THE EFFECT OF CORN HUSK POWDER COAGULANT DOSE VARIATIONS ON TSS AND BOD LEVELS IN DOMESTIC WASTEWATER FROM THE POLTEKKES KEMENKES YOGYAKARTA DORMITORY

Bonefasia Saniyanti[1], Haryono[2], Bambang Suwerda[3] Ibnu Rois
[1,2,3,4]Jurusan Kesehatan Lingkungan Poltekkes Kemenkes Yogyakarta,
Jl. Tatabumi No. 3 Banyuraden, Gamping, Sleman.
E-mail : saniadani04@gmail.com

ABSTRACT

Background: Untreated domestic wastewater from dormitories can pollute receiving water bodies, particularly because of its Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) content. Corn husk powder contains hydroxyl and carboxyl functional groups and has potential as a natural coagulant. Objective: To determine the effect of corn husk powder coagulant dose variations on TSS and BOD levels in domestic wastewater from the Poltekkes Kemenkes Yogyakarta dormitory. Methods: This laboratory experiment used a pretest-posttest control group design and a completely randomized design. Wastewater samples were collected by grab sampling from the dormitory's final discharge channel. Jar tests were conducted using rapid mixing at 120 rpm for 2 minutes, slow mixing at 40 rpm for 20 minutes, and sedimentation for 30 minutes. Corn husk powder doses of 14, 16, and 18 g/L were tested in triplicate. TSS was measured by the gravimetric method, while BOD was measured using the modified azide Winkler titrimetric method. TSS data were presented descriptively, whereas BOD data were analyzed using paired t-tests and one-way ANOVA at a significance level of 0.05. Results: The initial TSS concentration was 46 mg/L. After treatment, mean TSS increased to 192.67 mg/L at 14 g/L, 205.33 mg/L at 16 g/L, and 119.33 mg/L at 18 g/L, with mean effectiveness values of −318.84%, −346.38%, and −159.42%, respectively. TSS increased in eight of nine replicates and was therefore not analyzed statistically. The initial BOD concentration was 743.8 mg/L and decreased to mean values of 615.33 mg/L (14 g/L), 643.33 mg/L (16 g/L), and 587.33 mg/L (18 g/L), with mean reduction effectiveness of 17.27%, 13.51%, and 21.04%, respectively. BOD data were normal and homogeneous (Levene, $p = 0.129$). The overall decrease in BOD was significant (paired t-test, $p < 0.001$), but only the 16 g/L dose showed a significant decrease when analyzed separately ($p = 0.012$); the decreases at 14 g/L ($p = 0.051$) and 18 g/L ($p = 0.072$) were not significant. There was no significant difference in BOD reduction effectiveness among doses (one-way ANOVA, $p = 0.498$). Only the minor hypothesis for 16 g/L was proven. Conclusion: Corn husk powder at 14–18 g/L was not effective in reducing TSS and instead increased its concentration. Although BOD decreased, the reduction was limited and the final concentrations remained high (about 7.8–8.6 times the upper quality standard); therefore, the tested doses cannot be considered sufficient for wastewater treatment, and the most effective dose could not be established statistically. Further studies should examine lower doses, improve separation or filtration of the supernatant, and include an adequately replicated control group.

Keywords: *natural coagulant, corn husk powder, TSS, BOD, domestic wastewater*

PENGARUH VARIASI DOSIS KOAGULAN SERBUK KULIT JAGUNG TERHADAP KADAR TSS DAN BOD AIR LIMBAH DOMESTIK ASRAMA POLTEKKES KEMENKES YOGYAKARTA

Bonefasia Saniyanti[1], Haryono[2], Bambang Suwerda[3], Ibnu Rois
[1,2,3,4]Jurusan Kesehatan Lingkungan Poltekkes Kemenkes Yogyakarta,
Jl. Tatabumi No. 3 Banyuraden, Gamping, Sleman.
E-mail : saniadani04@gmail.com

ABSTRAK

Latar belakang: Air limbah domestik asrama yang dibuang tanpa pengolahan berpotensi mencemari badan air, terutama karena kandungan Total Suspended Solids (TSS) dan Biochemical Oxygen Demand (BOD). Serbuk kulit jagung mengandung gugus fungsional hidroksil dan karboksil sehingga berpotensi dimanfaatkan sebagai koagulan alami. Tujuan: Mengetahui pengaruh variasi dosis koagulan serbuk kulit jagung terhadap kadar TSS dan BOD air limbah domestik Asrama Poltekkes Kemenkes Yogyakarta. Metode: Penelitian ini merupakan eksperimen laboratorium dengan desain pretest-posttest with control group dan Rancangan Acak Lengkap. Sampel diambil secara grab sampling dari saluran pembuangan akhir asrama. Pengolahan dilakukan menggunakan uji jar dengan pengadukan cepat 120 rpm selama 2 menit, pengadukan lambat 40 rpm selama 20 menit, dan pengendapan selama 30 menit. Dosis serbuk kulit jagung yang diuji adalah 14, 16, dan 18 g/L dengan tiga ulangan. TSS diperiksa dengan metode gravimetri, sedangkan BOD diperiksa menggunakan metode titrimetri Winkler modifikasi azida. Data TSS disajikan secara deskriptif, sedangkan data BOD dianalisis dengan uji t berpasangan dan One-Way ANOVA pada taraf signifikansi 0,05. Hasil: Kadar TSS awal sebesar 46 mg/L. Setelah perlakuan, rata-rata TSS meningkat menjadi 192,67 mg/L pada dosis 14 g/L, 205,33 mg/L pada dosis 16 g/L, dan 119,33 mg/L pada dosis 18 g/L, dengan efektivitas rata-rata masing-masing −318,84%, −346,38%, dan −159,42%. Kadar TSS meningkat pada delapan dari sembilan ulangan sehingga tidak dianalisis secara statistik. Kadar BOD awal sebesar 743,8 mg/L dan menurun menjadi rata-rata 615,33 mg/L (dosis 14 g/L), 643,33 mg/L (dosis 16 g/L), dan 587,33 mg/L (dosis 18 g/L), dengan efektivitas penurunan rata-rata masing-masing 17,27%, 13,51%, dan 21,04%. Data BOD berdistribusi normal dan homogen (Levene, $p = 0,129$). Penurunan BOD secara keseluruhan bermakna (uji t berpasangan, $p < 0,001$), tetapi pada analisis masing-masing dosis hanya dosis 16 g/L yang menunjukkan penurunan bermakna ($p = 0,012$), sedangkan dosis 14 g/L ($p = 0,051$) dan 18 g/L ($p = 0,072$) tidak bermakna. Tidak terdapat perbedaan efektivitas penurunan BOD yang bermakna antardosis (One-Way ANOVA, $p = 0,498$). Hanya hipotesis minor dosis 16 g/L yang terbukti. Kesimpulan: Serbuk kulit jagung dosis 14–18 g/L belum efektif menurunkan TSS dan justru meningkatkan kadarnya. Meskipun kadar BOD mengalami penurunan, besar penurunannya masih terbatas dan kadar akhir tetap tinggi (sekitar 7,8–8,6 kali batas atas baku mutu). Dengan demikian, dosis yang diuji belum memadai sebagai pengolahan air limbah dan dosis paling efektif belum dapat ditentukan secara statistik. Penelitian lanjutan perlu menguji dosis yang lebih rendah, memperbaiki pemisahan atau penyaringan supernatan, serta menyertakan kelompok kontrol dengan jumlah ulangan yang memadai.
Kata kunci: koagulan alami, serbuk kulit jagung, TSS, BOD, air limbah domestik