**Plant preparation**

Selected plants will be acquired from Forestry Research Institute (FRIM), Malaysia. The plants will be identified by the Institute of Bioscience, University Putra Malaysia (UPM), and the School of Environmental and Natural Resources Sciences of Universiti Kebangsaan Malaysia (UKM). The plant leaves will be separated and cleaned before being dried in an oven at 50°C for 24-48 hours. Then, the dried leaves will be crushed into small pieces before being ground into powder using a laboratory blender. The powdered plant sample will be stored in an airtight bottle in a 4°C chiller until further use.

**Plant extraction**

The extraction process will be done using ethanol, water, hexane, and chloroform. The plant powder will be soaked in the solution at 1:10 ratio (plant:solution) for 24-48 hours at room temperature. Then, the suspension will be filtered using Whatman filter to obtain the extract yield before being concentrated using a rotary evaporator in vacuum conditions at 50°C. The extracts will be diluted by two-fold dilution to produce 5 different concentrations: 500 mg/ml, 250 mg/ml, 125 mg/ml, 62.5 mg/ml, and 31.25 mg/ml.

**Antibacterial activity test**

All bacteria will be cultured in Brucella broth at 37℃, shaking 120 rpm, in microaerophilic condition for 3-5 days before being spread onto the mueller hinton agar supplemented with 7% sheep blood. Then, blank discs will be soaked with the five concentrations of the extracts, respectively, and left to dry before seeding them onto the agar. The plates will then be incubated upside down at 37°C for 72 hours in microaerophilic condition. The zone of inhibition will be measured as the diameter of the clear zone surrounding the disc. For the negative control, a blank disc incorporated with dimethyl sulfoxide (DMSO) will be used. The tests will be done in triplicate.

**Minimum inhibitory concentration**

The minimum inhibitory concentration will be determined using broth microdilution in 96-well plates. The extracts dissolved in DMSO will be transferred into the plates to obtain two-fold dilutions. Then, the plates will be inoculated with microbial suspension (1.0 McFarland standards) in Brucella broth supplemented with 7% horse serum. The plates will then be incubated at 37°C for 72 hours at microaerophilic concentration. The MIC value will be recorded as the minimum concentration at which no growth is observed in the well. Bacterial suspension from the wells that show no growth will then be inoculated onto blood agar to determine minimal bactericidal concentration (MBC). The MBC will be recorded as the minimum concentration at which no growth or only one colony is observed on the agar plates.