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Alternative uses of tobacco

Tobacco has been one of the most important and used plants for decades. The structure, chemical and biological properties make tobacco a great raw material. However, the use of it mostly distributed to produce hazardous products for smoking. The production of it grows by year making it oriented only to affect people's health, therefore the prime goal is to discover and observe different alternative uses of it.

This comprehensive review aimed to explore alternative uses of tobacco beyond smoking, providing an extensive overview of the potential applications in various fields. The review analyzed more than 50 different publications, books, and scientific journals mostly published after 2010, discussing the goals, methodology, results, and discussions of these alternative uses. The primary goals of the review were to identify alternative uses of tobacco, analyze their potential benefits and drawbacks, and provide recommendations for further research and development.

This review revealed promising applications in biofuel production, medicine, agriculture, biotechnology, and cosmetics, offering potential benefits for public health, the environment, and the economy.

To achieve these goals, a systematic methodology was applied, which included:

- a) Selection of sources: a thorough search of relevant publications was carried out, books and scientific journals that discuss alternative species tobacco use.
- b) Evaluation of the quality and relevance of information: criteria were applied to ensuring that the selected sources are credible, up-to-date, and high quality.
- c) Data synthesis and analysis: Information from sources has been extracted, systematized, and analyzed to identify patterns, trends and gaps in the literature.

Criteria for selection of publications, books, and journals. The 50+ sources used in this review were selected based on the following criteria.

- a) Relevance; The material should have either focused on alternative uses of tobacco or provide valuable information about the broader context of cultivation, production and consumption tobacco.
- b) Credibility: the authors of the material must have relevant knowledge and experience, and the research methods used should be strict and transparent.

c) Diversity; The material must represent different points perspective, methodology and geographic locations.

d) Timeliness: materials must be up-to-date and reflect the latest research and developments in the field of alternative tobacco use.

Researched sectors

This overview presents the following different sectors and industries alternative use of tobacco.

a) Biofuel production: the potential of tobacco as a raw material for production of biofuels such as ethanol, biodiesel and biogas.

Using tobacco waste as a source of biofuels can meet global demand for renewable energy, reduce greenhouse gas emissions and contribute to sustainable development. However, to realize such use on a large scale, technical challenges need to be overcome, such as efficient processing processes and optimization of tobacco varieties with high biofuel yields.

b) Pharmaceuticals: b) Medicines: the pharmaceutical potential of tobacco for drug development; and the production of therapeutic proteins and vaccines.

Plant-based vaccine production using tobacco plants offers benefits such as cost-effectiveness, scalability, and reduced risk of contamination, regulatory hurdles, and the need for clinical trials to ensure the safety and efficacy of these vaccines may present challenges for their widespread adoption.

c) Agriculture Researchers are studying the use of tobacco to combat pests, soil improvement and as a source of bio-fertilizers and biostimulants.

The use of tobacco in these capacities could contribute to sustainable agricultural practices and reduce the reliance on synthetic chemicals. However, challenges include developing effective formulations and application methods, as well as addressing potential negative impacts on non-target organisms and the environment.

d) Biotechnology Tobacco is being explored for applications such as bioplastics, bionatural materials, industrial enzymes and genetically modified plants for special purposes.

Also, the topic of using tobacco in cosmetics for the anti-aging and anti-inflammatory purposes. However, based on the consumers point of view, tobacco as an ingredient might repel some of the customers, it might create an allergic reaction on some individuals.

Simply put, this review discusses alternative ways use of tobacco other than smoking to find healthier and more sustainable options.

In conclusion, there are plenty of applications of tobacco plant and the waste of the production, however it faces obstacles such as people's perception. Despite the numerous potential benefits of these alternative uses of tobacco, several challenges and obstacles must be overcome

to fully realize their potential. These challenges include technological limitations, regulatory hurdles, and social acceptance. To address these issues, we have provided several recommendations, such as encouraging interdisciplinary research and collaboration, investing in education and training, developing and implementing supportive policies and regulations, fostering technology transfer and commercialization, monitoring and evaluating progress, promoting public awareness and acceptance, encouraging international cooperation, adhering to principles of sustainability and environmental stewardship, supporting the development of new tobacco varieties, and establishing pilot projects and demonstration sites.

By repurposing tobacco and developing its alternative applications, we have the chance to create a positive impact on the world, turning a historically harmful plant into a source of hope, innovation, and progress.

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