

Formulation and Evaluation of Herbal Cigarettes

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Abstract: Herbal cigarettes are tobacco-free and nicotine-free alternatives formulated from a variety of medicinal herbs, intended to reduce the harmful health effects associated with conventional cigarette smoking. This study explores the development, formulation, and evaluation of herbal cigarettes using selected medicinal plants such as Tulsi (*Ocimum sanctum*), Mint (*Mentha arvensis*), Clove (*Syzygium aromaticum*), and Licorice (*Glycyrrhiza glabra*), known for their therapeutic properties including antimicrobial, expectorant, and antioxidant activities. The herbal mixture was processed, blended, and hand-rolled into cigarette form, and then assessed for organoleptic properties, smoke aroma, and burn rate. Preliminary phytochemical screening confirmed the presence of beneficial compounds such as flavonoids, tannins, and essential oils. Unlike conventional cigarettes, the herbal formulation lacks nicotine and tar, thus offering a potentially safer alternative for smokers seeking cessation or reduction. The findings suggest that herbal cigarettes could serve as a complementary approach in tobacco harm reduction strategies, though further clinical studies are recommended to evaluate long-term safety and efficacy..

Keywords: Herbal cigarette, Tobacco alternative, Medicinal plants, Non-nicotine smoking, Natural formulation, Antioxidant herbs, Respiratory support

I. INTRODUCTION

Cigarette smoking remains a leading cause of preventable disease and premature death worldwide, primarily due to the harmful effects of nicotine, tar, and other toxic chemicals present in tobacco products. Despite widespread awareness of the health risks, smoking cessation remains a significant challenge for many individuals due to nicotine addiction and habitual behaviors associated with smoking. In response, there has been growing interest in the development of safer alternatives, including herbal cigarettes, which are free from tobacco and nicotine.

Herbal cigarettes are made from a blend of medicinal and aromatic plants known for their therapeutic properties. These formulations aim to mimic the sensory experience of smoking while reducing the exposure to harmful substances. Commonly used herbs in these cigarettes include *Ocimum sanctum* (Tulsi), *Mentha arvensis* (Mint), *Glycyrrhiza glabra* (Licorice), and *Syzygium aromaticum* (Clove), which are traditionally used in Ayurvedic and herbal medicine for their anti-inflammatory, antimicrobial, and respiratory-supportive effects.

The purpose of developing herbal cigarettes is not only to provide a safer alternative to conventional cigarettes but also to explore their potential in aiding smoking cessation and delivering mild therapeutic effects through inhalation. This study aims to formulate a herbal cigarette using selected medicinal herbs, evaluate its physicochemical and sensory properties, and highlight its potential role as a harm-reduction tool in public health.

Research Objectives

1. To formulate herbal cigarettes using selected medicinal plants known for their therapeutic properties and absence of nicotine and tobacco.
2. To evaluate the physicochemical properties of the herbal cigarette, including moisture content, ash value, and burning rate.



3. To assess the organoleptic (sensory) characteristics of the herbal cigarette, such as aroma, smoothness of smoke, and overall acceptability.
4. To perform preliminary phytochemical screening of the herbal mixture to identify the presence of bioactive compounds such as alkaloids, flavonoids, tannins, and essential oils.
5. To compare the potential health impacts of herbal cigarettes with conventional tobacco cigarettes, particularly focusing on their non-addictive and less harmful nature.
6. To explore the feasibility of herbal cigarettes as a smoking cessation aid or harm- reduction tool for individuals seeking alternatives to tobacco.

Significance of the Study

The increasing health concerns associated with tobacco smoking, including respiratory diseases, cardiovascular disorders, and cancer, have created a strong demand for safer alternatives. Herbal cigarettes, which are free from tobacco and nicotine, offer a potential solution by mimicking the act of smoking while reducing the associated health risks. This study is significant as it aims to develop and evaluate herbal cigarettes using medicinal plants known for their therapeutic benefits, such as anti-inflammatory, expectorant, and calming effects.

By investigating the properties and effects of herbal cigarettes, this research may contribute to public health strategies aimed at smoking cessation and harm reduction. It provides valuable insight into the formulation of a product that may satisfy smokers' behavioral habits without exposing them to the toxic components of traditional cigarettes. Furthermore, the study promotes the use of indigenous and Ayurvedic herbs, supporting the integration of traditional medicine into modern lifestyle alternatives.

The findings may also encourage further scientific exploration of inhalable herbal therapies and offer a foundation for future innovations in herbal product development, particularly for individuals seeking natural remedies or transitional aids to quit smoking.

Materials and Equipment for Formulation of Herbal cigarettes

Materials

1. Medicinal Herbs (dried and powdered):
 - Ocimum sanctum (Tulsi)
 - Mentha arvensis (Mint)
 - Glycyrrhiza glabra (Licorice)
 - Syzygium aromaticum (Clove)
 - Rosa Rubiginosa (Rose)
2. Natural Binders (if needed):
 - Water
3. Rolling Material:
 - Herbal cigarette paper (unbleached and chemical-free)
4. Filter Material (optional):
 - Cotton

Equipment

- Mortar and Pestle – for grinding and blending herbs
- Weighing Balance – to accurately measure herbal components
- Sieve/Shifter – to obtain uniform herbal powder or particles
- Measuring Cylinders/Beakers – for handling any liquid binder or extract
- Cigarette Roller or Hand Roller – to shape the herbal cigarettes
- Drying Oven or Tray Dryer – to remove excess moisture from herbs before formulation



- Desiccator – to store formulated cigarettes and prevent moisture absorption
- Packaging Material – paper boxes or biodegradable pouches for storing finished products.

1. *Ocimum sanctum* (Tulsi)



Figure. *Ocimum sanctum* (Tulsi)

Chemical Constituents (Major):

- Essential oils: Eugenol, methyl eugenol, carvacrol
- Flavonoids: Orientin, vicenin
- Phenolic compounds: Rosmarinic acid
- Alkaloids, tannins, saponins
- Vitamins: A, C, calcium, zinc

Uses:

- Respiratory relief (cough, asthma)
- Antioxidant and anti-inflammatory
- Antimicrobial (bacteria, fungi, viruses)
- Adaptogen (stress relief)

2. *Mentha arvensis* (Mint)



Figure. Pop Bursting Mix Fruit Mint Flavor Menthol Capsule Crush Balls for Smoking Herbal Cigarettes



Chemical Constituents (Major):

- Essential oils:
 - Menthol (major component)
 - Menthone
 - Isomenthone
 - Limonene
 - Piperitone
- Flavonoids:
 - Luteolin, hesperidin
- Tannins and Phenolic compounds
- Other constituents:
 - Terpenes, rosmarinic acid, and trace alkaloids

Uses:

- Digestive aid – relieves indigestion, gas, and nausea
- Cooling agent – used in balms and liniments for its soothing effect
- Respiratory relief – helps with cough, congestion, and sinusitis
- Antimicrobial – inhibits bacterial and fungal growth
- Analgesic & anti-inflammatory – used in pain relief formulations
- Aromatherapy – for mental alertness and stress reduction.

3. Glycyrrhiza glabra (Licorice)



Figure. Glycyrrhiza glabra (Licorice)

Chemical Constituents:

- Glycyrrhizin (main active compound)
- Flavonoids: Liquiritin, isoliquiritin
- Saponins
- Coumarins
- Phenolic compounds: Glabridin

Uses:

- Expectorant – relieves cough and throat irritation
- Anti-inflammatory – treats gastritis, ulcers, and skin issues
- Antiviral – combats respiratory infections
- Adaptogen – reduces stress and supports adrenal health
- Gastroprotective – aids in managing ulcers and acid reflux



4. *Syzygium aromaticum* (Clove)



Chemical Constituents:

- Eugenol
- Acetyl eugenol
- Beta-caryophyllene
- Tannins Uses:
 - Antimicrobial – fights infections
 - Analgesic – relieves tooth pain
 - Anti-inflammatory – reduces swelling
 - Digestive aid – relieves nausea and indigestion
 - Antioxidant – protects against free radicals

5. *Rosa Rubiginosa* (Rose)



Figure. *Rosa Rubiginosa* (Rose)

Chemical Constituents:

- Essential oils: Citronellol, geraniol, nerol
- Flavonoids: Quercetin, kaempferol
- Phenolic compounds
- Vitamins: C, A



Uses:

- Antioxidant – protects cells from damage
- Anti-inflammatory – soothes irritation
- Antimicrobial – fights infections
- Astringent – tones skin
- Mood enhancer – reduces stress and anxiety

II. METHODOLOGY AND EXPERIMENTAL WORK

1. Selection of Herbal Ingredients

- Herbs used: *Ocimum sanctum* (Tulsi), *Mentha arvensis* (Mint), *Glycyrrhiza glabra* (Licorice), *Syzygium aromaticum* (Clove), and *Rosa rubiginosa* (Rose).
- Preparation: Fresh leaves and flowers were harvested, dried, and finely powdered. The herbs were carefully chosen for their known therapeutic properties, such as antimicrobial, anti-inflammatory, and respiratory support.

2. Formulation of Herbal Cigarette

- Proportions: The dried herbal powders were blended in varying proportions to optimize aroma, taste, and effectiveness.
- Binder: If necessary, a natural binder like honey or glycerin was added to help the mixture hold together.
- Rolling: The prepared herbal blend was rolled into cigarette paper (unbleached and chemical-free), with an optional filter made from natural materials such as cotton or corn silk.
- Drying: The rolled cigarettes were allowed to air-dry to prevent moisture content above 10%, which could affect burn quality.

3. Physicochemical Evaluation

- Moisture Content: Measured using a moisture analyzer to ensure that the herbal cigarettes do not have excess moisture, which could affect combustion.
- Ash Content: Determined by burning a sample of the herbal cigarette and measuring the residual ash.
- Burn Rate: Recorded by measuring how long it took for a cigarette to burn completely, providing insights into the smoking experience.
- Nicotine and Tar Testing: If applicable, nicotine and tar content may be analyzed using a gas chromatograph to confirm the absence or presence of these harmful substances.

4. Organoleptic Evaluation (Sensory Testing)

- Aroma and Flavor: Sensory panels (trained or untrained) evaluate the aroma and taste of the smoke. A scorecard system may be used to rate attributes like smoothness, flavor intensity, and overall acceptability.
- Smoothness of Smoke: Rated based on the harshness or smoothness experienced during inhalation.
- Overall Acceptability: A survey of participants or a sensory panel to rate the overall satisfaction and preference for the herbal cigarette.

5. Phytochemical Analysis

- Preliminary Screening: The presence of major bioactive compounds (such as flavonoids, alkaloids, essential oils) was assessed through standard phytochemical tests, including:
 - o Alkaloids: Dragendorff's test
 - o Flavonoids: Shinoda test
 - o Tannins: Ferric chloride test
 - o Essential Oils: Distillation and GC-MS analysis (if required)



Formulation for 50 g Herbal Cigarette

Herbal Ingredient	Quantity (g)	Purpose
Ocimum sanctum (Tulsi)	12 g	Antimicrobial, respiratory support
Mentha arvensis (Mint)	10 g	Cooling effect, digestive aid
Glycyrrhiza glabra (Licorice)	10 g	Expectorant, anti-inflammatory
Syzygium aromaticum (Clove)	8 g	Antiseptic, flavor enhancer
Rosa rubiginosa (Rose)	10 g	Aromatic, stress relief

Evaluation Tests for Herbal Cigarettes

1. Organoleptic (Sensory) Evaluation

- Aroma: Smell of the cigarette before and during burning
- Flavor/Taste: Pleasantness of the smoke when inhaled
- Smoothness: Harsh or smooth feeling during inhalation

2. Physicochemical Evaluation

- Moisture Content:
 - o Determines the shelf life and burning ability
 - o Method: Oven-drying method or moisture analyzer

3. Burn Rate:

- o Time (in minutes) taken for the herbal cigarette to burn completely
- o Measured using a stopwatch
- pH of Smoke Condensate (optional):
 - o Helps evaluate the irritation potential of smoke

4. Microbial Load Test

- Ensures the absence of harmful bacteria or fungi
- Important for product safety and regulatory approval

III. RESULTS AND DISCUSSION

- Sensory Evaluation: The herbal cigarettes showed good aroma (4.5/5), taste (4.2/5), and smoothness (4.0/5). The overall acceptability was high (4.3/5), with a pleasant and non-irritating smoke.
- Physicochemical Tests:
 - o Moisture content: 9.6% (ideal range)
 - o Ash value: 13.5% total, 1.8% acid-insoluble (indicates purity)
 - o Burn rate: 4.5 minutes (moderate and consistent)
 - o pH of smoke: 6.2 (mild, non-irritating)
- Phytochemical Screening: Positive for flavonoids, alkaloids, tannins, saponins, and essential oils — confirming the presence of therapeutic compounds.
- Conclusion: The herbal cigarette formulation is a potential tobacco-free alternative with antioxidant, antimicrobial, and respiratory benefits. Further safety and efficacy studies are suggested.

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