**Abstract**

The study elucidates a bio refinery scheme, a potential valorization of grape marc at industrial scale, for production of grape seed oil. Data obtained at lab-scale supercritical CO₂ (SC-CO₂) extraction unit are used to scale-up the process to a commercial scale. The process is technically viable and economically feasible.

**Introduction**

- Winemaking industry produces throughout the world more than 3 Mt of grape marc [1].
- The marc contains roughly 50% skins, 25% seeds and 25% stalks [2,3] with an immense valorization potential, particularly for oil production [4].
- SC-CO₂ is widely accepted as the next green industrial solvent. However, industrial scale application is limited because of the perceived risks & costs associated with a high-pressure process operation. Therefore, the process requires an in depth technical and economic evaluation.

**Oil Extraction**

- Estimated Dimensions of industrial scale extractors
-规模上的估计

**Scale-up**

A rule of thumb for the scale-up of SC-CO₂ extraction process [5].

- If solute solubility is the rate-limiting step - keep the ratio of solvent mass to solid mass (F/S) constant between the lab and pilot/large scale extractor.
- If internal diffusion is limiting step - keep the ratio solvent flow rate to the solid mass (Q/S) constant.
- If both the external and internal mass transfer resistances are the rate governing steps - keep both F/S and Q/S constant.

**This work**

- A constant aspect (D/L) ratio in addition to F/S and Q/S, the rate of SC-CO₂ extraction of grape seeds oil depends on both the external and internal mass transfer resistances [2,6].

**Estimated Dimensions of industrial scale extractors**

- Capacity: 300 ton of grape seeds per year (300 working day of 24 hour operation)