

The effects of Sapropel extracts on the activity of amyolytic enzymes applied in ethyl alcohol production



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INTRODUCTION

In the technology of ethyl alcohol production, amyolytic enzymes play a crucial role. However, the activity of amyolytic enzymes depends on different factors such as pH, temperature, and ionic conditions of the environment. Due to the composition of sapropel, an application of sapropel extracts to increase the safety of grains raw materials in ethyl alcohol production can affect the enzymatic activity. Due to the presence of humic substances in Sapropel extracts, these extracts may arrest bacterial and fungal growth and contain microbial enzyme activation via metallic ions contained in humic substances in an active organic form, particularly Cu, Fe, and Zn.

Objective of the study is to investigate the effects of Sapropel extracts on thermostable α -amylase used in ethyl alcohol production.

THE MAIN MATERIALS AND METHOD

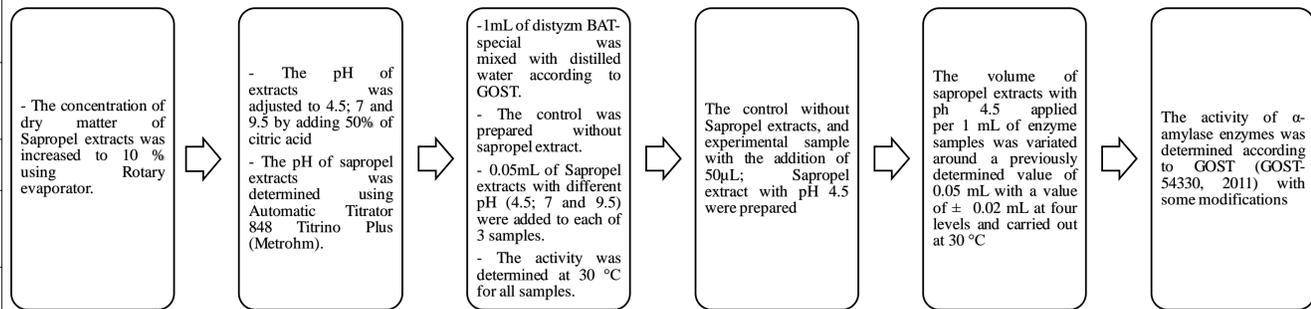
The objects of the study:

Sapropel extracts (UDHSS) obtained in the RAS Limnology Institute with alkaline extraction and ultrasound treatment of air-dry sapropels from Seryodka deposit (Pskov region, Russia).

Enzyme preparation Distizym BAT-special (Erbsloh, Germany). It contains *Bacillus licheniformis* α -amylase (BLA) α -amylase thermostable acid-resistant.

Table 1. Physicochemical parameters of sapropel extracts before and after optimization

Parameters	Content before optimization	Content after optimization
pH	13.2 ± 0.1	4.5 ± 0.1; 7.0 ± 0.2; 9.5 ± 0.2
Dry matter, %	7.7 ± 0.1	10.0 ± 0.2
Reducing sugars, mg /mL	5.5 ± 0.1	5.5 ± 0.1
Lipids, mg /mL	1070 ± 30	1070 ± 30
Humic substances, %	30.72 ± 0.23	30.72 ± 0.23



RESULTS

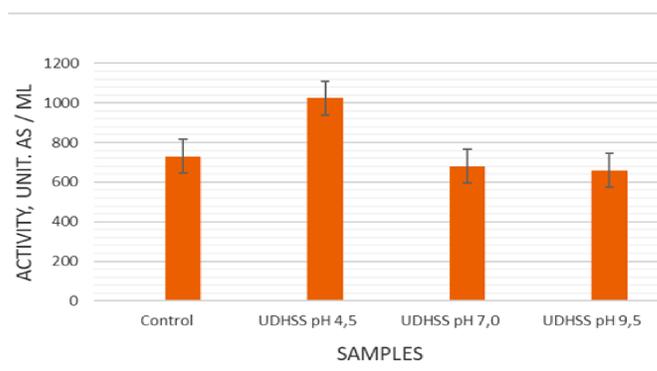


Figure 1. The effect of sapropel extracts with different pH on α -amylase *Bacillus licheniformis* (BLA)

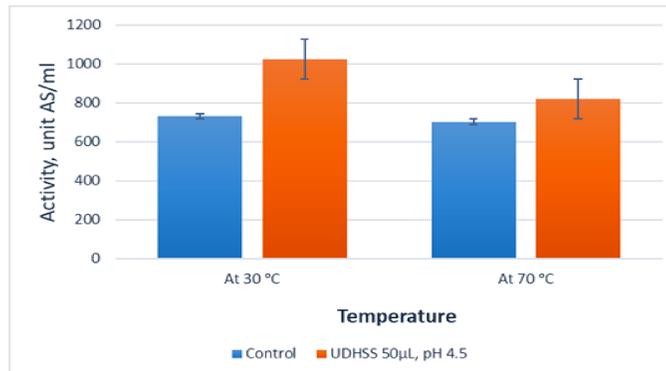


Figure 2. Effect of sapropel extracts at various temperatures on *Bacillus licheniformis* α -amylase

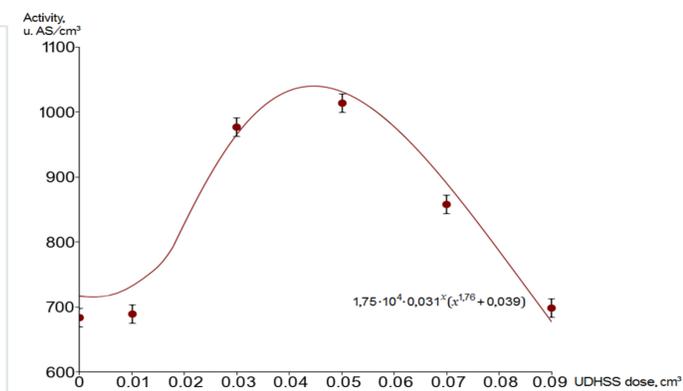


Figure 3. The effect of various doses of sapropel extracts (at pH 4.5 and 30 °C) on α -amylase of *Bacillus licheniformis* (BLA)

DISCUSSION AND CONCLUSION

The effects of Sapropel extracts on the activity of α -amylase depend on the dose, pH of sapropel extracts and the temperature. The results of this research revealed that 50 μ L of Sapropel extracts with pH 4.5, 10% concentration of dry matter and 30% concentration of Humic substances can increase the activity of *Bacillus licheniformis* α -amylase (BLA) by 40 % at 30 °C. However, at high temperatures, the humic substances don't retain their properties. The results of this research work will allow the application of sapropel extracts, at optimum conditions, in the production of ethyl alcohol technology. Further research is needed to study the effects of HS on glucoamylase and proteolytic (acidic protease) enzymes preparations.

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