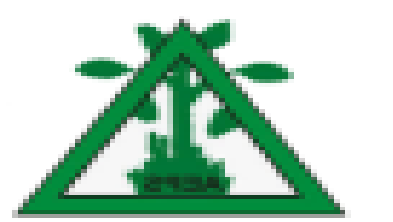


# Biodiesels as a green energy source from four Cameroonian plants: *Acacia hockii* (Fabaceae), *Croton gratissimus* (Euphorbiaceae), *Garcinia livingstonei* (Biodiesels as a green energy source from four Cameroonian plants: *Acacia hockii* (Fabaceae), *Croton gratissimus* (Euphorbiaceae), *Garcinia livingstonei* (Clusiaceae) and *Moringa oleifera* (Moringaceae)

SALAMATOU JULIETTE<sup>1</sup>, PATEL JIGARKUMAR<sup>2</sup>, MOMENI JEAN<sup>1</sup>

<sup>1</sup> Laboratory of Organic Chemistry and Applications, Department of Chemistry, Faculty of Science, University of Ngaoundere, P. O. Box 454, Ngaoundere, Cameroon.

<sup>2</sup> P G Department of Chemistry. Ankleshwar. AEPS (Ankleshwar Environmental Preservation Society) Institute of Science, Ankleshwar-393002, Dist. Bharuch, Gujarat affiliated with Veer Narmad South Gujarat University, Surat.



## Introduction.

The gradual depletion of traditional fossil fuels, the increase in environment pollution and global warming after their use, makes the science community to think of alternative renewable energy sources for both industrial and transportation purposes (Sanchez-Olmos et al., 2020). Biodiesel (methyl or ethyl esters) are known as alternative fuels of organic origins which have garnered a lot of attention due to the possible depletion of fossil fuel reserves and environmental benefits (Sanchez-Olmos et al., 2020). Biodiesel is also less toxic and non-flammable with low exhaust gas emission ,obnoxious fumes (Mohammed et al., 2017).

## Materials and Methods.

The seeds of the plants (AH: *Acacia hockii*, CG: *Croton gratissimus*, GL:*Garcinia livingstonei*, MO: *Moringa oleifera* ) were clean and ground into fine powder.



*Acacia hockii* ( Fabaceae)  
Common name: Shitum wood



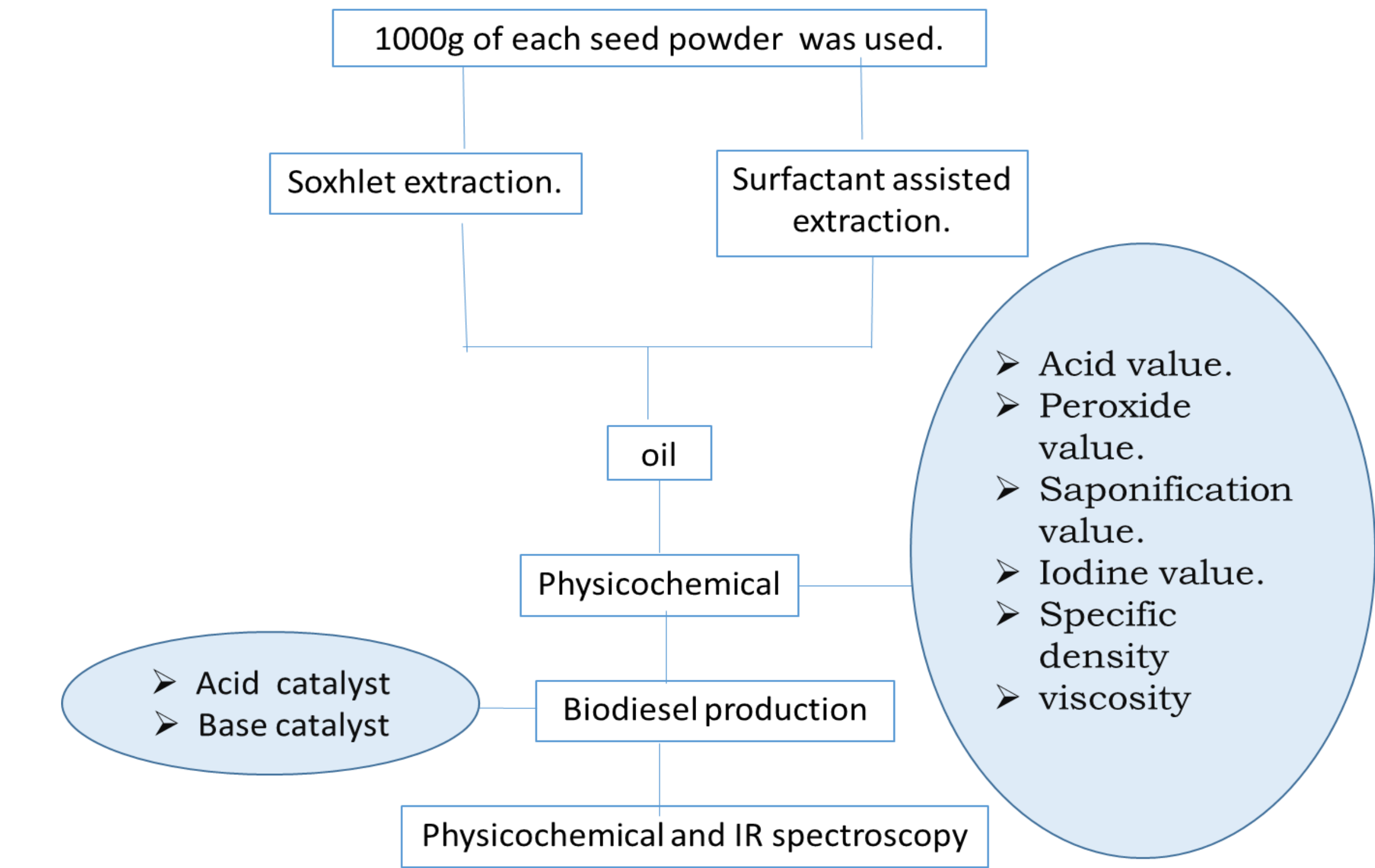
*Croton gratissimus* (Euphorbiaceae)  
Common name: Lavender croton



*Garcinia livingstonei* (Clusiaceae)  
Common name: African mangosteen



*Moringa oleifera* (Moringaceae)  
Common name: Moringa



Global protocol of experiment

## Results and Discussion

**Table 1: Results of oil extraction (AH: *Acacia hockii*, CG: *Croton gratissimus*, GL:*Garcinia livingstonei*, MO: *Moringa oleifera* )**

|                       | Yields % |       |      |      |
|-----------------------|----------|-------|------|------|
| Methods               | MO       | GL    | AH   | CG   |
| Soxhlet Extraction    | 36.83    | 10.21 | 9.57 | 7.72 |
| Surfactant Extraction | 33.00    | 7.30  | 3.00 | 2.50 |
| Lipid content         | 35.00    | 10.11 | 9.22 | 7.35 |

**Table2:** Physicochemical analyses of oil

| Properties                             | AH      | CG      | GL     | MO      |
|----------------------------------------|---------|---------|--------|---------|
| Specific gravity( g/mL)                | 0.876   | 0.989   | 0.843  | 0.865   |
| Acid value (mgKOH/g)                   | 8.730   | 51.710  | 10.950 | 32.000  |
| Free fatty acids (mgKOH/g)             | 4.360   | 25.850  | 5.470  | 16.000  |
| Saponification value (mgKOH/g)         | 143.030 | 260.860 | 72.930 | 126.220 |
| Iodine value (mgI./g)                  | 46.540  | 36.800  | 22.410 | 68.100  |
| Peroxide value (meq/Kg)                | 10.050  | 1.500   | 8.500  | 8.000   |
| Kinematic viscosity mm <sup>2</sup> /s | 21.000  | -       | 22.000 | 43.000  |

**Table3:** Biodiesel yield (BAH:Bdiesel *Acacia hockii*, BCG: Biodiesel *Croton gratissimus*, BGL: Biodiesel *Garcinia livingstonei*, BMO: Biodiesel *Moringa oleifera*

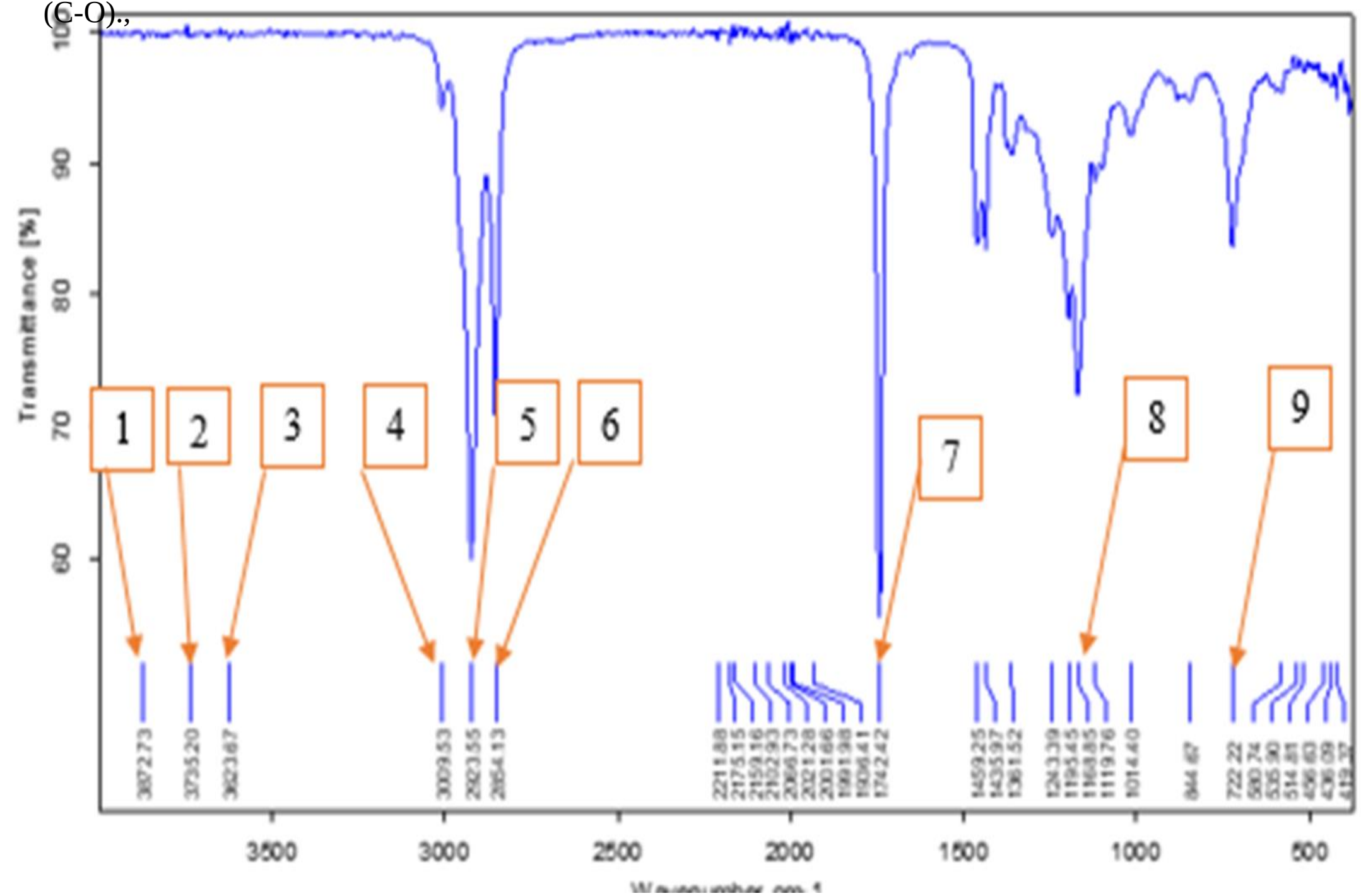
|          | Crude yields% |     |     |     |
|----------|---------------|-----|-----|-----|
| Catalyst | BAH           | BCG | BGL | BMO |
| Acid     | 90            | 90  | 90  | 90  |
| Base     | 87            | 50  | 85  | 74  |

**Table 4: Physiochemical analyses of biodiesel**

| Properties                                   | BAH     | BCG     | BGL     | BMO     |
|----------------------------------------------|---------|---------|---------|---------|
| Specific gravity (g/mL)                      | 0.865   | 0.932   | 0.836   | 0.850   |
| Acid value (mgKOH/g)                         | 0.561   | 43.680  | 0.448   | 0.561   |
| Free fatty acids (mgKOH/g)                   | 0.280   | 21.84   | 0.224   | 0.280   |
| Saponification value (mgKOH/g)               | 56.100  | 294.560 | 44.880  | 143.550 |
| Iodine value (mgI./g)                        | 34.260  | 2.110   | 24.530  | 76.560  |
| Peroxide value (meq/Kg)                      | 1.500   | 15.500  | 13.000  | 10.000  |
| Kinematic viscosity at 40 mm <sup>2</sup> /s | 4.000   | -       | 4.230   | 5.220   |
| Cetane number                                | 142.730 | 64.520  | 167.290 | 82.400  |

## Result of IR spectroscopy

•Biodiesel of *Acacia hockii*,the ester group is confirmed by **7** (1742.42 cm<sup>-1</sup>) for (C=O) and **8** (1168.85 cm<sup>-1</sup>) for (C-O).



**Oils of plants seeds** (AH: *Acacia hockii*, CG: *Croton gratissimus*, GL:*Garcinia livingstonei*, MO: *Moringa oleifera* respectively)



**Biodiesel of plants seeds** (BAH:Biodiesel *Acacia hockii*, BCG: Biodiesel *Croton gratissimus*, BGL: Biodiesel *Garcinia livingstonei*, BMO: Biodiesel *Moringa oleifera* Respectively)

## Conclusion

❖After the characterization of the oil *Acacia hockii* gave the required properties needed for the production of biodiesel, with an acid value of 15.0 mgKOH/g ;

❖Two catalyst were used for the transesterification, the acid catalyst gave 90% for all the plants then the base gave 87% as highest yield with *Acacia hockii* ;

❖The biodiesel from *Acacia hockii* as the properties needed for a diesel engine that is a low viscosity of 4.0 mm<sup>2</sup>/s and an acid value of 0.561 mgKOH/g.

## References

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