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Thesis
Forest Products and Paper Science
2024

Title:	**Solvent Extraction and Chemical Characterization of Oil From Jatropha curcas L. Seeds**
Author:	**Galang, Elyrose Brianne Teano**
Adviser:	**Jara, Aileen A.**
Stream:	**Production and Industrial Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	Jatropha curcas L. has demonstrated substantial potential as a renewable energy resource. The oil extracted from its seeds also contains bioactive compounds with promising antimicrobial applications. This research aimed to optimize the extraction of oil from J. curcas seeds using solvent extraction and to evaluate the chemical properties of the oil. The seeds were effectively dried and isolated after the fruits had decayed and dried. Green pods have an average moisture content of 765.74%±32.90, decreasing to 13.77%±0.93 when air-dried. Green seeds have a moisture content of 145.92%+89.36, while air-dried seed coat and kernel exhibit moisture contents of 11.10%±1.11 and 12.29%±5.27, respectively. The optimization and predictive model equation for JCSO extraction were analyzed using Response Surface Methodology (RSM) and Box-Behnken Design (BBD) in the Design-Expert software. The formulated model used oil yield as the dependent variable, whereas extraction time, solid-to-solvent ratio, and particle size as linear independent variables with coefficients of 2.35711, 31.50000, and 14.80846, respectively, with an intercept of -19.86957. Furthermore, the model included quadratic terms A2 and C2 with coefficients of -0.213092 and -8.86730, respectively. Optimal extraction conditions were found to be a 5.53-hour process with a solid-to-solvent ratio of 1:14 and a particle size below 0.850mm, yielding 28.74% oil. Phytochemical screening identified six major secondary metabolites in JCSO, namely coumarins, flavonoids, phytosterols, quinones, saponins, and terpenoids. Gas chromatography-mass spectrometry (GC-MS)

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	analysis revealed that the oil has 49.93% linoleic acid, 18.14% palmitic acid, 13.40% stearic acid, and 5.14% mono oleoylglycerol. The findings suggest potential applications in various industries, including biofuels, cosmetics, external medicines, wood preservative treatment, and other areas that require antimicrobial and antioxidant properties. seed oil, solvent extraction.
Title:	**Optimization and Phytochemical Characterization of Seed Oil and Bark Extracts from Mangium (*Acacia mangium Willd.*)**
Author:	**Galdo, Rob Hector Babac**
Adviser:	**Daracan, Vivian C.**
Stream:	**Production and Industrial Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	This study investigated the optimal extraction conditions for maximizing oil and bark extract yield from Mangium (Acacia mangium Willd.) using the Soxhlet method and decoction, respectively. Response surface methodology (RSM) was employed to analyze and optimize the effects of extraction time, solid-to-solvent ratio, and particle size. A Box-Behnken design (BBD) with 17 experimental runs was conducted for each extraction method. Statistical analysis revealed that particle size significantly impacted both oil and bark extract yield. Optimized conditions for oil extraction were determined to be 8 hours extraction time, 1:14 g/ml solid-to-solvent ratio, and particle size below 0.850 mm, with a predicted yield of 8.6%. On the other hand, bark extract yield was maximized under 3.55 hours extraction time, 1:11 g/ml solid-to-solvent ratio, and 0.1 cm particle size, achieving a predicted yield of 6.7%. Additionally, a quadratic polynomial model was found the most suitable model for each analysis with an equation of Y 11.77 +0.10A + 12.90B - 7.97C+1.41C2 for the seed oil, and Y = 4.44 + 1.44A - 3.68C - 0.20A2 + 0.89C2 for the bark extracts. Moreover, the phytochemical analysis identified Coumarins, Phytosterols, and Quinones in the seed oil, while the bark extract contained Cardiac Glycosides, Flavonoids, Tannins, Quinones, Saponins, and Terpenoids. These bioactive compounds suggest potential applications in cosmetics, external medicines, wood preservative treatment, and other areas requiring antimicrobial and antioxidant properties. This research work has successfully

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	optimized the extraction process for both oil and bark extract from Mangium, and characterized their phytochemical content, revealing potentially suitable applications.
Title:	**Assessment of the Morphological, Proximate Chemical, and Alkaline Pulping Properties of Bandala (Backcross Abaca with Native and Desirable Accessions to Lift Up Abaca Industry) Abaca Hybrid for Papermaking**
Author:	**Lato, Ma. Isabel Taroy**
Adviser:	**Grande-Flores, Jeannette O.**
Stream:	**Production and Industrial Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	Due to insufficient domestic supply in the Philippines, pulp and paper industry heavily relies on imported raw material with imports reaching US $1.48 billion in 2025, making it the 41st largest importer globally. This dependency has grown since the implementation of Executive Order No. 23 in 2011 which restricted local timber harvest. RANDALA Abaca fiber is a cultivar hybrid developed by backcrossing abaca with good natural accessions Study aimed to evaluate its potential for papermaking by analyzing its fiber morphology, chemical composition, percent yield and spent liquor at various chemical loadings of NaOH:Na 50, (4.8:18, 5:20, 5.5:22). Fiber morphology showed flexibility ratio, fiber density, runkel ratio and slenderness ratio are 0.729, 0.449, 0.638, and 149-155, respectively. Proximate chemical analysis revealed that BANDALA fiber has 1.46% ash, 10.32% lignin, and 87.59% holocellulose, and exhibits solubility of 0.60% in cyclohexane ethanol, 0.64% in hot water and 21.94% in hot 1% NaOH. Pulp yield was 70-73% on the average and spent liquor indicated 57-59% of consumed thiosulfate Generally, these results showed that BANDALA fibers offer good morphological, proximate chemical, and alkaline pulping properties enabling efficient sheet formation, processing, cohesion and the production of quality final paper.
Title:	**Characterization of Charcoal Briquettes from Bikal (*Dinochloa acutiflora* (Munro) S. Dransf.) CULM**
Author:	**Merluza, Ericka Mae Casas**

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Type:	**Thesis**
Abstract/Executive Summary:	This study aimed to evaluate the properties of charcoal briquettes made from Bikal (Dinochloa acutiflora). The focus was documenting the production process, determining the optimal binder-to-fines ratio, analyzing its physicochemical properties, and recommending strategies to enhance its fuel properties. The properties tested included density, compressive strength, calorific value, moisture content, volatile matter, ash content, and fixed carbon. Results showed that increased binder content enhanced the briquettes' density and compressive strength. However, briquettes with 40% binder resulted in a higher ash content of 16.48%, surpassing the SNI standard (< 8%), thereby reducing its fixed carbon value of 50.28%, which is a vital indicator of the briquette's heating value. Briquettes with 30% binder ignited the fastest at an average of 1.37 minutes, followed by those with 40% binder at an average of 1.54 minutes, while the slowest to ignite was the briquettes with 20% binder, taking an average of 1.73 minutes. Briquettes with a 40% binder had the longest burning time of 100.63 minutes, 30% binder burned for 86.04 minutes, and those with a 20% binder had the shortest burning time of 82.98 minutes. Briquettes with 20% binder exhibited the highest burning rate of 0.15 g/min, followed by those with 40% binder at 0.13 g/min, and those with 30% binder at a rate of 0.12 g/min, respectively. Despite the promising result of its heating value of 21.11%, compared with other raw materials, the high ash content indicates the charcoal briquette from D. acutiflora does not meet the standard requirements for charcoal briquettes.
Title:	**Parametric Study of Seed Oil Extraction From Baguilumbang (Reutealis trisperma (Blanco) Airy Shaw)**
Author:	**Tarranco, Daryl Jeter Sagadraca**
Adviser:	**Daracan, Vivian C.**
Stream:	**Production and Industrial Forestry**
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Abstract/Executive Summary:	This study aimed to optimize the seed oil extraction process of Baguilumbang (Reutealis trisperma (Blanco) Airy Shaw). The preparation of R. trisperma seeds involved pre-treatment methods such as dehulling, size reduction, and oven-drying. In this study, the dependent variable is the yield, and the three independent variables are extraction duration (A), solid-to-solvent ratio (B), and particle size (C). A total of 17 experimental runs and three confirmation runs were conducted. Oil extraction was carried out using the Soxhlet extraction method with n-hexane as the solvent, yielding an average yield of 58.35%. The study employed the Response Surface Methodology-Box Behnken Design (RSM-BBD) to optimize the extraction process. The final model suggested was a quadratic model, exhibiting an F-value of 9.27. The study's diagnostic plots demonstrated no discernible patterns in the residuals, and the Box-Cox plot results included λ=1 within the 95% confidence interval range. The recommended optimal conditions for the extraction of seed oil were determined to be an extraction duration of 7 hours and 48 minutes, a solid-to-solvent ratio of 1:14, and a particle size of 0.850 mm. The obtained mean value, 59.95% from the confirmation runs, was within the predicted interval range, validating the model's ability to accurately predict the yield. The conclusions drawn from this study provide a comprehensive foundation for enhancing the efficiency of oil extraction from R. trisperma seeds.
Title:	**Value Chain Analysis of Bahay Kubo in Ilocos Norte, Philippines**
Author:	**Tizon, Zeth Uriel D.**
Adviser:	**Daracan, Vivian C.**
Stream:	**Production and Industrial Forestry**
Access:	**Restricted**
Type:	**Thesis**
Abstract/Executive Summary:	This study analyzed the value chain of bahay kubo (traditional Filipino stilt house) production in Ilocos Norte, Philippines. The objectives were to identify key players, describe their roles, map the value chain, and determine opportunities and constraints. The analysis focused on six main actors with two main channels: two farmers/pole suppliers, three processors/manufacturers, and a product trader. The farmer grows and supplies kawayan tinik bamboo poles to the processor. The processor manufactures bahay kubo and sells it to end users and the product trader, who

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	resells it at a markup. Value addition analysis showed the first processor captures the highest share at 76.47%, followed by the trader at 20.46% and the first farmer at 3.07% in the first channel, and 52.92% for the second processor and 47.08% for the second farmer. Key constraints identified include pest incidence, lack of manpower, insufficient capital and equipment, and poor farm-to-road access. Participatory systems analysis revealed government assistance, advertising, and manpower as critical factors influencing the chain. Despite challenges, opportunities exist to improve competitiveness through lowering prices and increased promotion. The study provides insights into the structure, performance, and issues in the bahay kubo value chain in Ilocos Norte. Addressing challenges related to pest management, resource access, and strategic marketing could improve efficiency and profitability for actors. Results can inform targeted interventions by policymakers and stakeholders to strengthen the local bamboo industry. However, as the study used limited secondary data, further primary research on additional bamboo products and expanded geographic scope is recommended for more comprehensive conclusions.