

**PENENTUAN KECUKUPAN PANAS MENGGUNAKAN METODE BALL
DAN KINETIKA PERUBAHAN WARNA PADA PEMASAKAN OTAK-
OTAK BANDENG (*Chanos chanos* sp.)**

ABSTRAK

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Otak-otak bandeng merupakan salah satu produk diversifikasi olahan ikan bandeng yang banyak dikonsumsi masyarakat Indonesia. Pembuatan otak-otak bandeng melalui proses pemanasan pada suhu 90-100°C selama 20-40 menit. Proses pemanasan hanya memberikan umur simpan selama 3 hari pada suhu ruang. Oleh karena itu, karakteristik penetrasi panas (nilai j dan f) perlu diketahui untuk menentukan nilai kecukupan panas proses pemasakan.

Pada penelitian ini, penentuan kecukupan panas didasarkan pada penurunan jumlah mikrobia *Clostridium botulinum* dan perubahan warna otak-otak bandeng selama pemanasan. Warna otak-otak bandeng merupakan salah satu penentu kualitas mutu. Proses pemanasan memberikan dampak pada warna otak-otak bandeng. Oleh karena itu, perlu diketahui kinetika perubahan warna otak-otak bandeng selama pemanasan. Pengujian penetrasi panas dilakukan pada suhu 100°C selama 29 menit. Perhitungan kecukupan panas dan waktu proses dilakukan menggunakan metode Ball. Penentuan parameter kinetika reaksi perubahan warna dilakukan pada suhu 60, 70, 80, 90, dan 100°C dengan lama pemasakan secara berturut-turut 90, 45, 30, 20 dan 15 menit.

Hasil pengujian penetrasi panas diperoleh nilai j_{ch} sebesar 1,65 dan nilai f_h sebesar 11,13 menit. Nilai kecukupan panas (F_0) otak-otak bandeng berdasarkan perubahan warna sebesar 4,23 menit dan berdasarkan kandungan mikrobia adalah 0,99 menit. Nilai kecukupan panas pada pemasakan suhu 90-100°C selama 20-40 menit belum memenuhi persyaratan kecukupan panas *Clostridium botulinum*. Waktu proses pemanasan (B) dalam memenuhi kecukupan panas otak-otak bandeng dilakukan pada suhu 120°C selama 21 menit. Hasil pengujian perubahan warna berupa nilai L^* (derajat kecerahan), a^* (derajat kemerahan), dan b^* (derajat kekuningan). Derajat kecerahan (L^*) berpengaruh nyata terhadap lama pemasakan, namun derajat kemerahan (a^*) dan derajat kekuningan (b^*) relatif stabil. Persamaan konstanta laju reaksi perubahan warna adalah $K = 4,41 \times 10^4 \times e^{-\frac{42,39}{R.T}}$.

Kata kunci : Penetrasi Panas, Kecukupan Panas, Otak-Otak Bandeng, Kinetik, Perubahan Warna

DETERMINATION LETHALITY USING BALL METHODS AND KINETICS OF COLOUR CHANGE ON OTAK-OTAK BANDENG (*Chanos chanos* sp.) DURING HEATING PROCESS

ABSTRACT

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Milkfish “otak-otak” is one of the diversified milkfish products, which is consumed by many Indonesian people. Milkfish “otak-otak” was prepared by heating at 90-100°C for 20-40 min. The self-life of this product was only 3 days at room temperature. Therefore, heat penetration characteristics (j and f values) need to be evaluate to determine the value of the cooking heat sufficiency.

In this study, the determination of cooking heat sufficiency was based on the decrease in the amount of *Clostridium botulinum* and the color changes of milkfish “otak-otak” during heating. The color of milkfish “otak-otak” was one of the determinants of quality. The heating process had an impact on the color of the milkfish “otak-otak”. Therefore, the color change kinetics of milkfish “otak-otak” during heating needed to be determined. The heat penetration test was carried out at 100 ° C for 29 min. The calculation of the cooking heat sufficiency and process time were performed by the Ball method. The determinations of kinetic parameters of the color change reaction were carried out at 60, 70, 80, 90, and 100 ° C for 90, 45, 30, 20 and 15 min, respectively.

Results from heat penetration test show that j_{ch} value and f_h value were 1.65 and 11.13 min, respectively. The value of cooking heat sufficiency (F_0) of milkfish “otak-otak” based on color change and on *Clostridium botulinum* were 4.23 min and 0.99 min, respectively. The cooking at temperature 90-100 ° C for 20-40 min has not fulfilled the requirement of cooking heat sufficiency based on *Clostridium botulinum*. The heating time (B) to fulfil the requirement of the cooking heat sufficiency was carried out at 120 ° C for 21 min. The color change test was the value of L^* (brightness degree), a^* (reddish degree), and b^* (yellowish degree). The degree of brightness (L^*) has a significant effect on cooking time, but the degree of redness (a^*) and yellowishness (b^*) were relatively stable. The rate constant of color change reaction was $K = 4.41 \times 10^4 \times e^{-\frac{42,39}{R.T}}$.

Keyword : Heat Penetration, Lethality, Otak-Otak Bandeng, Kinetics, Colour Change