

GRUPPO QUESITI N. 1

- 1) Il candidato descriva il principio di funzionamento della spettrometria di massa, illustrando le principali fasi dell'analisi (ionizzazione, separazione e rivelazione degli ioni) e spieghi come le tecniche MS ad alta e bassa risoluzione possano essere differenzialmente applicate per le analisi quantitative e qualitative di campioni complessi.
- 2) Il candidato descriva le principali funzionalità di un foglio di calcolo e fornisca un esempio di come potrebbe essere utilizzato per organizzare, analizzare e visualizzare dati sperimentali in ambito scientifico.
- 3) Tradurre il seguente brano:

Extra virgin olive oil (EVOO) is one of the main ingredients of the Mediterranean diet. It is claimed as a functional food for its unique content of health-promoting compounds. Tyrosol (Tyr), Hydroxytyrosol (Htyr), and their phenolic derivatives present in EVOO show beneficial properties, and their identification and quantification, both in their free form and after the hydrolysis of more complex precursors, are important to certify its quality. An alternative method for quantifying free and total Tyr and Htyr in EVOO is presented using an LC-MS interface based on electron ionization (EI), called liquid electron ionization (LEI). This method requires neither sample preparation nor chromatography; the sample is diluted and injected. The selectivity and sensitivity were assessed in multiple reaction monitoring mode (MRM), obtaining confirmation and quantification in actual samples ranging from 5 to 11 mg/Kg for the free forms and from 32 to 80 mg/Kg for their total amount after hydrolysis.

GRUPPO QUESITI N. 2

- 1) Il candidato spieghi il principio della cromatografia UHPLC (Ultra High Performance Liquid Chromatography), evidenziando le differenze principali rispetto alla HPLC tradizionale. Quali vantaggi offre l'UHPLC nell'analisi di miscele complesse in termini di risoluzione, tempi di analisi e consumo di solventi?
- 2) Il candidato indichi le principali funzioni dei fogli di calcolo e spieghi come possano essere utilizzate per l'elaborazione di dati sperimentali.
- 3) Tradurre il seguente brano:

The chemical composition of finished table olive products is influenced by the olive variety and the processing method used to debitter or cure table olives. Herein, a rapid ultrahigh-pressure liquid chromatography triple-quadrupole tandem mass spectrometry method, using dynamic multiple reaction monitoring, was developed for the quantitation of 12 predominant phenolic and secoiridoid compounds in olive fruit, including hydroxytyrosol, oleuropein, hydroxytyrosol-4-O-glucoside, luteolin-7-O-glucoside, rutin, verbascoside, oleoside-11-methyl ester, 2,6-dimethoxy-p-benzoquinone, phenolic acids (chlorogenic and coumaric acids), oleuropein aglycone, and ligstroside aglycone. Levels of these compounds were measured in fresh and California-style black ripe processed Manzanilla olives and two dry salt-cured olive varieties (Mission from California and Throuba Thassos from Greece).

GRUPPO QUESITI N. 3

- 1) Il candidato descriva i principi alla base della spettrometria di massa tandem (MS/MS) e spieghi come questa tecnica consenta l'identificazione strutturale di analiti in matrici complesse.
- 2) Il candidato descriva l'utilizzo dei fogli di calcolo per la realizzazione di curve di calibrazione ed analisi quantitative.
- 3) Tradurre il seguente brano:

Oleocanthal and oleacein, two key secoiridoid derivatives present in virgin olive oil (VOO), are gaining clinical and nutritional interest thanks to their proven bioactivity; therefore, the determination of both phenols is a growing demanded application to increase the value of VOO. The main problem of previously reported liquid chromatography-based methods for oleocanthal and oleacein measurement is their interaction with water or other polar solvents, such as methanol, to promote the formation of hemiacetal or acetal derivatives. This interaction can occur during either sample extraction, basically liquid-liquid extraction, and/or chromatographic separation. The aim of this research was to evaluate the suitability of LC-MS/MS for absolute quantitation of oleocanthal and oleacein in VOO.