

Supplementary Fig. S1. Extraction of sweet flag rhizome

oil (hydro distillation method).

A. Sweet flag (*Acorus calamus*) rhizomes.

B. Weighing of rhizomes (500 g) for extraction

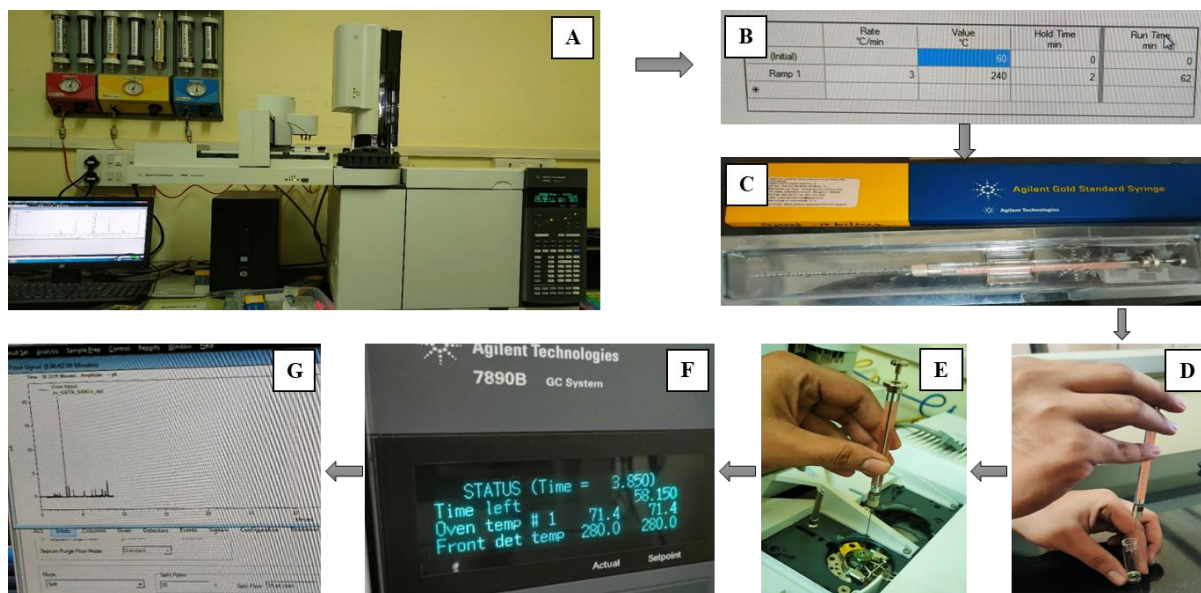
C. Chopping of rhizomes into small pieces for uniform distillation

D. Soaking chopped rhizomes in distilled water at 1:5 ratio (w/v)

E. Hydrodistillation using Clevenger apparatus for 240 minutes

F. Removal of residual moisture using anhydrous sodium sulfate (Na_2SO_4)

G. Collection and labeling of extracted essential oils for GC-MS analysis



Supplementary Fig. S2. Quantification of sweet flag rhizome oil (Gas chromatography system).

A. Agilent 7890B GC-MS system setup

B. Temperature program setup for GC oven (60°C to 240°C at 3°C/min ramp rate)

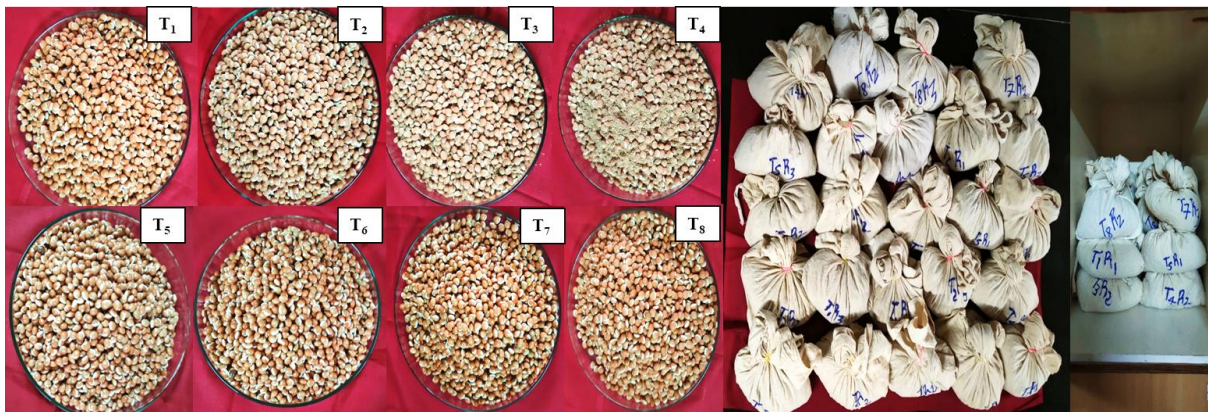
C. GC-MS compatible Agilent gold standard syringe used for sample injection

D. Sample preparation and loading of essential oil into the syringe

E. Injection of essential oil sample into the GC injector port

F. GC-MS operational status showing oven and detector temperatures

G. Chromatogram output displaying compound peaks for essential oil components



Supplementary Fig. S3. Seed treatment of field bean with sweet flag rhizome powder, oil, and spinosad, and their storage in cotton cloth bags at room temperature in DSST, UASB, GKVK.

T₁: Control

T₂: Sweet flag rhizome powder at 5 g/kg

T₃: Sweet flag rhizome powder at 10 g/kg

T₄: Sweet flag rhizome powder at 15 g/kg

T₅: Sweet flag rhizome oil at 2.5 ml/kg

T₆: Sweet flag rhizome oil at 5 ml/kg

T₇: Sweet flag rhizome oil at 7.5 ml/kg

T₈: Spinosad at 0.04 ml/kg