-Steam Distillation- -V1-

- Standard Operating Procedure -

Department - Process and Chemistry

Department Head - _____ Date _____

Provider - Gemstone Essential LLC

Purpose – To achieve a high quality fragrant essential oil of biomass sample for the purposes of compound qualification, product flavor/fragrance additive, and bioactive integration. Essential Oils are collected by creating conditions to quickly remove the Lighter-Than-Air components from a botanical sample, and removing the oil from atop its co-distilled hydrosol collection.

Document Control - Document Revision & Approval History					
Revision	**Pages**	**Prepared By**	**Reviewed By**	**Approved By**	**Date**
#1		Gemstone Essential	Gemstone Essential	Gemstone Essential	1/12/2019

Definitions –

Decarboxylation - Removal of the Carboxylic acids from compounds in the oleoresin

Essential Oil - Lighter-than-air and fragrant fractions of extracted oleoresin

Extraction – Treatment of organic matter with an organic or non-organic solvent for the purpose of concentrating valuable Drug and Non-Drug type molecules

Extraction Vessel- (EV) Container in which extraction protocols are conducted. An appropriate vessel that can handle required solvent, temperature, and pressure variables.

Extract Liquor – Post- extraction oil containing ethanol

Filtration – The use of filters, sieves, or separation to remove solid and semi-solid contaminates from a liquid collection

Keck clip – Plastic/ stainless steel clamp that fits snugly to specific scientific glass joint sizes to ensure separation does not occur

Oleoresin - Extracted Oil-bearing products from the Cannabis plant lineage

Terpenes – Individual Fragrant molecules that make up an Essential Oil

Volatiles - Fraction of low molecular weight compounds that have a BP below 120^{o}c under vacuum.

Reaction - A process in which chemicals undergo a change of molecular structure

e.g. Decarboxylation of THC-Acid into THC

Equipment –

Boiling/ Liquid Trap Vessel (round bottom flask, jacketed vessel)

Heating equipment (heat mantle/ Steam generator, recirculating heater)

Material Vessel (Glass/ Stainless Steel biomass vessel)

Liquid Condenser (Glass/ Stainless)

Cold Heat Transfer Fluid Recirculator

Oil/water Separatory Funnel

Vapor Transfer Arm

Pipette

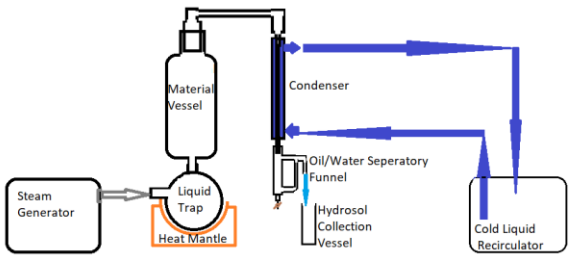
Essential Oil Storage Vessel (25-250mL)

Hydrosol Storage Vessel (1-5L)

Liquid transfer tubing

Procedure –

1. Break up Biomass until a 1-2 cm particle size is achieved throughout
2. Place a stainless steel mesh screen (10-25 lines per inch) at the bottom joint of the Material Vessel to ensure biomass is retained
3. Load Material Vessel with desired biomass. Use only moderate packing methods: (too tight of packing will cause steam channeling and cause a detriment to overall quality and yield)
4. Assemble Steam Distillation set up as shown below



   a. Fill Steam Generator with water
   b. Attach water-out line of Cold Liquid Recirculator onto bottom hose barb of condenser
   c. Attach water-in line of Cold Liquid Recirculator onto top hose barb of condenser
   d. Attach Steam Generator steam hosing to Port 1 of Liquid Trap Vessel
   e. Place Liquid Trap in Heat Mantle/ temp. appropriate vessel stand
   f. Place Material Vessel on primary ground glass joint of Liquid Trap Vessel, secure with lab stand clamp and Keck Clip
   g. Place large joint of Vapor Transfer Arm on top of Material Vessel joint
   h. Place Condenser under small joint of Vapor Transfer Arm, Secure with Keck clip and lab stand clamp
   i. Fill Oil/water Separatory funnel with Distilled water
   j. Place Oil/Water Separatory funnel under bottom joint of Condenser. Secure with Keck clip and Lab stand clamp. Ensure stopcock valve is closed
   k. Attach hose from hydrosol port of Oil/ Water Separatory Funnel and place in Hydrosol Collection Vessel
5. Set Cold Liquid Recirculator to 2-5°c and begin recirculation. If no Cold Liquid

Recirculator is available, use a bucket of ice water and an aquarium pump

6. Begin Steam Distillation by initiating Steam Generator function
    a. If no Steam Generator is available, Fill Liquid Trap under Material Vessel with distilled water, and set to 110°. Ensure flask is filled periodically.
7. Allow steam to travel from Steam Generator through setup and into condenser
8. If vapor is seen to be exiting Oil/Water Separatory Funnel, or if Oil/ Water Separatory Funnel is warm or hot to the touch, stop operation and check Condenser/ Cold Liquid Recirculator is operating properly.
9. If liquid is trapped at the bottom of the Material Vessel, and appears to be soaking/ refluxing over material, momentarily pause Steam Generator operation and allow liquid to drain.
10. Collect Essential Oil by removing Oil/ Water Separatory Funnel and using a pipette to transfer Oil into suitable Essential Oil Collection Vessel; Draining via Stopcock will cause loss of yield due to transfer loss on glass walls.
11. Place air-tight cap on Essential Oil Collection Vessel and place in a freezer to freeze any remaining water/hydrosol. Filter through small glass funnel with clean a cotton ball into a new, clean Essential Oil Collection Vessel
12. FOR BEST RESULTS:
    a. Load only Distilled water into Steam Generator
    b. After 20 minutes of operation: Collect multiple fractions of essential oil. (Earlier fractions will be of higher quality)
        i. Momentarily stop Steam Generator
        ii. Remove Oil/ Water Separatory Funnel
        iii. Use a pipette to drain off oil level which collects on top of the hydrosol collected within the Oil/ Water Separatory funnel
        iv. Re-connect Oil/Water Separatory Funnel, ensure secure connection with Lab stand Clamp and Keck Clip
        v. Resume operation
    c. Use fresh, high quality biomass