

POPULATION GENETIC STRUCTURE AND PHENOTYPING OF ITALIAN VARIETIES AIMING TO A GENOME WIDE ASSOCIATION STUDY FOR OLIVE OIL CHEMICAL COMPOSITION

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The effects of climate change in recent years are heavily impacting the olive growing in traditionally suited areas. The increase in average temperatures is causing a shortening of the maturation time and a reduction of the oleic acid content, risking compromising the quality of the extra virgin olive oil. The identification of allelic variants responsible for the quality of oil through a genome wide association study (GWAS) could contribute both to the assisted selection of new varieties and to the application of genome editing techniques to counteract the effect of climate change in favoring traditional varieties. To this end, an extensive phenotyping of the acidic and phenolic composition of olive oil in 160 Italian varieties from the CREA-OFA collection was started. Drupe samplings were conducted in fall 2019 in a ripening stage ranging from 1.8 to 2.2 of Jaen index and analyzed by NMR spectroscopy. All varieties were authenticated with a set of 12 microsatellites and analyzed for the population genetic structure using the tool STRUCTURE, v2.3.4. A wide

genetic variability and a low degree of differentiation among olive varieties were found encouraging the use of GWAS. The range of variability for both oleic acid and hydroxytyrosol content was wide covering almost all the phenotypic variability for the cultivated olive following to a normal frequency distribution. To evaluate the environment impact on these quantitative traits, a subset of common cultivars from CREA-OFA collection and Fojanini Foundation experimental field located in Valtellina, were compared for their olive oil chemical composition. Significant differences in chemical composition between the two environments were found showing higher oleic acid content for all varieties grown in Valtellina. As expected, the hydroxytyrosol content was more variable than those of fatty acids, highlighting a strong impact of environmental conditions. Interestingly, some varieties showed stable content for oleic acid or hydroxytyrosol under two completely different environments. These preliminary results encourage towards the GWAS for olive oil chemical composition using Italian varieties.