

# Valorization of Potato Peelings in the Production of Bioethanol by Fermentation: Optimization of Pretreatment, Liquefaction and Saccharification

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## ABSTRACT

This work aims to produce bioethanol from the starch of fresh potato peelings. The process goes through thermal pre-treatment followed by grinding then enzymatic liquefaction by alpha amylase, saccharification by glucoamylase and finally by fermentation using *Saccharomyces cerevisiae*. The results show that optimal conditions of the thermal pre-treatment were 130°C for 15min. While enzymatic liquefaction by alpha-amylase was conducted at pH6, under 55°C during 2 hours and un ratio of 18 CEIP/g of fresh potato peelings. Optimal conditions of saccharification were determined as a duration of 3 h, at pH4, and T°=50°C for an average ratio of 0,06 g-glucoamylase/g of liquefied fresh potato peelings, which resulted in a yield of (90%-99%). A maximum bioethanol concentration of 86g/l was obtained by fermentation which correspond to a real yield of 43g of bioethanol (55 mL) /Kg of fresh potato peelings.

**Keywords:** Bioethanol, Potato peelings, liquefaction, Saccharification, Fermentation, *Saccharomyces cerevisiae*.

## 1. Introduction

Algeria, a major consumer country of potatoes, rejects enormous quantities of solid or liquid waste following its consumption or its transformation. This waste is rejected either by agriculture, household, restaurants (public, university or hospital) or by the potato processing industry (crisps and mash factory). Different sources of waste such as, non-edible potatoes, peelings or washing waters, are rich in starch and could therefore be transformed to produce Bioethanol by fermentation. We can therefore make extensive use of this abundant waste in our country. This work aims to produce bioethanol from the starch of fresh potato peelings.

## 2. Experimental

The process goes through thermal pre-treatment followed by grinding then enzymatic liquefaction by alpha amylase, saccharification by glucoamylase and finally by fermentation using *Saccharomyces cerevisiae*.

## 3. Results and Discussion

Optimal conditions of the thermal pre-treatment were 130°C for 15min. While enzymatic liquefaction by alpha-amylase was conducted at pH6, under 55°C during 2 hours and un ratio of 18 CEIP/g of fresh potato peelings. Optimal conditions of saccharification were determined as a duration of 3 h, at pH 4, and T°=50°C for an average ratio of 0,06 g-glucoamylase/g of liquefied fresh potato peelings, which resulted in a yield of (90%-99%). Fermentation was achieved at ambient temperature at pH5. Maximum yield of bioethanol of 86g/l was obtained under optimal conditions which corresponds to a real yield of 43g of bioethanol/Kg of fresh potato peelings.



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#### 4. Conclusions

Fresh potato peelings are good raw materials for bio ethanol production which is a good alternative to fossil fuels. High bio ethanol yield of 55 mL/ Kg of fresh potato peelings is obtained. This yield is not negligible since it is obtained from waste. A rational and total exploitation of these peelings by exploiting all carbohydrates of this waste (6% of starch and 6% of cellulosic residues), can improve significantly this yield in the future.

#### References

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