

ABSTRACT

EFFECT OF ADMINISTRATION OF BLACK PEPPER ETHANOL EXTRACT (*Piper nigrum* L) IN CEMENT ANALYSIS (CONCENTRATION, MOTILITY, SPERM MORPHOLOGY) MALE WHITE RAT DIABETES MODEL *Rattus norvegicus*

By

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*Introduce: Diabetes mellitus (DM) is a chronic metabolic disease that can cause male reproductive disorders due to oxidative stress that inhibits spermatogenesis. One potential alternative therapy for infertility caused by DM is the use of antioxidant-active plants, such as black pepper (*Piper nigrum* L.). This study aims to evaluate the effect of black pepper ethanol extract on the concentration, motility, and morphology of spermatozoa in male white rats (*Rattus norvegicus*) as a diabetes model.*

Method: This is an experimental study with a Posttest-Only Randomized Control Group design. A total of 24 rats were divided into four groups: negative control (K1), positive control (K2, rats induced with alloxan 150 mg/kg body weight), and two treatment groups with black pepper extract at doses of 13 mg/kg body weight (P1) and 24.5 mg/kg body weight (P2). Diabetes was induced by intraperitoneal injection of alloxan, followed by the administration of the extract for 8 days. The concentration, motility, and morphology of spermatozoa were measured using a Neubauer counting chamber and a light microscope. Data analysis was performed using Kruskal-Wallis and Post Hoc LSD tests.

Result: The results showed that the P2 group had the highest sperm concentration (158.16 million cells/mL) and motility (3.16%) compared to the other groups, with lower abnormal sperm morphology compared to the positive control. Statistical tests showed significant differences between groups ($p < 0.05$).

Conclusion: In conclusion, black pepper extract has the potential to improve sperm quality in a diabetes model rat through the antioxidant activity of piperine. Further research is needed to explore the molecular mechanisms and its clinical potential in humans.

Keywords: Diabetes mellitus, spermatogenesis, black pepper, antioxidants, piperine

ABSTRAK

PENGARUH PEMBERIAN EKSTRAK ETANOL LADA HITAM (*Piper nigrum L*) PADA ANALISIS SEMEN (KONSENTRASI, MOTILITAS, MORFOLOGI SPERMA) MODEL DIABETES TIKUS PUTIH JANTAN *Rattus norvegicus*

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Pendahuluan: Diabetes mellitus (DM) merupakan penyakit metabolik kronis yang dapat menyebabkan gangguan reproduksi pria akibat stres oksidatif yang menghambat spermatogenesis. Salah satu terapi alternatif potensial untuk infertilitas akibat DM adalah penggunaan tanaman beraktivitas antioksidan, seperti lada hitam (*Piper nigrum L.*). Penelitian ini bertujuan mengevaluasi pengaruh ekstrak etanol lada hitam terhadap konsentrasi, motilitas, dan morfologi spermatozoa tikus putih jantan (*Rattus norvegicus*) model diabetes.

Metode: Jenis penelitian adalah eksperimental dengan rancangan *Posttest-Only Randomized Control Group*. Sebanyak 24 ekor tikus dibagi menjadi empat kelompok: kontrol negatif (K1), kontrol positif (K2, tikus yang diinduksi aloksan 150 mg/kgBB), serta dua kelompok perlakuan dengan ekstrak lada hitam dosis 13 mg/kgBB (P1) dan 24,5 mg/kgBB (P2). Induksi diabetes dilakukan dengan aloksan secara intraperitoneal, diikuti pemberian ekstrak selama 8 hari. Konsentrasi, motilitas, dan morfologi spermatozoa diukur menggunakan bilik hitung *Neubauer* dan mikroskop cahaya. Analisis data menggunakan uji *Kruskal-Wallis* dan *Post Hoc LSD*.

Hasil: Hasil penelitian menunjukkan kelompok P2 menunjukkan konsentrasi (158,16 juta sel/mL) dan motilitas spermatozoa (3,16%) tertinggi dibandingkan kelompok lain, dengan morfologi spermatozoa abnormal yang lebih rendah dibandingkan kontrol positif. Uji statistik menunjukkan perbedaan signifikan antar kelompok ($p < 0,05$).

Kesimpulan: Ekstrak lada hitam berpotensi meningkatkan kualitas sperma pada tikus model diabetes melalui aktivitas antioksidan piperin. Penelitian lebih lanjut diperlukan untuk eksplorasi mekanisme molekuler dan potensi klinisnya pada manusia.

Kata Kunci: Diabetes mellitus, spermatogenesis, lada hitam, antioksidan, piperin