

Comparative Study of Moisture Analysis Techniques on Cannabis

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Introduction

Moisture in cannabis impacts potency and must be accurately determined. Loss on drying (LOD) is the most popular method for determining moisture in cannabis. Unfortunately, this technique is not specific to moisture and the loss of any volatile components, such as terpenes, will be incorrectly classified as moisture. Karl Fischer (KF) titration is the only chemically specific test for moisture. It requires less than 0.5 grams of sample and produces no odor. This poster describes the instrument used to determine moisture content by Karl Fischer titration and compares the results of this data to loss on drying.

Instrument

- » 874 Karl Fischer oven
- » 890 Karl Fischer titrator
- » tiamo™ software

The system is comprised of an 874 Karl Fischer oven sample processor with capacity for 35 6mL aluminum septum sealed vials, an 890 Karl Fischer Titrando and one Dosino with 10 mL buret.



Analysis

Standard KF titration requires that the sample is added directly into the KF solvent before titration. Since cannabis is not soluble in these reagents, the particle size needs to be reduced considerably in order to obtain a representative sample and ensure that all of the moisture is available for titration. The KF oven eliminates the sample preparation requirement. Approximately 0.5 grams of cannabis sample is weighed directly into the sample vial, the vial is sealed and then placed onto the sample processor.

During analysis, the sample is lowered into an oven set to a predetermined temperature and the septum seal pierced with a double hollow needle. Dry gas enters the titration vessel and, as water is vaporized, carries it to the titration vessel for analysis.

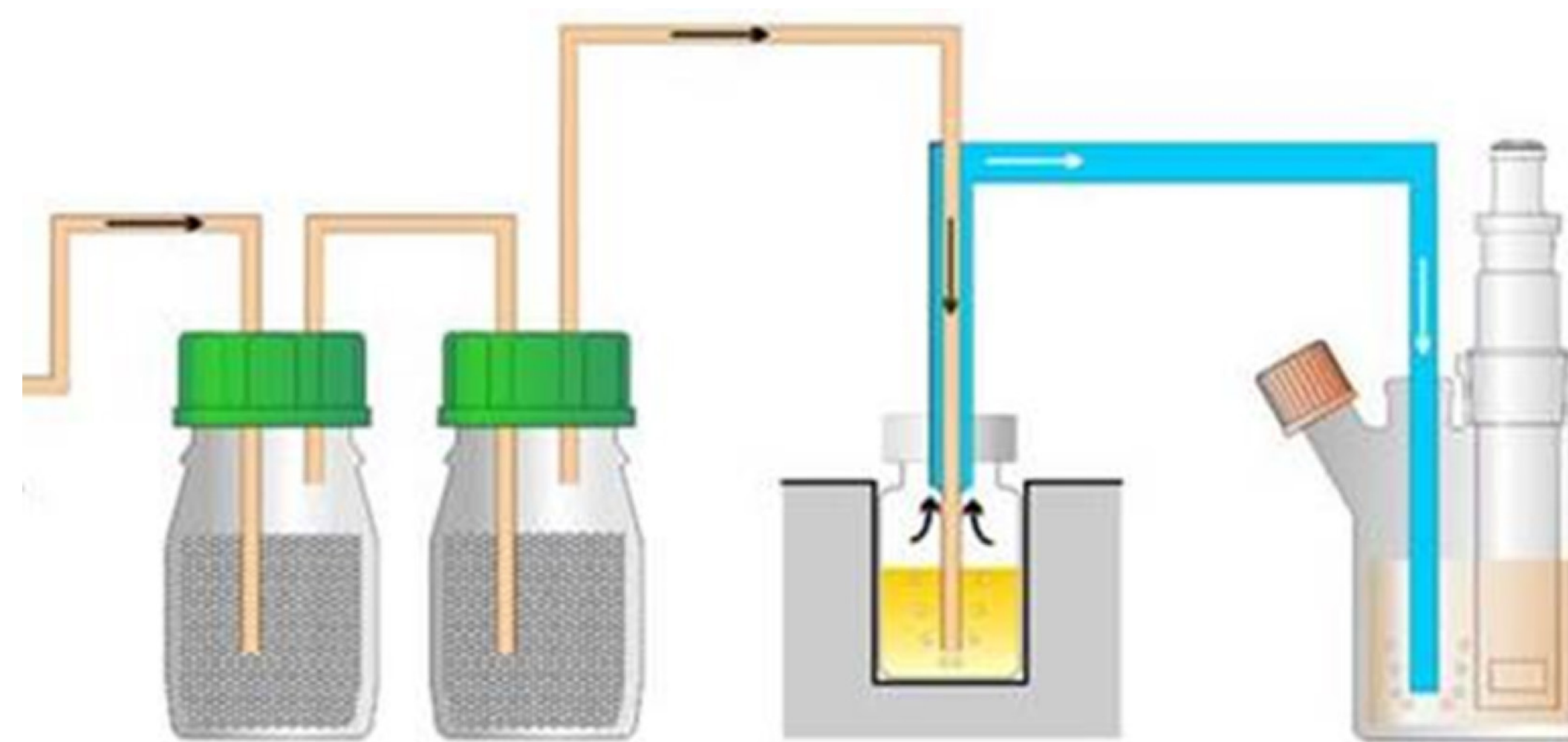


Figure 1. Schematic of KF oven analysis

Karl Fischer Oven Procedure

- » Samples are analyzed at 150°C. This is the temperature at which water is efficiently released without sample degradation.
- » Approx. 0.5 grams of sample is weighed into a vial, the mass recorded and sealed with an aluminum septum seal.
- » Samples are placed on the sample processor rack and all relevant data (sample weight, sample identification, oven temperature, etc.) is entered into the tiamo™ software.
- » The system is periodically checked with a Hydranal®-Water Standard KF-Oven with known water content.

Loss on Drying Procedure

- » 3-4 grams of sample is weighed and the mass recorded
- » Sample is heated
- » Sample is reweighed
- » Difference in weight is attributed to moisture

Moisture in Cannabis Results

Sixty-six cannabis flower and plant tissue samples were analyzed by Karl Fischer titration and LOD. LOD consistently returned a higher moisture content due to the release of other volatile compounds such as terpenes.

Hydranal®-Water Standard KF-Oven 140-160°C was analyzed to verify system functionality. Standard recovery is expected to be within 97-103% of the certified value. An acceptable recovery was obtained for 3 standard replicates.

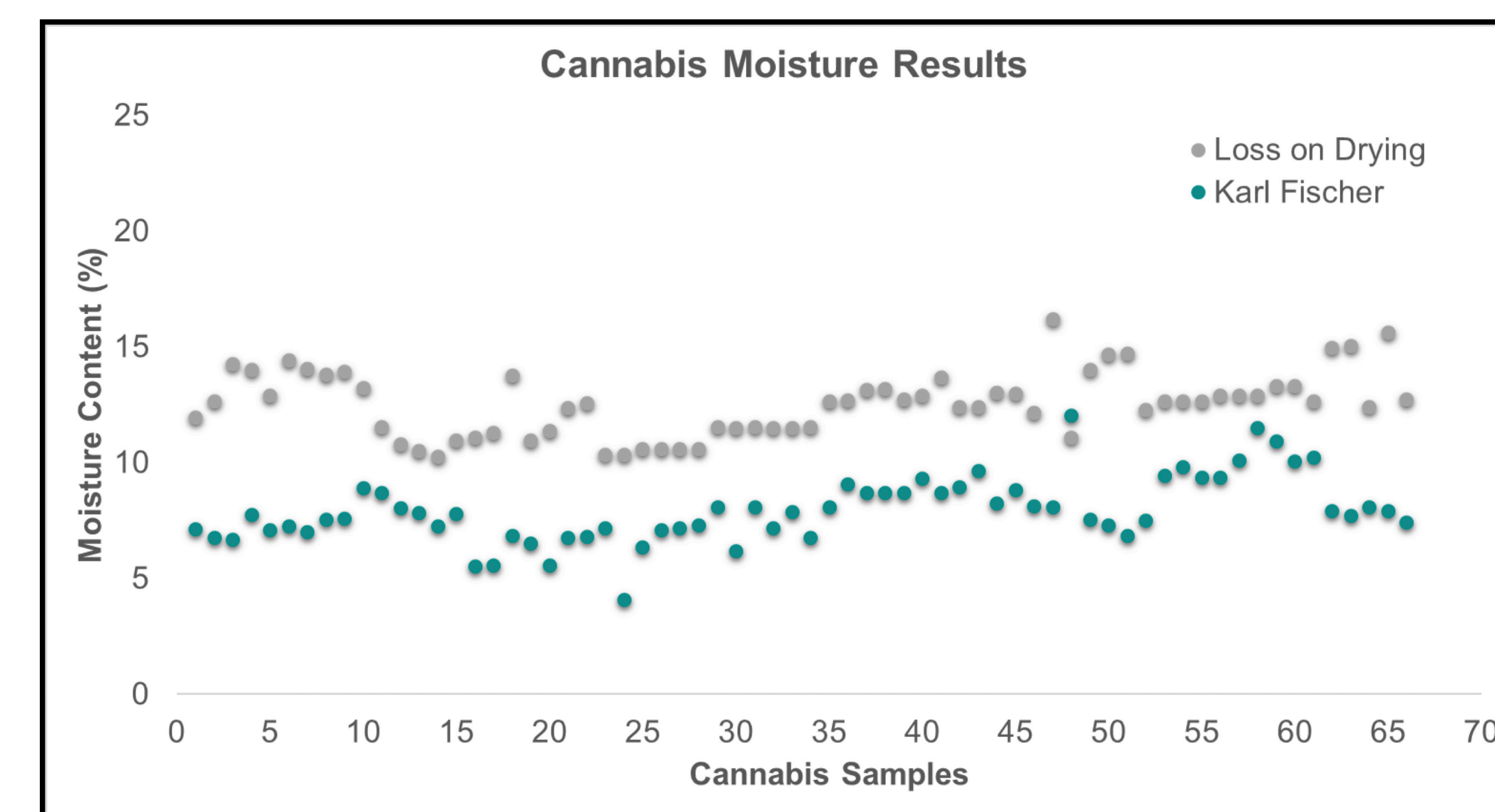


Figure 2. Cannabis sample Karl Fischer titration and LOD moisture results

Moisture content by Karl Fischer titration ranged from ~4-12%. The LOD results were on average 36% greater than the KF results for the same sample with a range of ~10-16%.

Conclusion

Moisture analysis by Karl Fischer titration is chemically specific to moisture and can be used to accurately determine moisture content in cannabis flowers and plant tissue. Loss on drying consistently returns a higher moisture content than KF titration due to the volatilization of water and additional volatile species such as terpenes.