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MULTI-PESTICIDE RESIDUE DETERMINATION OF AVOCADO SAMPLES FROM
DIFFERENT ORIGINS, COMPARISON OF DEFATTING STEPS

SUMMARY

Avocado production is faced with challenges of pests, weeds, and fungal spoilage. Pesticides are used to improve yield as well as quality. However, pesticides used in avocado production might lead to human health related issues as well as environmental contamination. This has led to regulation on the use of pesticides by the European Union.

Europe's demand for avocado fruits is much higher than the supply leading to a deficit which is covered through imports from other regions such as East Africa and Peru. Therefore, the exporting countries need to comply with the regulations set by the importing country for them to access the market. Compliance of exporting countries to EU pesticides regulation led to the choice of this current study. The aim of this study was:

- i) To determine multipesticide residues in avocado samples from Kenya, Tanzania, EU, and Peru.
- ii) To compare two defatting methods (combination of module C1 and C2 against module C4) suggested alternatively by the regulation of EN 15662:2018.

Multi-determination of pesticide residues was carried out using HPLC-MS/MS with dMRM method. This method offers good separation of pesticides and can analyze a wide range of polar and nonpolar compounds. However, it has limitations in the determination of complex samples due to interference from matrix components. Four MRM pairs were detected. Qualification and quantification were done based on set requirements leading to identification of thiabendazole, methoxyfenozide and fenpyroximate residues.

Thiabendazole is used as postharvest fungicide for prevention of avocado spoilage and prolonging shelf life. The sample from Peru recorded the highest concentration of 1.57mg/Kg, followed by Tanzania with 0.04mg/Kg. Peru might be focusing more on post-harvest treatment to improve shelf life leading to higher residues as compared to other regions. The EU sample posted the lowest concentration of 0.01mg/Kg which might be attributed to the EU strict regulation of plant protection practices, the shorter delivery time as well as use of modern and effective pesticides next to thiabendazole, by which it requires lower dose of application. Thiabendazole was not

detectable in the Kenyan sample probably because of alternative methods of post-harvest preservation such as cold chain regime. This might be due to the high cost of thiabendazole. The sample from EU also contained 0.08mg/Kg of methoxyfenozide while fenpyroximate was below the detection limit. It was concluded that all the countries of origin obey the regulations of pesticides usage for avocado production; hence the fruits are safe for human consumption.

Comparison of the defatting steps was done by comparing the slopes of the matrix matched calibration solutions. There was no significant difference in the concentrations of the samples prepared by C1C2 and C4. These two methods can be used interchangeably depending on the circumstances. Module C1C2 is a cheaper defatting step because it uses less reagents, for instance, it does not use ODS which is used in module C4. However, the freeze out step takes 12 hours and therefore increases the time of analysis. On the other hand, module C4 takes a shorter time for analysis but is expensive because an additional reagent (ODS) is used. The choice of the defatting step therefore depends on the cost and time of analysis.

This study was done on samples from only four regions. Further studies can focus on several regions to get more representative data. More research can also be done on samples collected randomly from the farms across the different regions before the fruits are exported to the EU.