

# Selection of Carbon Feed Stocks for Cost-Efficient Polyhydroxyalkanoate (PHA) Production



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## Abstract

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Cost efficiency in biopolymer production is mainly determined by the price for required raw materials; they contribute with up to 50% to the expenses of the entire process. Recent studies underline that PHA production from pure substrates can be considered as optimized to a high degree. Hence it is important to enhance economics of biopolymer production by substituting pure substrates by cheaper carbon sources or by integrating PHA production into energetically autarkic production lines of the carbon source. The research of the authors of this study that is carried out in narrow cooperation with industrial partners provides novel insights into the enhancement of cost-efficient PHA production.



Industrial plant for PHA production (here: PHBISA, Brazil)

Downstreaming Processing & Product Refining

## Viable Solution Strategies:

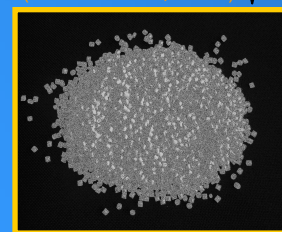


Production strain

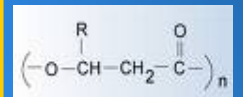


Research on laboratory scale

Scale up



Granulated PHA for processing



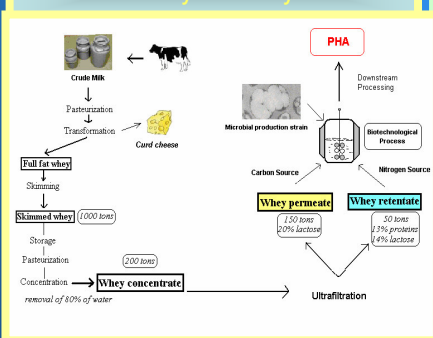
General structure of PHAs

## Cost-efficient Carbon Source

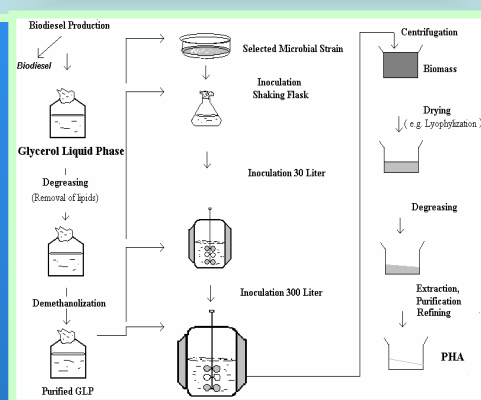


Vendible, compostable bioplastic items (Source: PHBISIA)

### Whey Lactose from Dairy Industry

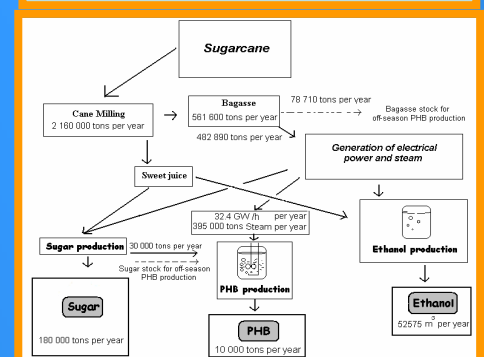


### Glycerol Liquid Phase from Biodiesel Production



### Cane Sugar –

Integrated process of Saccharose, Bioethanol and PHA Production in Brazil



## Conclusion:

The presented examples demonstrate that a variety of surplus materials deriving from agrofood industry exists which are of interest for production of PHA biopolyesters. Exemplarily, waste materials like whey lactose from cheese industry and crude glycerol liquid phase from biodiesel production are discussed. Some of these inexpensive substrates directly act as carbon source for industrial production of future-oriented bioplastics such as poly-3-(HB-co-HV). The application of surplus materials unites the enhancement of cost efficiency in PHA production and the decrease of the amounts of waste originating from these surplus materials. Independent from the raw material, an industrial plant for PHA production from waste- and surplus materials should be integrated into existing process lines, where the raw materials directly accrue. The selection of the appropriate raw material for PHA production is very much dependent on where the production is located (whey or GLP in Europe, cane sugar in South America). In future, the entire process chain starting from the upstream processing via the bio production until the downstream processing has to be improved in order to achieve significant process in cost efficient production of "green plastics".

## References

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