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# Assessing the main dietary roughage source of dairy systems by milk quality indicators

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**Introduction -** The discrimination among dairy systems based on the roughage source used in the lactating dairy cow rations is an ongoing topic of interest. So far, the proposed specific milk quality indicators are still quite laboratory expensive and/or they do not provide specific information on the nutritional value.

**Aim - Evaluating an easier traceability model that provides also an indication of the nutritional value by considering milk proximate composition and micro-element profile.**

## Material and Methods

- 14 specialized dairy farms (lowland in the North-East of Italy)
- According to the main roughage dietary sources, 3 experimental thesis: **high maize silage** (**HMS**), **mixed crop-silage/hay** (**MSH**) and **high permanent meadow hay** (**HMH**)
- According to the cow's breed, **HMS** and **HMH** split: Friesian vs Brown (F-HMS, B-HMS and F-HMH, B-HMH)
- 5 sample collections (March, May, July, September, December)
- Milk (70 bulk samples) proximate composition (NIR spectroscopy), minerals (Total Reflection X-Ray Fluorescence), health parameters (SCC, BHB, urea)
- Factorial Discriminant Analysis (FDA) by SAS software

**High maize silage HMS**

- ✓ >100 cows/farm
- ✓ Maize silage over 25% (DM basis)
- ✓ 34 kg FCM cow/day

**Mixed crop silage/hay MSH**

- ✓ 87 cows/farm
- ✓ Mix of ensiled crop over 35% (DM basis)
- ✓ 30 kg FCM cow/day

**High meadow hay HMH**

- ✓ 72 cows/farm
- ✓ Hay over 50% (DM basis)
- ✓ 28 kg FCM cow/day

## RESULTS

**FDA (Wilks'λ = 0.081; P<0.001) showed a relevant discrimination among dietary experimental groups (Figure 1).**

**The first two factors (F1 and F2) accounted for 71.1% and 22.9% of the total variance.**

**FDA algorithm selected 5 most informative variables: total protein, lactose, somatic cells count (SCC) and Br … casein (5th) contributes to the separation of Brown from Friesian.**

**Performance of correctly attribution ranged from 68-97% (Figure 2).**

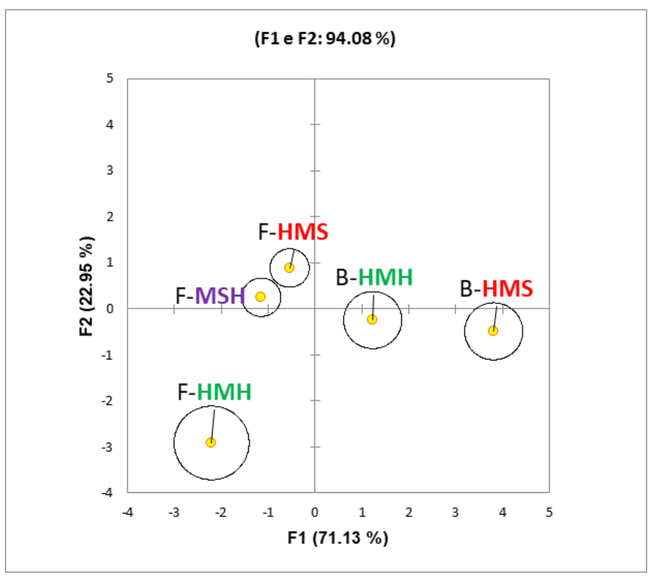


**Figure 1. FDA scattergram of the dietary roughage *per* breed dairy systems (plot of centroids and vectorial-loadings)**

| *Predicted* \ *Actual* | B-HMH | B-HMS | F-HMH | F-HMS | F-MSH |
|---|---|---|---|---|---|
| B-HMH | **7** | 1 | 0 | 1 | 0 |
| B-HMS | 1 | **9** | 0 | 1 | 0 |
| F-HMH | 0 | 0 | **5** | 0 | 2 |
| F-HMS | 1 | 0 | 0 | **15** | 5 |
| F-MSH | 1 | 0 | 1 | 5 | **15** |
| Total | 10 | 10 | 6 | 22 | 22 |
| Accuracy | 0.93 | 0.96 | 0.96 | 0.81 | 0.80 |
| Precision | 0.78 | 0.82 | 0.71 | 0.71 | 0.68 |
| Sensitivity | 0.70 | 0.90 | 0.83 | 0.68 | 0.68 |
| Specificity | 0.97 | 0.97 | 0.97 | 0.88 | 0.85 |
| MCC | 0.70 | 0.83 | 0.75 | 0.56 | 0.54 |

**Figure 2. Confusion matrix of classification of FDA results**

## DISCUSSION&CONCLUSIONS

**According to the confusion matrix, the model has a medium ability to discriminate the dairy systems, considering both the breed and the roughage source.**

**The selection of the 5 variables can be explained as the effect of: (1) breed – Brown (total protein) and Friesian (lactose); (2) use of maize silage (lactose); (3) soil – soil marker (Br).**

**Also the casein content can highlight the effect of the breed (Brown).**

**In progress: authentication by DART (*Direct Analysis Real Time High Resolution Mass Spectrometry*) and other multivariate models.**

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