

ABSTRACT
INNOVATION SUPPLEMENTARY FOOD OF TONGKOL FISHBALLS
(*Euthynnus affinis*) WITH MORINGA LEAF (*Moringa oleifera*)
SUBSTITUTION ON PROTEIN, CALCIUM, BETA-CAROTENE AND
ACCEPTABILITY LEVELS

Stunting Toddlers Aged 24-59 Months

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The prevalence of stunting in Indonesia is high at 31.8%. Stunting can be prevented with supplementary food from local foods such as tuna and Moringa leaves. Tongkol fish (*Euthynnus affinis*) were rich in omega-3 and high in protein and calcium, which were beneficial for the growth and development of toddlers. Moringa leaves (*Moringa oleifera*) had benefits due to their calcium and beta-carotene content, which helped increase children's height. This study aimed to analyze the differences in moringa leaf substitution on protein, calcium, beta-carotene content, and the acceptability of tongkol fish fishballs as a supplementary food for stunted toddlers. This experimental study used a Completely Randomized Design (CRD) with four treatments and three replications. The formula used tongkol fish with the addition of Moringa leaves: F1 (100%:0%), F2 (95%:5%), F3 (90%:10%), and F4 (85%:15%). The protein content was tested using the Kjeldahl method, calcium with a Spectrophotometer, beta-carotene with UV-Vis Spectrophotometry, and acceptability through an organoleptic test involving semi-trained panelists and untrained panelists. Nutritional data analysis was conducted using the One Way ANOVA method followed by the Post Hoc Duncan test, while the organoleptic test data were analyzed using the Kruskal-Wallis test, followed by the Mann-Whitney test with a p-value < 0.05. The results showed that the highest protein content was in F1 at 10.79g (p=0.000), while the calcium content in F4 was 2.35g (p=0.000), and the beta-carotene content was 24.63g (p=0.000). The organoleptic test showed that the color category was more accepted in F1 (p=0.007), while aroma, taste, texture, and overall preference were more favored in F4 (p<0.05) by semi-trained panelists. Untrained panelists showed the highest acceptance in color and aroma categories in F4 at 86.7%, taste at 100%, and texture at 93.3%. The highest protein content was found in F1, while the best calcium, beta-carotene, and acceptability results were in F4.

Keywords: Moringa leaves, nutrients, stunting, tongkol fish

ABSTRAK
INOVASI MAKANAN TAMBAHAN BAKSO IKAN TONGKOL (*Euthynnus affinis*) DENGAN SUBSTITUSI DAUN KELOR (*Moringa oleifera*) TERHADAP KADAR PROTEIN, KALSIMUM, BETAKAROTEN DAN DAYA TERIMA
Balita *Stunting* Usia 24-59 Bulan

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Data prevalensi *stunting* di Indonesia tergolong tinggi sebesar 31,8%. *Stunting* dapat dicegah dengan PMT dari pangan lokal seperti ikan tongkol dan daun kelor. Ikan tongkol (*Euthynnus affinis*) kaya akan omega-3 dan tinggi protein serta kalsium yang baik untuk pertumbuhan dan perkembangan balita. Daun kelor (*Moringa oleifera*) memiliki manfaat karena kandungan kalsium dan betakaroten yang membantu meningkatkan tinggi badan anak. Tujuan penelitian ini untuk menganalisis perbedaan substitusi daun kelor terhadap kadar protein, kalsium, betakaroten, dan daya terima bakso ikan tongkol sebagai PMT balita *stunting*. Penelitian ini menggunakan jenis eksperimen Rancangan Acak Lengkap (RAL) 4 perlakuan dan 3 kali replikasi. Formula ini menggunakan ikan tongkol dengan penambahan daun kelor, F1 100%:0%, F2 95%:5%, F3 90%:10%, F4 85%:15%. Metode uji kadar protein menggunakan *Kjehdal*, kalsium dengan Spektrofotometer, betakaroten dengan Spektrofotometri UV-Vis dan daya terima menggunakan uji organoleptik dengan panelis semi terlatih dan tidak terlatih. Analisis data zat gizi menggunakan *One Way ANOVA* dan *post hoc Duncan*, data uji organoleptik menggunakan *Kruskal-Wallis* dan *Mann Whitney* dengan nilai *p-value* <0,05. Hasil menunjukkan kadar protein tertinggi F1 sebesar 10,79g (*p*=0,000), sedangkan kadar kalsium pada F4 sebesar 2,35g (*p*=0,000), dan betakaroten sebesar 24,63g (*p*=0,000). Uji organoleptik kategori warna lebih diterima pada F1 (*p*=0,007), sementara aroma, rasa, tekstur, dan keseluruhan lebih disukai pada F4 (*p*<0,05) oleh panelis semi terlatih. Panelis tidak terlatih menunjukkan penerimaan terbaik kategori warna dan aroma pada F4 sebesar 86,7%, rasa sebesar 100%, dan tekstur sebesar 93,3%. Uji kadar protein tertinggi yaitu F1, uji kadar kalsium, betakaroten dan daya terima terbaik yaitu F4.

Kata kunci: Daun kelor, zat gizi, *stunting*, ikan tongkol.

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