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Abstract:

Edible oil plays a major role in the diet as a source of saturated and unsaturated fatty acids. Oils are stored in human body in the form of fats and can be utilized as fuel/energy for various biochemical reactions whenever necessary. One of the feed-stocks, *Lagenaria siceraria* (Bottle gourd) seed, from which oil can be extracted, has many applications in various food as well as non-food industries. The *Lagenaria siceraria* seed's oil is considered as the most dietetic oil since it contains omega-3 which is known to promote energy levels, brain function and overall human vitality. The main focus of this study was to extract the oil from *Lagenaria siceraria* seed using an oil expeller. The effect of process parameters on oil expression efficiency from the seed was investigated. The ranges of parameters investigated were: rpm of screw (45, 65, 85, 105 and 125 rpm), moisture content (8.24, 10.1, 12.06, 14.4 and 16.1 % (d.b.)), heating temperature (50, 70, 90, 110 and 130 °C), and heating time (5, 10, 15, 20 and 25 minutes) of seeds. It was observed that seed having moisture content of 14.4 % (d.b.) were conditioned at 70°C with 10 min and screw speed of 85 rpm, gave maximum oil yield of 20.06%. At these optimum conditions, physical properties of oil such as colour, specific gravity, refractive index and viscosity were also determined. The information generated is likely to be useful in interpreting the effect of process variables and expelling equipment for subsequent modification in mechanical oil expression.

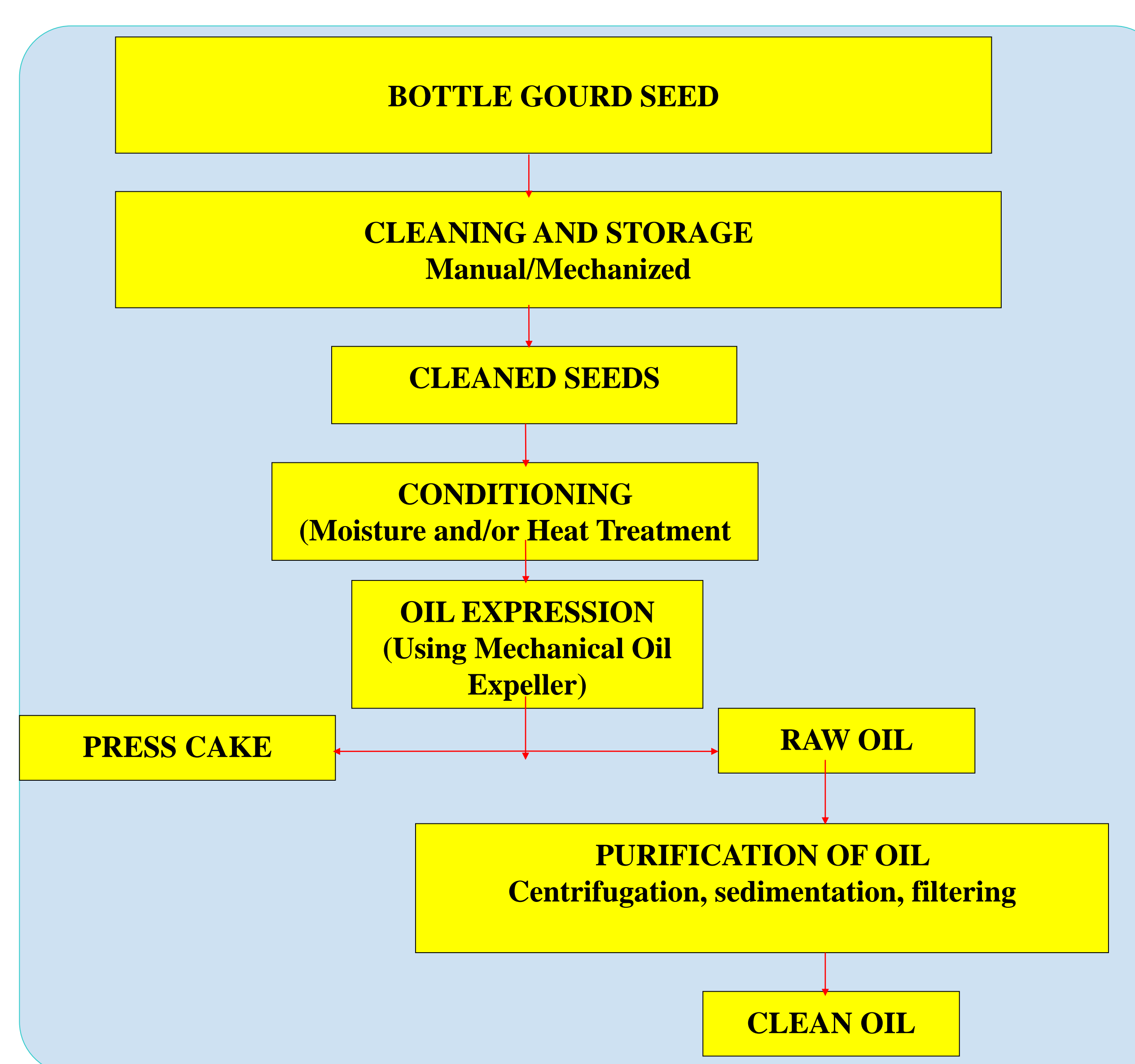
- The bottle gourd (*Lagenaria siceraria*), belongs to family *cucurbitaceae*, is used in appliance of pharmaceuticals and dietary formulations.
- It produces fruits of bottle shape and hard texture. These fruits are fleshy and multi seeded.
- The bottle gourd seeds are encapsulated with innumerable phytochemicals, such as vitamins, minerals and essential amino acids along with saponin and essential fatty acids (especially ω -3 which helps to promote energy level and functional activity of brain)
- It is grown throughout the tropical regions of the world mainly in Africa, Central America, China, Ethiopia, India, Japan, Sri Lanka, and Thailand.
- The bottle gourd seed's kernel has following proximate composition: moisture content (2.47%), protein (30.72%), oil (52.54%), carbohydrates (8.3%), fiber (1.58%) and ash (4.43%).

- The main reason for the cultivation and harvest of oilseeds is the production of oil, which is used in several technical applications.
- The method used for oil production depends on the application for which the oil is provided.
- Before oil is obtained, oilseeds have to undergo either an expression or an extraction process in order to remove the entrapped oil.
- Present day technologies for the production of vegetable oils include hydraulic pressing, screw pressing, solvent extraction with hexane and super critical CO₂ extraction.

- One of the oldest methods for the oil production is the mechanical expression of the seeds by means of a screw press.
- The characteristics of this process are low energy requirement without any use of chemical extractive agents.
- These oil expression machines are in continuous in operation and do not require any special supervision.
- Efficient expression of oil from oilseeds using the screw press requires processing of oilseeds and optimum use of operational conditions for better oil yield.
- In this research, bottle gourd seeds are taken for oil expression using a mechanical oil expeller

Physicochemical parameter	Extraction method		
	Supercritical CO ₂ (500 bar, 60°C, 15 g/min, 3h)	Hexane (Soxhlet, 70°C, 12 h)	Mechanical (14.4% moisture content) 85rpm
Oil yield	34.60±0.52 ^a	43.47±0.33 ^a	20.06±0.52 ^a
Colour	Yellow	Yellow	Yellow
Odour	Agreeable	Agreeable	Pleasant
Boiling point °C	129.67±5.51 ^a	142±4.59 ^a	163±5.57 ^a
Melting point °C	22.33±1.53 ^b	23.67±1.16 ^a	25.34±1.72 ^a
Density, g/cm ³	0.92±0.02 ^a	0.87±0.06 ^b	0.867±0.07 ^b
Specific Gravity	0.92±0.02 ^a	0.87±0.06 ^b	0.867±0.06 ^b
Viscosity, Cst	43.00±0.08 ^a	35.70±0.03 ^b	29.86±0.04 ^b
Refractive index	1.51±0.03 ^a	1.41±0.03 ^a	1.32±0.03 ^a
Acid value (mg KOH/g)	9.76±0.2 ^b	14.39±0.2 ^a	16.39±0.2 ^a
Free fatty acid (%)	1.36±0.1 ^b	1.79±0.08 ^a	1.692±0.08 ^a
Peroxide value (Eq. O ₂ /kg)	6.15±0.49 ^a	5.53±0.94 ^a	3.6±0.49 ^a
Iodine value (mg/100g)	71.36±1.12 ^b	78.83±3.7 ^a	142.89±3.7 ^a
Saponification value (mgKOH/g)	223.97±2.5 ^a	218.85±9.27 ^b	221±9.8 ^b
Ester value (mg KOH/g)	187.69±2.61 ^b	194.58±9.65 ^a	205±9.7 ^a
Impurity (%)	0.93±0.06 ^b	1.36±0.09 ^a	1.52±0.08 ^a
Unsaponifiable matter (%)	0.32±0.06 ^b	1.32±0.06 ^a	1.48±0.07 ^a

Note: Values bearing different superscripts (a, b, c) in a column differ significantly (Duncan test, P<0.05)



Mechanical Oil Expeller



The performance of oil expeller was affected by the seed moisture content, heating temperature and time and speed of screw. It was observed that seed having moisture content of 14.4 % (d.b.) were conditioned at 70°C with 10 min and screw speed of 85 rpm, gave maximum oil yield of 20.06%. At these optimum conditions, physical properties of oil such as colour, specific gravity, refractive index and viscosity were found suitable and better than solvent extracted oil.