70° EAAP Meeting

# Effect of wheat soluble concentrate on performances and nitrogen metabolism in lactating dairy cows

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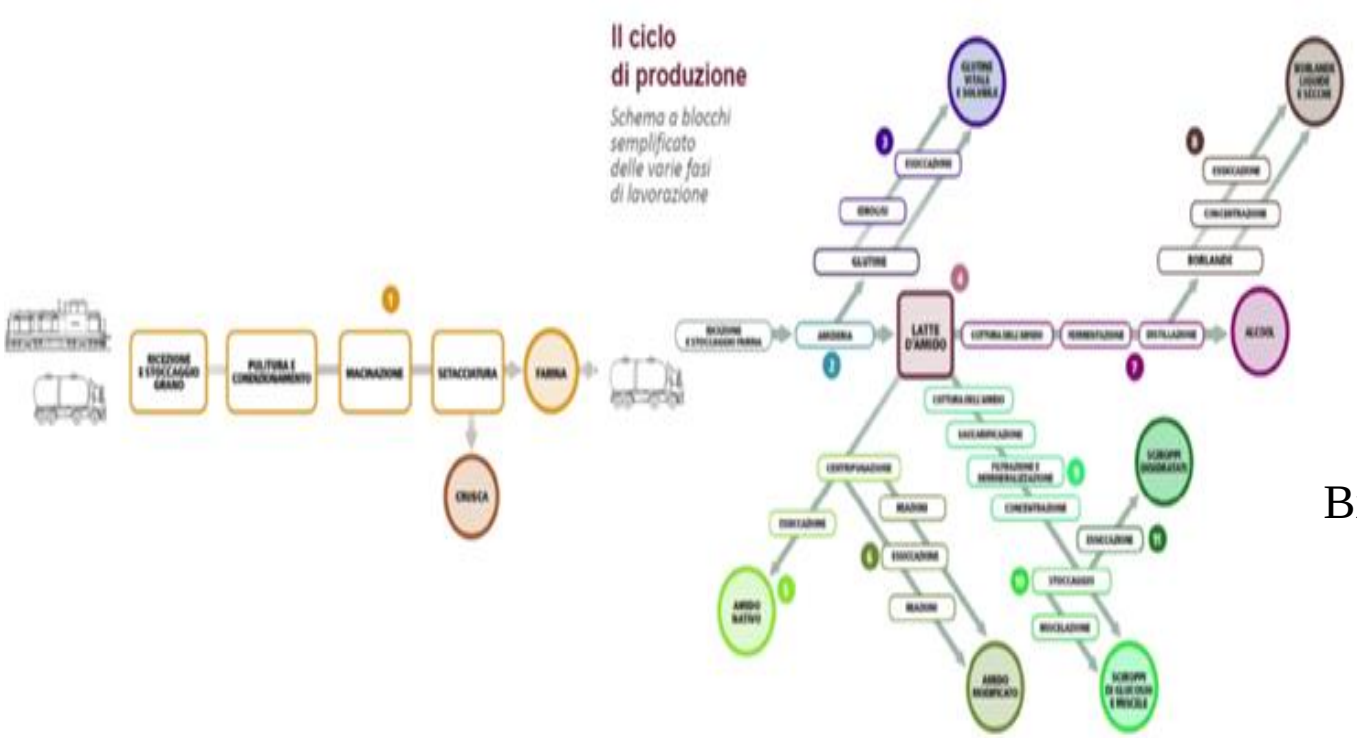
# Introduction

- Environment
- Animal nutrition
- Sustainability
- Profitability
- «Circular Economy»

- Use of by - products

# Introduction




Distillers and soluble concentrates production

Biofuels

Human nutrition

**Reg. UE 1017/2017, section A, comma 3, Ref. 1.12.8**

# Objective

**Evaluate Wheat Soluble Concentrate (WSC) as N source in dairy cows' rations**

**Evaluate WSC on production, milk composition and N metabolism**

# Materials and Methods

*Cross Over Design*.

| | | Group 1 | Group 2 |
|---|---|---|---|
| 42 dd | Period 1 | **WSC** | **CRTL** |
| | Period 2 | **CTRL** | **WSC** |

- 8 Holstein cows
- 2wks adaptation
- 1w sample collection

| **Animal Characteristics** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Age | Lact. # | BW, kg | DIM | Milk prod. Kg | Fat | Prot. | Lact. | Urea, mg/dl | SCC | Rumin, min |
| 1 | **2.3** | **1.3** | **621** | **125** | **40.2** | **3.5** | **3.1** | **5.0** | **26.0** | **67** | **568** |
| 2 | **2.8** | **1.8** | **617** | **109** | **39.4** | **3.4** | **3.1** | **4.9** | **26.5** | **39** | **487** |

# Materials and Methods

| DIETS COMPOSITION | | | |
|---|---|---|---|
| | **WSC** | **CRTL** | |
| **Ingredient** | Kg/h/d | Kg/h/d | % DM |
| **1 st Cut hay** | 12 | 12 | 40 |
| **Concentrate**[1] | 9 | 9 | 30 |
| **Flaked Corn** | 5 | 5 | 16.7 |
| **Inert Fat** | 0.5 | 0.5 | 1.7 |
| ***Treatment***[2] | *3.5* | *3.5* | *11.7* |
| **Long hay (grass)** | *Ad Libitum* | | - |

[1] **Composition**: wheat bran, sorghum meal, soybean meal, macro- micro-minerals

[2] **WSC** for treatment diet,
**beet pulp and soybean meal** in CTRL diet

**WSC composition** = DM = 36% – CP = 23.5% Sugars = 28% – Ash= 11% – aNDFom = 1%– Starch = 17%

| CHEMICAL COMPOSITION | WSC | CTRL |
|---|---|---|
| DM | 84.52±0.52 | 84.54±0.53 |
| **CP** | **16.26±0.76** | **16.31±0.94** |
| FAT | 3.40±0.72 | 4.39±0.68 |
| STARCH | 16.41±1.66 | 17.51±1.70 |
| *SUGARS* | *8.56±0.82* | *5.25±0.20* |
| *aNDFom* | *33.59±2.72* | *35.86±2.80* |
| *ADF* | *24.38±1.87* | *26.15±1.82* |
| *ADL* | *4.52±0.39* | *5.28±0.47* |
| uNDF240 | 12.58±0.82 | 14.05±0.85 |
| pdNDF | 21.01±1.33 | 25.65±1.37 |
| IVNDFD 30h, % aNDFom | 38.39±0.50 | 39.66±0.52 |
| IVNDFD 120h, % aNDFom | 53.68±0.68 | 55.46±0.70 |
| IVNDFD 240h, % aNDFom | 62.54±1.33 | 64.61±1.37 |
| ASH | 8.41±0.90 | 7.91±0.92 |

# Materials and Methods

## Daily

- INTAKE TMR – STRAW – WATER
- BW
- Milk Production
- Rumination Time

## EXP. WEEK

- TMR
- RESIDUALS
- FECES
- Rumen Fluid
- Milk Composition

# Materials and Methods

Mixed model on R

*fixed*

Diet (WSC – CTRL)

period

*random*

cow

*Post Hoc*

Tukey

# Results.

## *Intake and farm parameters*

| | WSC | CTRL | SEM | *P* |
|---|---|---|---|---|
| DMI, kg | 24.46 | 24.66 | 1 .27 | 0.72 |
| TMR, kg | 23.95 | 23.86 | 1.19 | 0.87 |
| Long hay, kg | 0.48 | 0.78 | 0.12 | <.10 |
| *Day* | *0.24$^{b}$* | *0.48$^{a}$* | *0.07* | *<.05* |
| night | 0.26 | 0.34 | 0.08 | 0.73 |
| Water Intake, l | 163.35 | 166.69 | 10.49 | 0.12 |
| BW, kg | 637.98 | 643.70 | 29.38 | 0.28 |
| Rest Time, min | 544.58 | 591.73 | 47.23 | 0.17 |
| Rumination time, min | 465.20 | 502.65 | 26.23 | 0.67 |

# Results.

## *Milk production and composition*

| | WSC | CTRL | SEM | *P* |
|---|---|---|---|---|
| Milk production, kg | 32.64 | 33.72 | 2.12 | 0.92 |
| Milk/DMI, kg | 1.35 | 1.37 | 0.06 | 0.91 |
| Fat, % | 3.70 | 3.80 | 0.32 | <.10 |
| Protein, % | 3.07 | 3.01 | 0.09 | 0.40 |
| Lactose, % | 4.90 | 4.88 | 0.08 | 0.38 |
| *Urea, mg/dl* | *23.10$^{b}$* | *26.31$^{a}$* | *1.54* | *<.05* |
| ECM, kg | 30.74 | 32.01 | 1.41 | 0.55 |
| N Retention, % | 25.30 | 24.90 | 0.63 | 0.57 |
| FCM 4%, kg | 30.30 | 32.10 | 1.74 | 0.41 |
| *FA DeNovo* | *22.01$^{a}$* | *21.05$^{b}$* | *0.64* | *<.05* |
| *C8:0* | *1.08$^{a}$* | *1.03$^{b}$* | *0.04* | *<.05* |
| *C10:0* | *2.46$^{a}$* | *2.31$^{b}$* | *0.13* | *<.05* |
| *C14:1* | *0.23$^{B}$* | *0.25$^{A}$* | *0.01* | *0.01* |
| *FA Mixed* | *33.49$^{a}$* | *34.29$^{b}$* | *0.68* | *<.05* |
| AG Preformed | 36.10 | 36.31 | 0.84 | 0.85 |
| *C18:2 Cis9,Trans11* | *0.40$^{B}$* | *0.45$^{A}$* | *0.01* | *<.01* |
| *C24:0* | *0.19$^{a}$* | *0.18$^{b}$* | *0.01* | *<.05* |

# Results.
## *Rumen fluid*

| | WSC | CTRL | SEM | *P* |
|---|---|---|---|---|
| $NH_3$, mg/dl | 6.05 | 6.71 | 0.46 | 0.18 |
| 12h p.f. | 6.17 | 6.16 | 0.55 | 0.99 |
| 24h p.f. | 5.93 | 7.25 | 0.58 | <.10 |
| Acetic, mmol/% | $60.04^{B}$ | $63.01^{A}$ | 1.29 | <.01 |
| 12h p.f. | 59.75 | 63.46 | 1.73 | <.10 |
| 24h p.f. | $60.32^{B}$ | $62.57^{A}$ | 1.13 | <.01 |
| Propionic, mmol/% | $24.68^{A}$ | $21.93^{B}$ | 1.42 | <.01 |
| 12h p.f. | $25.88^{a}$ | $22.63^{b}$ | 2.05 | <.05 |
| 24h p.f. | $23.99^{a}$ | $21.73^{b}$ | 1.34 | <.05 |
| A / P | $2.57^{b}$ | $2.99^{a}$ | 0.23 | <.05 |
| 12h p.f. | 2.47 | 3.05 | 0.35 | 0.16 |
| 24h p.f. | $2.64^{b}$ | $2.91^{a}$ | 0.19 | <.05 |
| Valeric, mmol/% | $1.53^{A}$ | $1.31^{B}$ | 0.06 | <.01 |

# Results.

## *Feces composition and TTD*

| | WSC | CTRL | SEM | *P* |
|---|---|---|---|---|
| DM | 54.01 | 52.98 | 0.80 | 0.87 |
| Starch | 3.01$^{b}$ | 3.10$^{a}$ | 0.04 | <.05 |
| Ash | 13.37$^{B}$ | 14.06$^{A}$ | 0.10 | <.01 |
| CP | 13.09 | 13.16 | 0.20 | 0.64 |
| aNDFom | 55.47 | 55.08 | 0.49 | 0.35 |
| ADF | 40.21 | 39.98 | 0.34 | 0.47 |
| ADL | 14.47$^{B}$ | 14.92$^{A}$ | 0.16 | <.01 |
| $IVNDFD_{24h}$, %aNDFom | 10.32 | 10.09 | 0.21 | 0.25 |
| $IVNDFD_{240h}$, %aNDFom | 28.24 | 27.81 | 0.58 | 0.40 |
| Total tract digestibility (pdNDF) | 78.07 | 79.18 | 0.57 | 0.74 |

# Conclusions

WSC diet ↓ Milk urea and Rumen ammonia → More efficient N metabolism – reduced excretion

↓ Less long hay intake

↑ DeNovo FA

↓ CLA

Similar Total Tract Digestibility
Similar production parameters
Similar rumination time

Inclusion of WSC in dairy cows diet replacing soybean would generate no negative effects on performances

Benefits in terms of «circular economy» and sustainability

# *Thanks for your attention!*

*"The darkest place in the world is inside a dairy cow's stomach"*

W.D. Hoard

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