

**PENGARUH PROTEIN SEL TUNGGAL *Bacillus* sp.
TERHADAP PERILAKU KECEMASAN DAN HEMATOLOGI
PADA MENCIT JANTAN BERBASIS *INTERNET OF THINGS***

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ABSTRAK

Gangguan kecemasan merupakan gangguan mental dengan prevalensi tertinggi di dunia, sementara terapi farmakologis konvensional masih menyisakan efek samping sehingga mendorong pencarian alternatif berbasis nutrisi yang aman dan berkelanjutan. Protein Sel Tunggal (PST) merupakan biomassa mikroorganisme dengan kandungan protein tinggi (50–80%) yang kaya asam amino esensial dan senyawa bioaktif, serta dapat diproduksi dari limbah agroindustri yaitu limbah cair tahu. Penelitian ini bertujuan menganalisis pengaruh PST hasil fermentasi *Bacillus* sp. terhadap perilaku kecemasan dan profil hematologi mencit jantan menggunakan pemantauan berbasis *Internet of Things* (IoT). Penelitian menggunakan Rancangan Acak Lengkap dengan 24 ekor mencit jantan yang dibagi menjadi empat kelompok: kontrol, P1 (50 mg/kg BB), P2 (100 mg/kg BB), dan P3 (150 mg/kg BB), dengan pemberian oral selama 14 hari. Perilaku kecemasan dievaluasi melalui *Open Field Test* (OFT) dan *Elevated Plus Maze* (EPM) berbasis IoT dan computer vision, sedangkan parameter hematologi meliputi jumlah eritrosit, leukosit, dan kadar hemoglobin. Data dianalisis menggunakan ANOVA pada taraf signifikansi 5%. Hasil menunjukkan PST berpengaruh signifikan ($p < 0,05$) terhadap seluruh parameter. Kelompok P2 memberikan respons terbaik dengan peningkatan *center time* OFT ($11.98 \pm 1.52\%$), *open arm time* EPM ($56.00 \pm 21.87\%$), jumlah eritrosit ($9.00 \pm 0.61 \times 10^6/\text{mm}^3$), dan kadar hemoglobin ($14.53 \pm 2.40 \text{ g/dL}$), sedangkan P3 menunjukkan jumlah leukosit tertinggi ($16.27 \pm 3.49 \times 10^3/\text{mm}^3$). Hasil penelitian ini menunjukkan bahwa Protein Sel Tunggal hasil fermentasi *Bacillus* sp. berpotensi menurunkan perilaku kecemasan dan memperbaiki profil hematologi pada mencit jantan, dengan dosis optimum sebesar 100 mg/kgBB.

Kata Kunci: *Bacillus* sp., kecemasan, hematologi, *Internet of Things* (IoT), protein sel tunggal.

EFFECT OF *Bacillus* sp. SINGLE-CELL PROTEIN ON ANXIETY-LIKE BEHAVIOR AND HEMATOLOGICAL PROFILE IN MALE MICE USING AN INTERNET OF THINGS-BASED MONITORING SYSTEM

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ABSTRACT

Anxiety disorders are the most prevalent mental health disorders worldwide. However, conventional pharmacological therapies are often associated with adverse side effects, prompting the search for safer and more sustainable nutritional alternatives. Single Cell Protein (SCP) is a microbial biomass containing a high protein content (50–80%), rich in essential amino acids and bioactive compounds, and can be produced from agro-industrial waste, such as tofu wastewater. This study aimed to evaluate the effects of *Bacillus* sp.-derived SCP on anxiety-like behavior and hematological profiles in male mice using an Internet of Things (IoT)-based monitoring system. A Completely Randomized Design was employed using 24 male mice randomly assigned into four groups: control, P1 (50 mg/kg body weight), P2 (100 mg/kg body weight), and P3 (150 mg/kg body weight). The animals received oral administration for 14 consecutive days. Anxiety-like behavior was assessed using the Internet of Things (IoT)-based Open Field Test (OFT) and Elevated Plus Maze (EPM) integrated with computer vision technology, while hematological parameters included erythrocyte count, leukocyte count, and hemoglobin concentration. Data were analyzed using one-way analysis of variance (ANOVA) at a 5% significance level. The results demonstrated that SCP significantly affected all observed parameters ($p < 0.05$). The P2 group exhibited the most favorable response, showing increased OFT center time ($11.98 \pm 1.52\%$), EPM open-arm time ($56.00 \pm 21.87\%$), erythrocyte count ($9.00 \pm 0.61 \times 10^6/\text{mm}^3$), and hemoglobin concentration ($14.53 \pm 2.40 \text{ g/dL}$), whereas the P3 group showed the highest leukocyte count ($16.27 \pm 3.49 \times 10^3/\text{mm}^3$). These findings indicate that *Bacillus* sp.-derived Single Cell Protein has the potential to reduce anxiety-like behavior and improve hematological profiles in male mice, with an optimum dose of 100 mg/kg body weight.

Keywords: anxiety, *Bacillus* sp., hematology, *Internet Of Things*, single-cell protein.