Experimental

An Agilent 7800 ICP-MS with the standard High Matrix Introduction (HMI) system was used for the analysis. Sampling was performed by the introduction of 50 mL of sample to a 50 mL SP54 autosampler. The ICP-MS was configured with the standard sample introduction system consisting of a MicroMist concentric nebulizer, quartz spray chamber, and spray chamber with a 1 mm id injector. The cones were nickel plated with a copper core sampler. Instrument operating conditions are listed in Table 1.

Results and Discussion

As part of the instrument quality control (QC), NIST 1646 Natural Water was used as an initial Calibration Verification (CV) standard. The results given in Table 4 show that the recoveries for all the certified elements present in 1646a were excellent, ranging from 93-104%. A mid-level calibration standard comprising mineral elements at 1 ppm, Hg at 1 ppm and all trace elements at 50 ppm was used as the Continuing Calibration Verification (CCV) solution. The CCV was analyzed six times throughout the run. The mean recoveries and range are shown in Figure 1. All CCV recoveries were within ±10% of the expected value. Three SRMs were analyzed to verify the digestion process (results not shown).

For most elements, the mean results in Table 3 were in good agreement with the certified concentrations where certified values are provided. The measured results for As in NIST 1547 and Se in both NIST 1547 and 1573a did not show such good agreement. Some plant materials may contain high levels of rare earth elements (REEs), also known as lanthanides (La). These REEs can ionization potentials, so readily form doubly-charged ions (REE\(^{++}\)). As the quadrupole mass spectrometer separates ions based on their mass to charge ratio (m/z), these doubly-charged ions can overlap that can bias the results for As and Se in samples that contain high levels of the REEs. The Agilent 7800 ICP-MS corrects for these interferences using "half mass correction", which is automatically set up in the ICP-MS MassHunter software. The improvement provided by half-mass correction was observed.

Some plant materials may contain rare earth elements (REEs) or lantanides (La) which may bias the final results due to interference from doubly charged ions (REE\(^{++}\)) on elements such as As and Se. The Agilent 7800 ICP-MS corrects for these interferences using "half mass correction", which is automatically set up in the ICP-MS MassHunter software. The software also collects semiquantitative data across the entire mass range, referred to as Quick Scan. Quick Scan provides data for elements that may not be present in the calibration standards.

In this study, the 7800 ICP-MS was used to analyze 25 elements in a range of cannabis and cannabis-related products. For more information, a spike recovery test was carried out. The few samples were spiked with an Environmental Mix Spike containing analyte elements at 200 ppb, Na, Mg, K, Ca, Fe at 2000 ppb, and Hg at 4 ppb.

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The analysis of cannabis and associated products is easily performed using the Agilent 7800 ICP-MS. The Agilent 7800’s HMI capability enables the routine analysis of samples that contain high and variable matrix levels, while minimizing the need for conventional dilution.

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References
