# Valorisation of sugar beet pulp for the production of poly(3-hydroxybutyrate) and poly(3-hydroxybutyrate-*co*-3-hydroxyvalerate)

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The transition to the circular bio-economy era requires technological breakthroughs in sustainable biorefinery development using crude renewable resources, microbial bioconversions and recycling of biopolymers. Poly(3-hydroxybutyrate) (PHB) and poly(3-hydroxybutyrate-*co*-3-hydroxyvalerate) (PHBV) belong to the polyhydroxyalkanoate family and they are currently used for the production of bio-based plastics with many applications (e.g. 3D printing, packaging, biomedical). PHB granules are formed intracellularly under growth-limiting conditions after the depletion of a nutrient (e.g. phosphorus) and serve as carbon and energy storage. The production of PHBV requires the supply of a specific carbon source (e.g. levulinic acid). Under this concept, the present study focusses on the valorisation of sugar beet pulp (SBP) for the production of PHB and PHBV. SBP is also used in the production of crude enzymes via solid state fermentation (SSF) with *Aspergillus awamori*. The crude enzymes are used for SBP hydrolysis and the hydrolysate was used as fermentation feedstock in *Paraburkholderia sacchari* cultures.

The produced enzymes via SSF were used to generate a nutrient-rich hydrolysate with a final sugar concentration of 47 g/L. Fed-batch bioreactor cultures using SBP hydrolysate alone with *P. sacchari* resulted in 60 g/L total dry weight with 50% (w/w) PHB content. The production of PHBV was evaluated in shake flask cultures using SBP hydrolysate and levulinic acid supplementation. The effect of adding different concentrations of levulinic acid was studied in fed-batch bioreactor fermentations using commercial sugars simulating the SBP hydrolysate in order to evaluate the production of PHBV. The addition of 22 g/L levulinic acid during fed-batch fermentation resulted in the production of more than 90 g/L total dry weight with a PHBV content higher than 50% (w/w) and a 3HV content of ca. 30%.

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