Vital parameters for high gamma-aminobutyric acid (GABA) production by an industrial soy sauce *koji* *Aspergillus oryzae* NSK in submerged-liquid fermentation

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Abstract In submerged-liquid fermentation, seven key parameters were assessed using one-factor-at-a-time to obtain the highest GABA yield using an industrial soy sauce *koji* *Aspergillus oryzae* strain NSK (AOSNSK). AOSNSK generated maximum GABA at 30 °C (194 mg/L) and initial pH 5 (231 mg/L), thus was able to utilize nitrogen sources failed to improve GABA production, however a combination of yeast extract (YE) and glutamic acid (GA) improved GABA at 646.78 mg/L. Carbon-to-nitrogen ratio (C8:N3) produced the highest cell (24.01 g/L) and GABA at a minimal time of 216 h. The key parameters of 30 °C, initial pH 5, 100 g/L of sucrose,