POLYPHENOLS CONTENT AND AROMA COMPOSITION OF CIDERS TYPICALLY PRODUCED IN AOSTA VALLEY

Sabina Valentini[1,2], Monica Chasseur[1,2], Laura Thedy[1,2], Marcello Freguglia[1,2], Antonella Sado[1,2], Provino Lale Demoz[1,2], Ivan Barrel[1,2], Morgan Diemoz[1,2], Andrea Barmaz[1,2].

[1]Institut Agricole Régional, Aosta, Italy

[2]Unità di Ricerca Nutralp VdA "Nutraceutici in Valle d'Aosta"

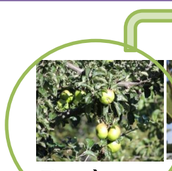
Presenting author: s.valentini@iaraosta.it

Introduction 1

The fermentation of apple must is a complex microbial reaction involving the sequential development of various strains of yeasts and bacteria. Among these micro-organisms, yeast are primarily responsible for alcoholic fermentation. Alcohols, esters and acids are the main volatile compounds produced during alcoholic fermentation. Polyphenols play important roles in the cider quality as they are related to the color, bitterness and astringency; this balance defines the overall mouthfeel of the beverage. The phenolic and aroma profile of apples and apple products is influenced by several factors: variety, climate, maturity, storage and processing. The aim of this study was to characterize, for the first time, ciders typically produced in Aosta Valley with different apple varieties (Renetta Canada, Golden Delicious, Jonagold and Ravèntze), and to evaluate the influence of apple cultivar, cidermaking and alcoholic fermentation on phenolic profile and aroma composition of these final products. For this purpose forty-nine experimental and commercial ciders, obtained from each apple variety with different cidermaking procedures (with or without maceration, still or sparkling), were analysed for total polyphenols content, phenolic profile and aroma composition.

Materials & Methods 2

EXPERIMENTAL CIDER:
Without Maceration (WM) – With Maceration (M)
Still (S) – Sparkling (SP)

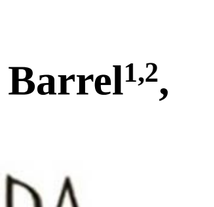

Ravèntze


Renetta Canada


Jonagold


Golden Deliciuos

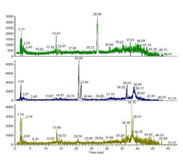
COMMERCIAL CIDER (C)



Cider Must

Filter 0.22 µm

HPLC/MS


Polyphenols Profile

Sample purification

SOLID PHASE EXTRACTION

FOLIN-CIOCALTEU ASSAY

Total polyphenol content


SPECTROPHOTOMETER

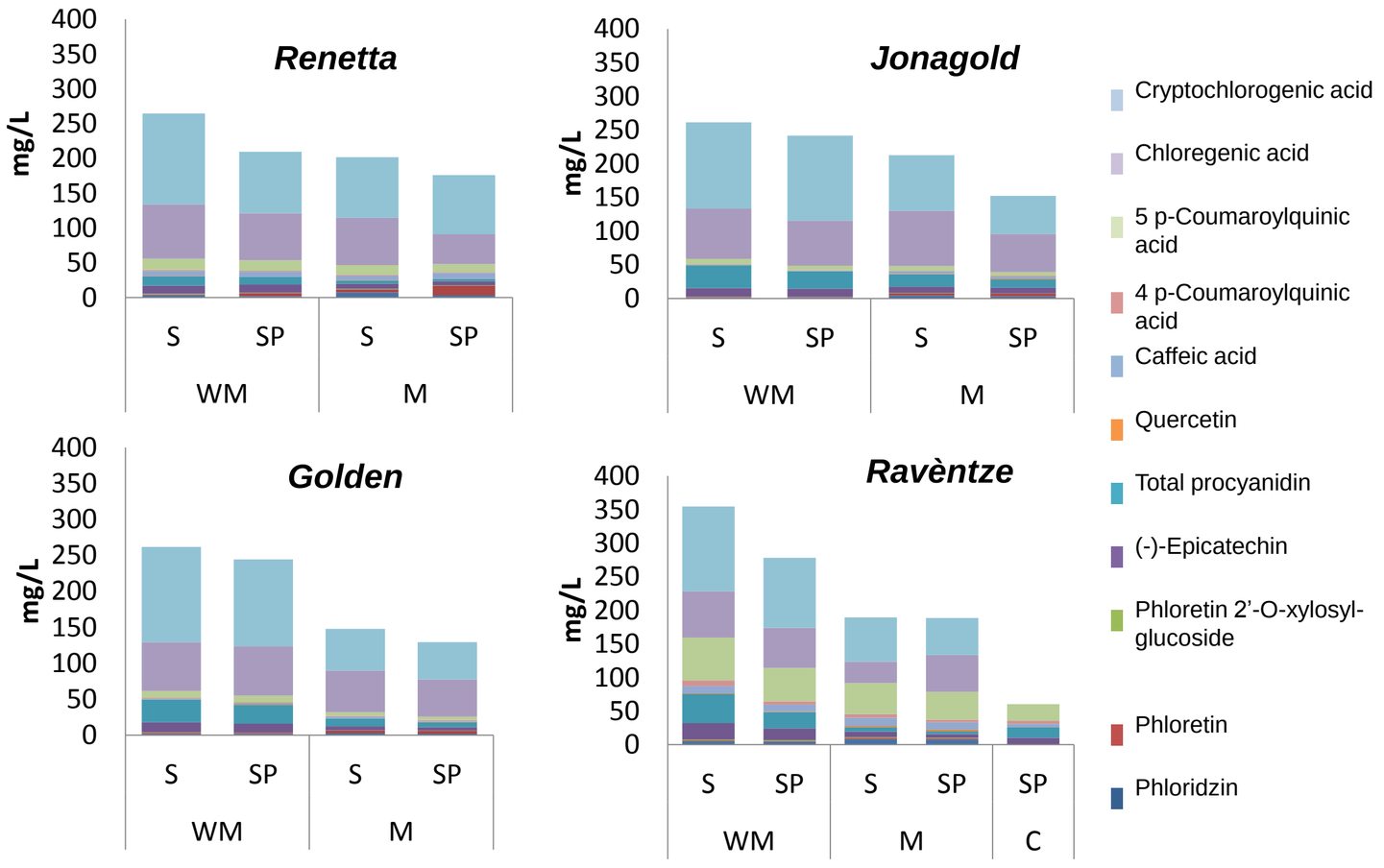
SPME


GC/MS


Aromatic Profile

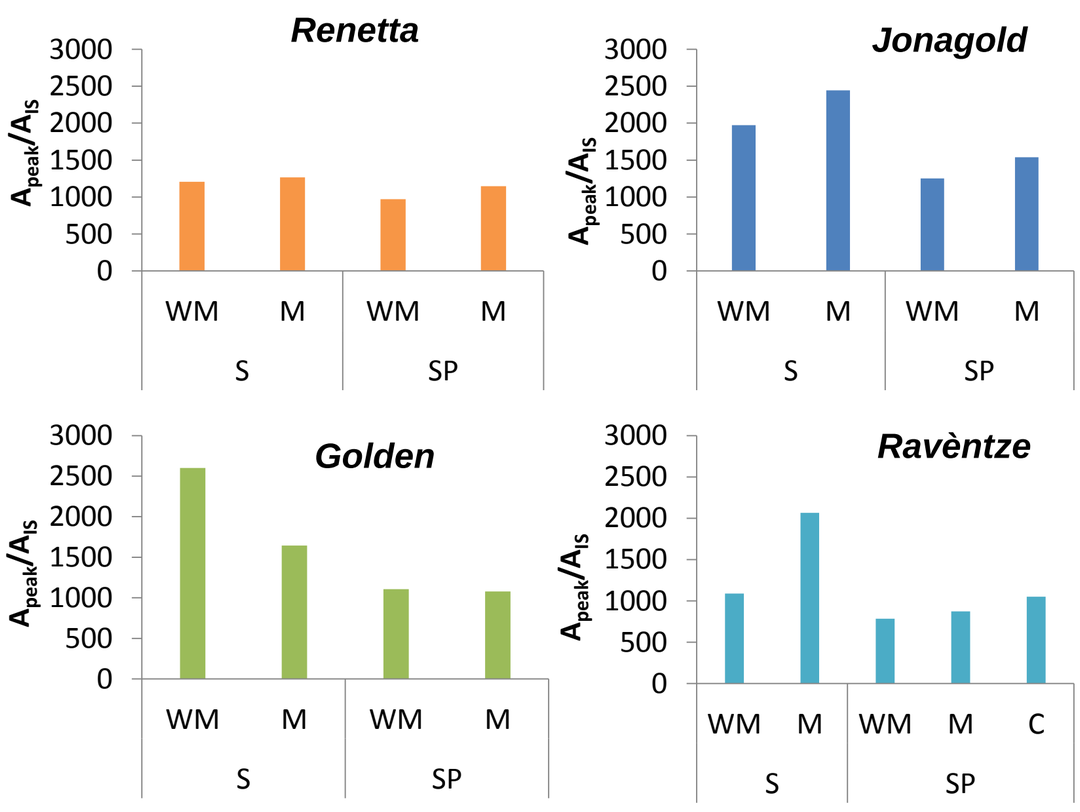
Results 3

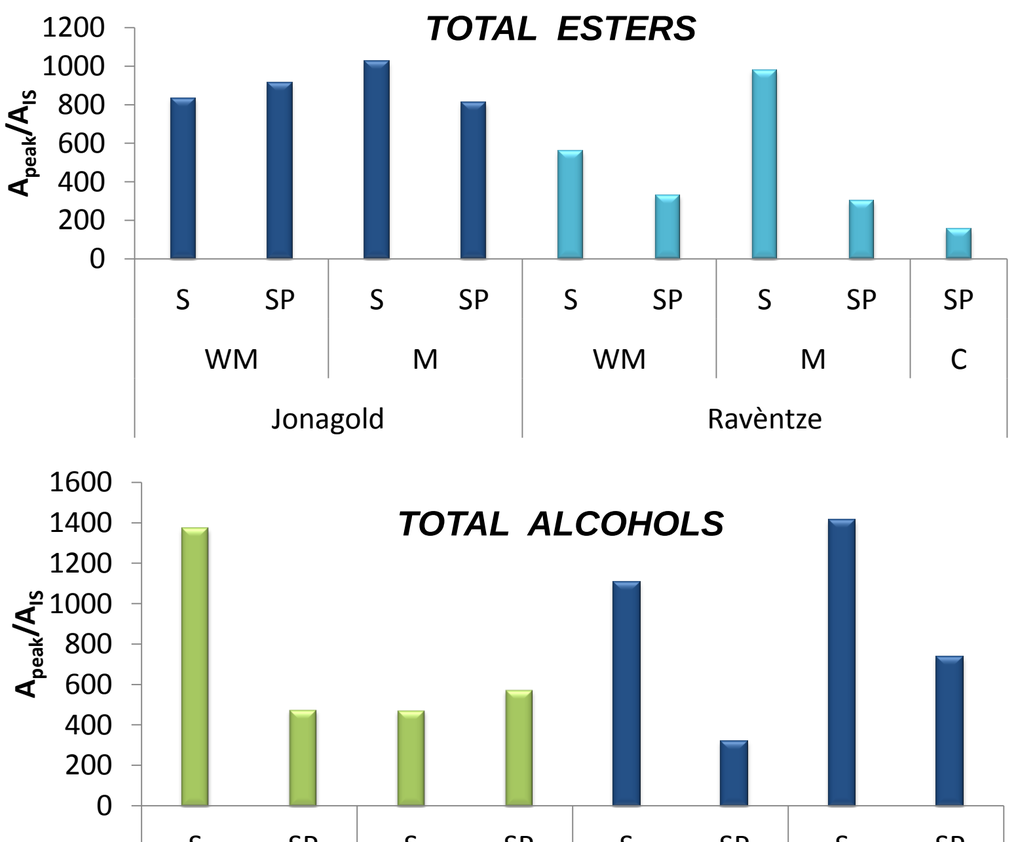
POLYPHENOL PROFILE – LC/MS



AROMATIC PROFILE – GC/MS

VOCs

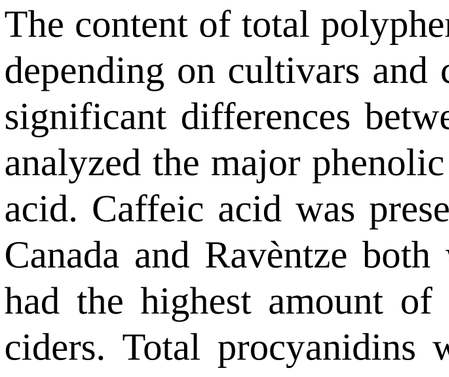


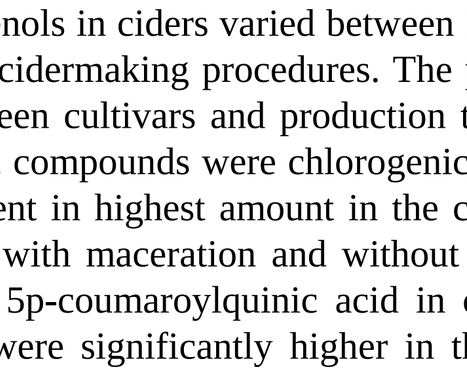


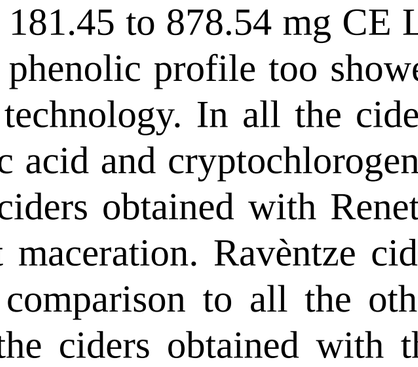
Discussions & Conclusions 4

The content of total polyphenols in ciders varied between 181.45 to 878.54 mg CE L^{-1} depending on cultivars and cidermaking procedures. The phenolic profile too showed significant differences between cultivars and production technology. In all the ciders analyzed the major phenolic compounds were chlorogenic acid and cryptochlorogenic acid. Caffeic acid was present in highest amount in the ciders obtained with Renetta Canada and Ravèntze both with maceration and without maceration. Ravèntze cider had the highest amount of 5p-coumaroylquinic acid in comparison to all the other ciders. Total procyanidins were significantly higher in the ciders obtained with the cidermaking procedure without maceration, while phloridzin in the ciders obtained with maceration. Esters and alcohols were the most abundant classes of volatile compounds in all the ciders analyzed with some significant differences between cultivars and production technology. Total volatile compounds were significantly higher in still ciders. Total esters dominated in the ciders made with Jonagold and Ravèntze, while alcohols were predominant in the ciders made with Golden Delicious without maceration.

This study represents the first characterization of Italian ciders from the point of view of aroma and phenolic composition.







Aknowledgement. This study was funded by "*FESR Competitività regionale 2007/2013"* and *"FSE Occupazione 2007/2013"* programs Special thanks to Maley s.r.l and Ottin Elio SS, partners of *"Unità di Ricerca NUTRALP VDA"* for providing apples and ciders analyzed in this study.