PROTECTIVE EFFECT OF KAYU SECANG (CAESALPINIA SAPPAN L.) ON WISTAR RAT'S TRACHEA UPON EXPOSURE TO CIGARETTE SMOKE

Irfan Yunianto

Pendidikan Biologi UAD
Unggul, Inovatif, Berwawasan Global, Islami

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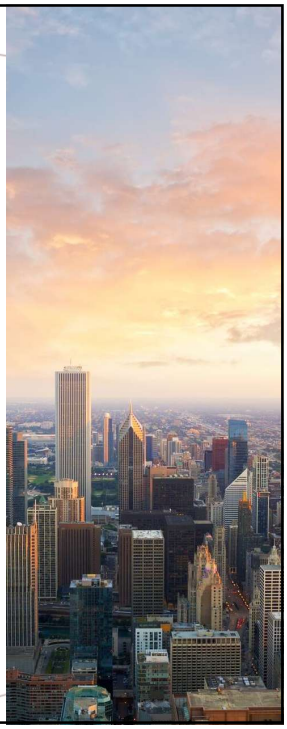

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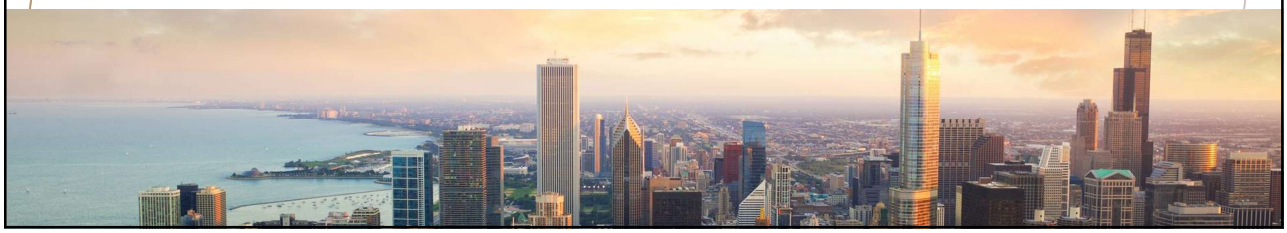
BACKGROUND

Health Risks of Smoking in Indonesia

- Smoking poses a major health risk
- High prevalence among men
- Cigarette smoke contains thousands of toxicants
- Induces oxidative stress
- *Caesalpinia sappan* has strong antioxidant properties



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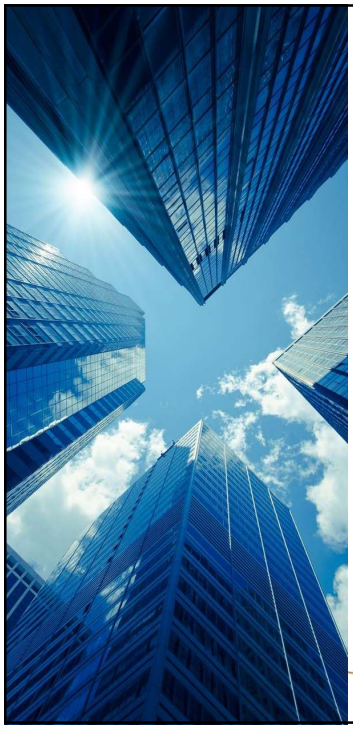

RESEARCH OBJECTIVE

Investigate the **protective effects** of Kayu Secang (*C. sappan* L.*)* extract on respiratory health.

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METHODOLOGY

- **Study Design:** *In vivo* experiment on 24 male Wistar rats (12 weeks old, ~250g)
- **UAD ethics committee approval No: 012412360**
- **Extraction procedures:** Kayu secang → dried overnight, mashed in blender → macerated in 96% EtOH → rotary evaporator → red-brownish semi-solid extract

- **Administration of extract and exposure to cigarette smoke**
  Control (K) – No exposure
  Negative Control (KN) – Cigarette smoke exposure (2/day)
  P1 – *C. sappan* extract (300 mg/kg) + Cigarette smoke exposure (2/day)
  P2 – *C. sappan* extract (600 mg/kg) + Cigarette smoke exposure (2/day)
  Duration of treatment: 30 days (Chandra et al. 2023)

- **Measured parameters**: Avg. rats' Body weight, SGOT and SGPT levels, histopathology of trachea; statistical analysis: ANOVA and Duncan's test

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EXTRACTION RESULTS

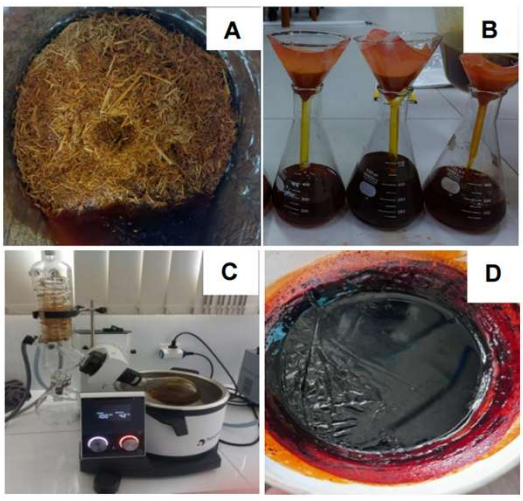

Fig. 1 Extraction of kayu secang with 96% Ethanol. **A.** maceration in a closed jar; **B.** filtration with filter paper; **C.** extract was concentrated by rotary evaporator; **D.** solvent was completely air-dried to yield red-brownish semi-liquid extract

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SAFETY PROFILE ASSESSMENT

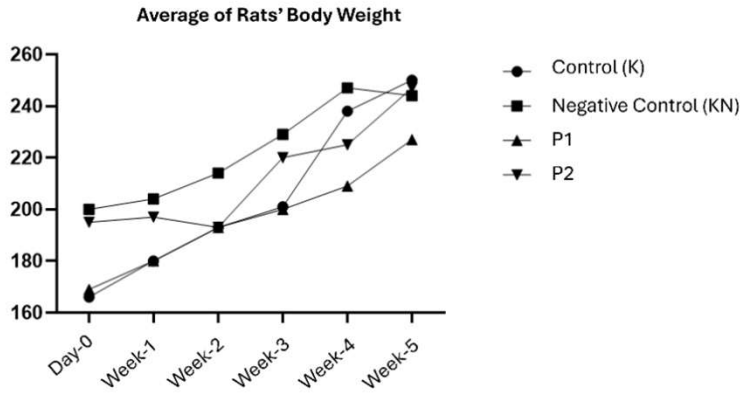

Fig. 2 Average of rats' body weight (g) for each group. Day-0 refers to the initial average body weight on acclimatization, week-1 refers to the average rats' body weight after acclimatization, and week-5 refers to the last day of treatment.

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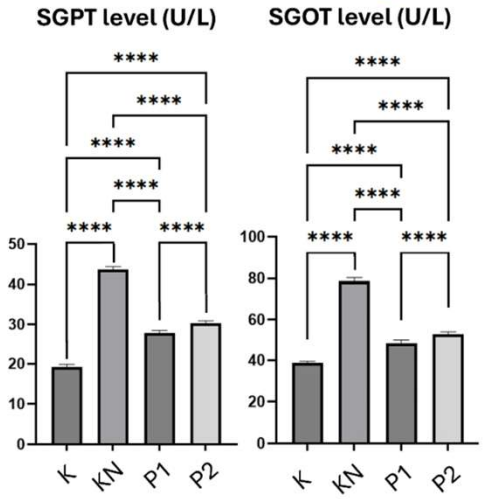

Fig. 3 SGPT and SGOT level (U/L) after 30 days of treatment. K (control group), KN (negative control group, exposed to cigarette smoke), P1 (300 mg/kg of kayu secang extract and exposed to cigarette smoke), and P2 (600 mg/kg of kayu secang extract and exposed to cigarette smoke). Data were obtained from 6 animals in each group, presented as mean ± SD. One-way ANOVA was performed for statistical analysis with Duncan's post hoc test (****$p<0.0001$).

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TRACHEAL HISTOPATHOLOGICAL ASSESSMENT

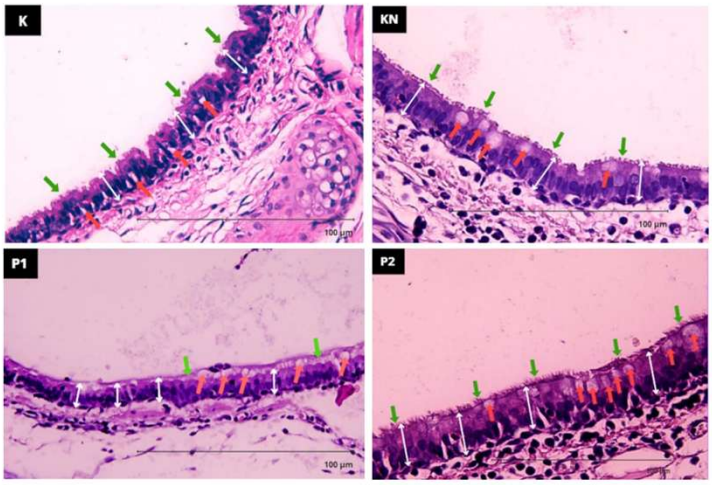

Fig. 4 Rats' tracheal histopathological structure after 30 days of treatment. Hematoxilin-eosine staining. K (control group), KN (negative control group, exposed to cigarette smoke), P1 (300 mg/kg of kayu Secang extract and exposed to cigarette smoke), and P2 (600 mg/kg of kayu Secang extract and exposed to cigarette smoke). Green arrows show ciliary cells, red arrows show goblet cells, and white arrows show epithelial cells. Magnification 40X objective, scale bars = 100 µm.

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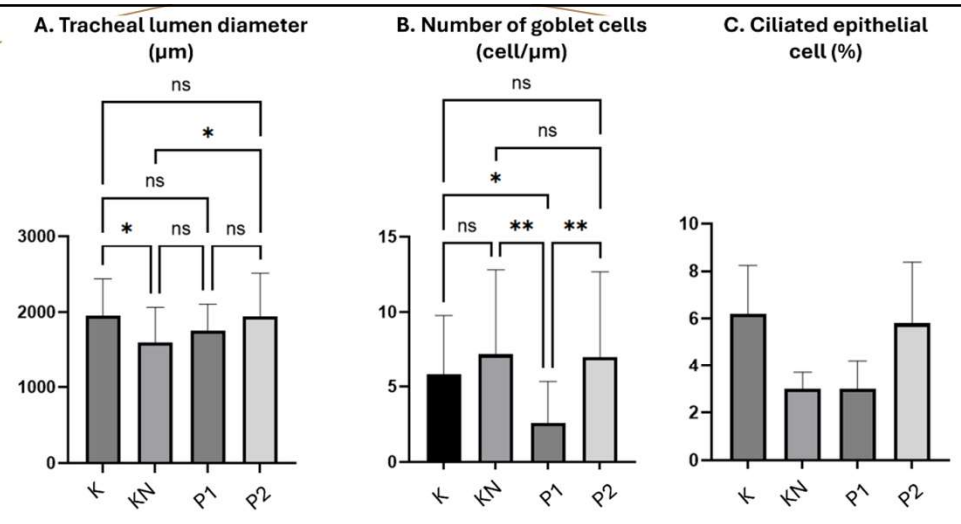

Fig. 5. A) Tracheal lumen diameter (µm). B) Number of goblet cells (cell/µm). C) Ciliated epithelium cell (%). K (control group), KN (negative control group, exposed to cigarette smoke), P1 (300 mg/kg of kayu Secang extract and exposed to cigarette smoke), and P2 (600 mg/kg of kayu Secang extract and exposed to cigarette smoke). Data were obtained from 6 animals in a group, with 5 technical replicates each, presented as mean ± SD. One-way ANOVA was performed for statistical analysis with Duncan's post hoc test (*$p<0.05$; **$p<0.01$).

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DISCUSSION

- Smoking induces liver injury → direct and indirect toxicity, immunologic, and oncogenic → Cytotoxic constituents cause oxidative stress, leading to fibrosis, increasing proinflammatory cytokines (IL-8 and TNF-α) → liver cell damage.
- Cigarette smoke → trachea epithelial damage → EGFR activation→ ERK pathway activation → upregulation of MUC5AC → mucus overproduction, Goblet cells hyperplasia
- Bioactive components of Kayu Secang extract (Brazilin, brazilein) →inhibits MMP-9, lowers SGPT, SGOT, MDA in rats

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CONCLUSION

- The administration of ethanolic extracts of Kayu Secang demonstrated a potent hepatoprotective effect by significantly reducing SGPT and SGOT levels, which are key biomarkers of liver damage. Additionally, the extract reduced oxidative stress, improving tracheal histopathology.
- Further research is warranted to explore its molecular mechanisms in preventing cellular damage to the respiratory organs.

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ACKNOWLEDGEMENT

This study was supported by the research grant from LPPM UAD, number: PD-031/SP3/LPPMUAD/XI/2024.

PI:

Irfan Yunianto, M.Sc. Ph.D.

Co-PI:

Haris Setiawan S.Pd., M.Sc.

THANK YOU !