

**Improved Biobutanol Production in 2-L Simultaneous Saccharification and Fermentation  
with Delayed Yeast Extract Feeding and *in-situ* Recovery**

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## Supplementary documents

S1: The observation during saccharification of oil palm empty fruit bunch in different types of impeller

| Type of impeller                                                    | Sugar production (g/L) | Observation                                                                          | Observation remark                                                                                      |
|---------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Rushton turbine                                                     | $21.00 \pm 0.14$       |    | The OPEFB was not homogeneously mixed as the OPEFB starts to accumulate at the bottom of the bioreactor |
| Pitched turbine                                                     | $27.22 \pm 0.42$       |   | There is some amount of OPEFB trapped at the baffle, at the bottom of the bioreactor                    |
| Pitched turbine with lifted baffle ring to the middle of bioreactor | $32.91 \pm 0.53$       |  | All OPEFB fibers were homogeneously mixed in the bioreactor                                             |