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APPLICATION OF PCR METHODS AND MOLECULAR MARKERS TO OLIVE OIL TRACEABILITY

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Olive oil is one of the most important agricultural products of the European Union. The olive oil demand is increasing because of the beneficial health implications of this product, but frauds and adulteration can be a serious problem in this market sector. The development in recent years of methods based on DNA analysis has produced useful instruments in food authentication. PCR methods have been successfully applied for the food analysis, because of their high specificity and sensitivity as well as to their rapidity. In the last years DNA analysis with molecular markers has made a step forward from plant tissues to olive oil.

In the present study we demonstrated the possibility to use AFLP (Amplified Fragments Length Polymorphisms), SSR (Simple Sequence Repeats), SNP (Single Nucleotide Polymorphisms) and SCAR (Sequence Characterized Amplified Region) to DNA fingerprinting in olive oil. AFLP analysis was applied on DNA extracted from different monovarietal olive oils. It was found that with a fresh olive oil there was the ability to assign a monovarietal olive oil to the corresponding cultivar leaves profile with a high level of confidence. SSR correspondence of allelic profiles with reference cultivar, and reproducibility of profiles in different DNA extractions, were evaluated in monovarietal olive oil samples. Application of SNP fingerprinting approach was developed in olive oil.

In comparison to commonly used vegetable oils, the cost of olive oil is normally higher, therefore, olive oil can be subjected to adulteration with other cheaper oils in order to increase profits. The ability to assess the olive oil composition is, nowadays, one of major concern to food safety and quality. In order to distinguish the presence of other oils in olive oil, a TaqMan assay was designed on the SCAR marker CP-rpl16T. It was found that when the amount of olive oil decreased, also the signal of this marker decreased, because it was specific for olive. In this way this system allows to define the presence of alien oil in an olive oil. A specific SYBR® GreenER™ Real Time PCR with primers designed on sequences specific for olive (*Olea europaea*) hazelnut (*Corylus avellana)*, sunflower (*Helianthus annuus*) and maize (*Zea mays*) was developed to assess capacity of detecting DNA from olive, hazelnut, sunflower and maize oils. The analyses of dissociation curves of PCR products showed amplicons of oils matched with those obtained from leaves of respective plants.