Research on Production of γ-Aminobutyric Acid by Lactobacillus Fermentation of Brown Rice

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Abstract. First, the experiment deals with the brown rice by the limewater and anaerobic means to concentrate GABA in the brown rice. Then, we make use of lactobacillus fermentation to produce GABA. We obtain the following results of power sequence of the influence factors of the GABA output from optimization of fermentation process. The sequence is culture time> culture temperature> inoculation amount. This study provides a new way for the preparation of γ-Aminobutyric acid.

GABA (γ-Aminobutyric acid, referred to as GABA) is also called gammalon. It is in the position of the γ -C amino, known as non protein amino acid [1], produced by L- glutamic acid decarboxylase catalyzed L-glutamate decarboxylation. Its molecular formula is $NH_2CH_2CH_2CH_2COOH$[2]. GABA, as a kind of natural active factor, has existed in plants and animals, and its distribution range is extremely wide[3]. GABA exists in a large number of nerve tissue in the animal body, especially in the distribution of the most concentrated in the brain tissue, the content is about 0.1 ~ 0.6 mg/g[4]. The research shows that GABA has the function of delaying the aging of nerve cells, lowering blood pressure, treating mental disease and repairing skin function. In order to effectively improve the accumulation of GABA in the human body, we can add it to the daily diet to achieve the purpose of promoting human health.

Materials and Method

Experiment Materials and Ragents. Brown rice purchased in farm product market, lactobacillus, γ -Aminobutyric acid standard product, phenol, ethanol and so on.

Brown Rice Germinating Treatment. Carefully selecte the high quality rice and removal of moldy materials and impurities, soaking, germination, germination, anaerobic treatment, drying and crushing, made of brown rice noodles spare.

Effect of Culture Temperature on GABA Output. 5g brown Rice noodles was added to the mixed 10ml sterile water evenly, inoculated with 5% strains, in 24, 28, 30, 34, 32, 37 and five DEG C temperature gradient under static culture of 72h, every time the 3 parallel, with concentration in samples were determined by GABA colorimetry.

Effect of Culture Time on GABA Output. 5g brown rice flour was added to the 10ml sterile water to mix evenly, inoculated 5% strains, static culture at 30 C, 24, 48, 72, 96, 120h, each time to

do 3 parallel, using the colorimetric method to determine the GABA concentration in the sample.

Effect of Inoculation Amount on GABA Output. 5g brown rice flour was added to the 10ml sterile water to mix evenly, 3, 5, 1, 7, 9% of the strains were inoculated in 30 C conditions, static culture 72h, each time to do 3 parallel, with the colorimetric method to determine the concentration of GABA in the sample.

Determination of GABA Content. The colorimetry for determining was adopted to determine the GABA content.

Results and Discussion

Effect of Culture Temperature on GABA Output.

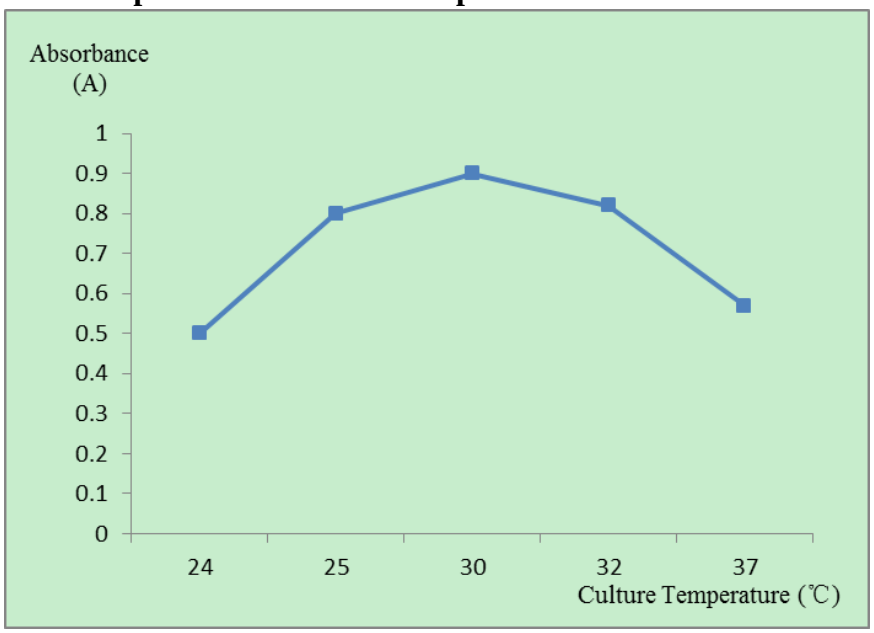


Figure 1. Effect of culture temperature on GABA output

It is seen from Figure 1 that the yield of GABA increased with the increase of temperature in a certain range. When the temperature reached 30 degrees celsius, the absorbance value was 0.900. At this time the highest yield of 6.63mmol/L GABA. The content of GABA decreased gradually with the increase of temperature. The suitable temperature was the necessary condition for the increase of the synthesis of nutrients. Too high or too low temperature would affect the enzyme activity.

Effect of Culture Time on GABA Output.

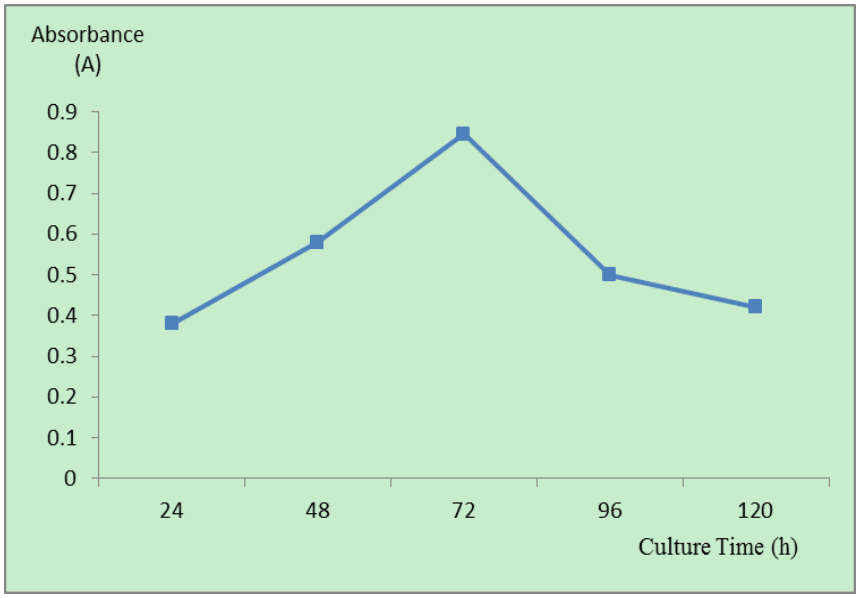
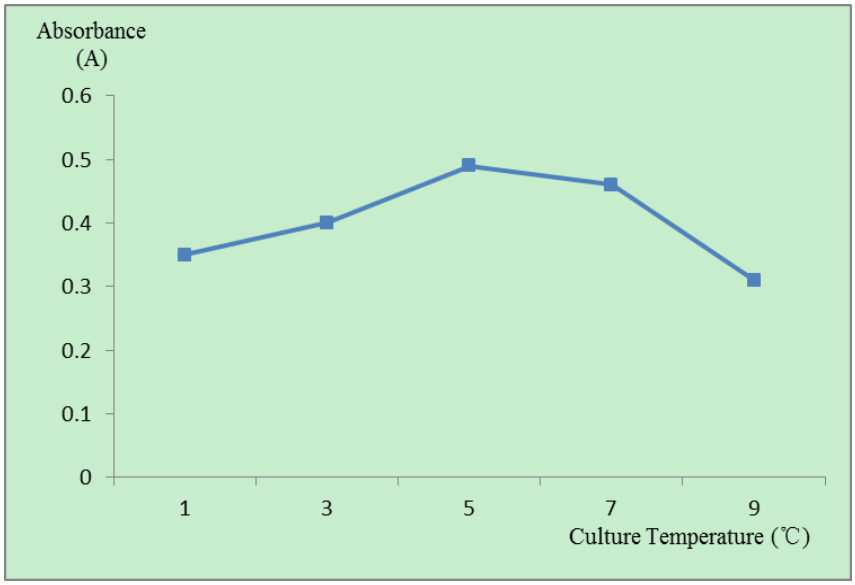


Figure 2. Effect of culture time on GABA output

It is seen from Figure 2 that when the culture time was 72h, the light absorption value was 0.845. The concentration corresponding to GABA is 6.23mmol/L and the yield reached the maximum. It decreases with the increase of culture time. The reason may lie in the long culutre time. GABA has been transformed into transaminase catalyzed by succinic semialdehyde for longer periods of time, which led to the decrease of GABA content.

Effect of Inoculation Amount on GABA Output.



The yield of GABA and the inoculation amount almost linearly in a certain range. When the inoculation amount was 5%, the corresponding light absorption value was 0.495. The yield of GABA reached the maximum after 3.7mmol/L. Then it has a slight change with the increase of the inoculation volume.

Acknowledgements

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