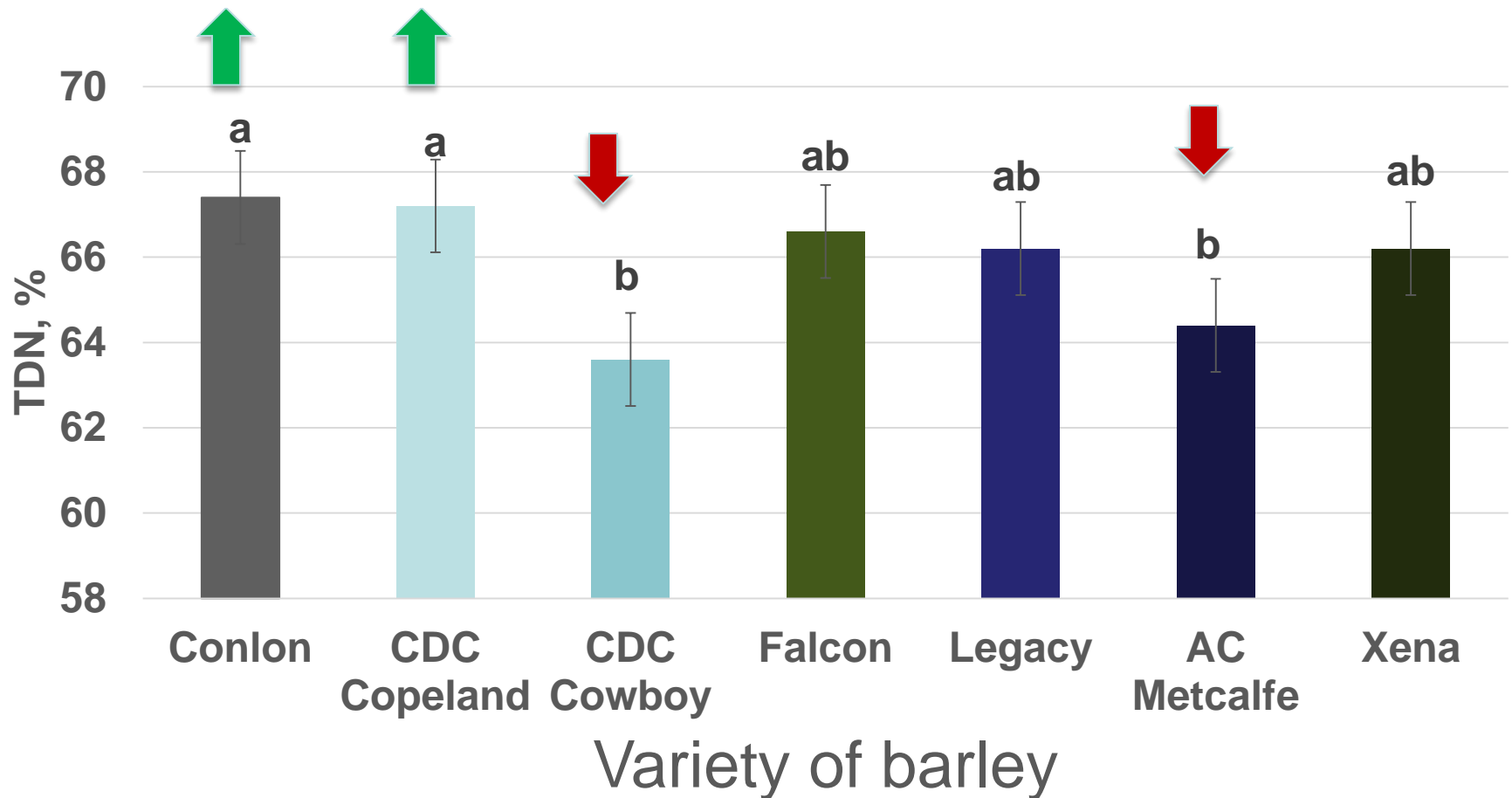
## Effect of variety of barley for silage on Neutral detergent fiber (NDF) content ( $P < 0.01$ )



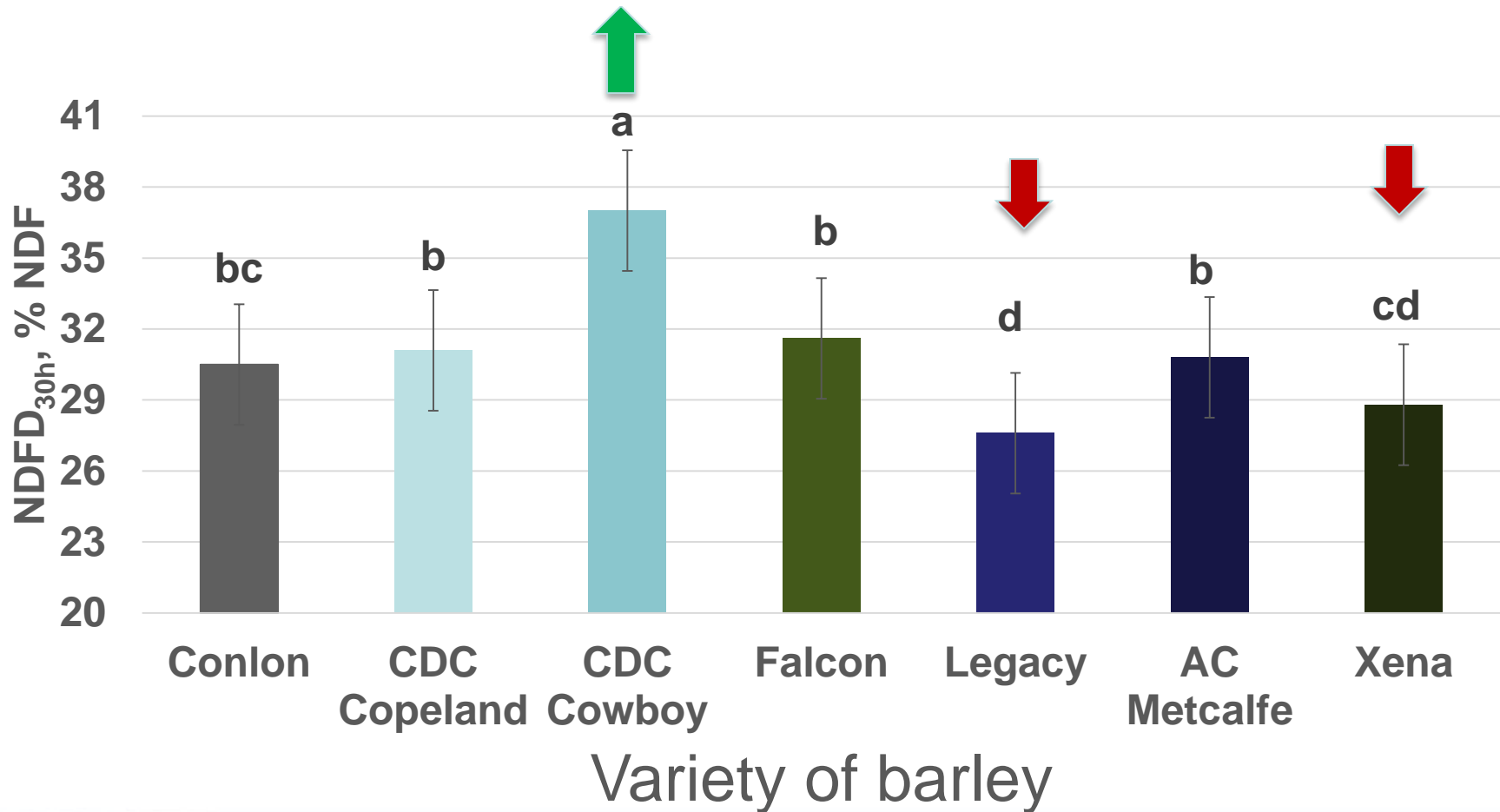
## Effect of variety of barley for silage on starch content ( $P < 0.01$ )



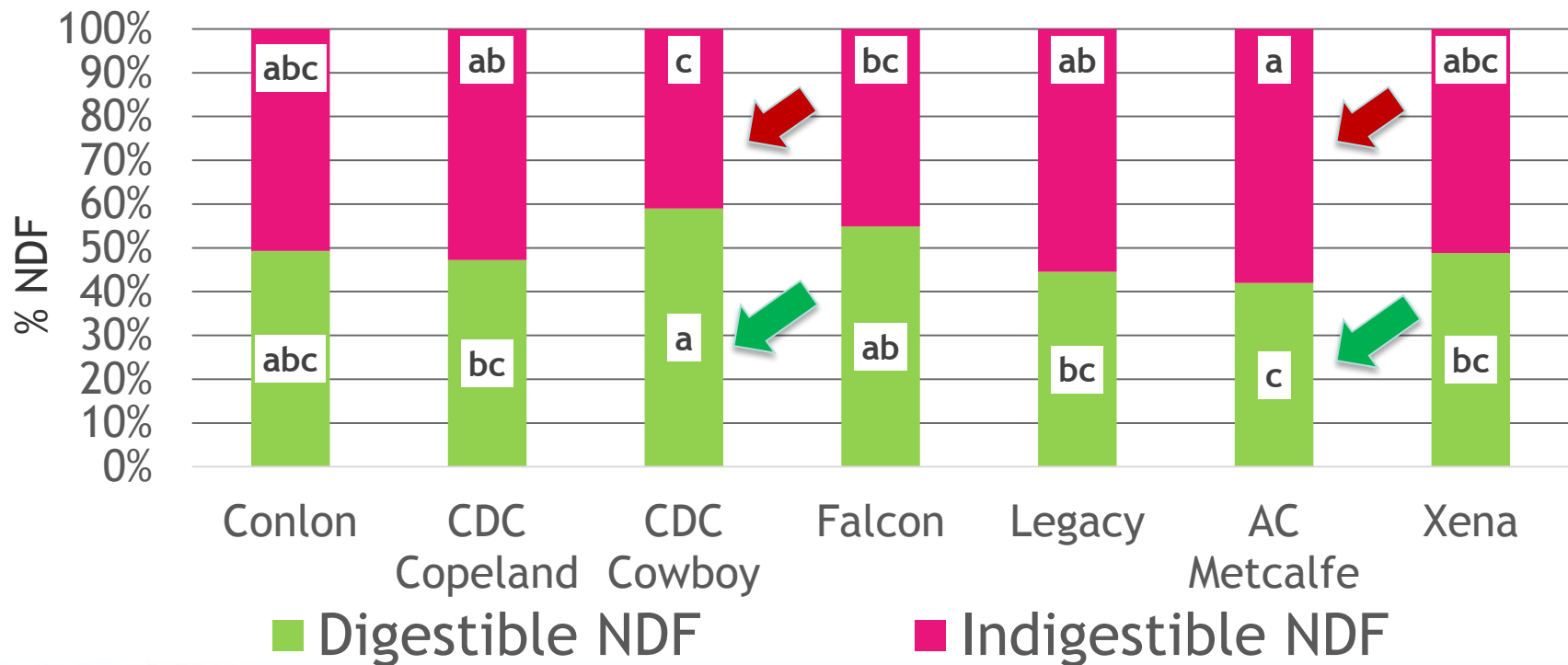
## Effect of variety of barley for silage on Total digestible nutrients (TDN) content ( $P < 0.01$ )



Effect of variety of barley for silage on 30-h Neutral detergent fiber digestibility (NDFD) ( $P < 0.01$ )



## Effect of variety of barley for silage on NDF pool ( $P < 0.01$ )





# Forage awns and mouth lesions

- Awns
  - Is a reduced leaf
  - Photosynthetically active
  - Contribute to grain yield
  - Awned barley generally out yields awn less isotypes

- Triticale, spear grass, wild barley, mature haylage
- Dwarf and rough awn barley cultivars
- Rye grass, wild oats, porcupine grass, downy brome
- Annual grass – foxtail
- – all reported to produce mouth lesions

- Karren et al. (1994)
  - Incidence of mouth lesion among finishing steers
  - 15551 slaughter cattle
    - Normal stem with rough awns – 13.5%
    - Normal stem with smooth awns – 11.8%
    - Semi-dwarf stem with rough awns - 29.3%
  - Carcass weights not affected by the presence of mouth lesions

- Incidence of lesion was determined more by the type of stem rather than roughness of awn
- Further research using rough vs smooth awned variety is needed to evaluate the effect of awn type on incidence of mouth lesions
  - CDC Cowboy vs Maverick

# Conclusion

- Barley varieties grown for silage in western Canada are inherently different in terms of chemical composition and digestibility parameters
- Potential benefits of greater neutral detergent fiber digestibility of CDC Cowboy could be negated by greater neutral detergent fiber (NDF) and lower starch content
- There is potential for plant breeders to select barley varieties for enhanced nutrient and digestibility parameters

# Acknowledgements

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- Canadian Cattleman's Association
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- Beef and Dairy Producers