

DEVELOPMENT AND COMMERCIALIZATION OF ARECA-BASED HERBAL TOOTH POWDER FOR SAFER ORAL CARE SOLUTIONS

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Introduction:

1. For generations, communities across Asia have turned to the areca nut as a natural remedy for maintaining oral hygiene, and today, that age-old wisdom is finding its way into modern dental care. Scientists and formulators are now working to capture the best of what this plant has to offer its natural ability to fight bacteria and tighten gum tissue, while carefully removing the alkaloids that have historically raised health concerns. The result is an herbal tooth powder that feels less like a laboratory invention and more like a thoughtful bridge between ancestral tradition and present-day science.
2. What makes this development particularly exciting is its timing? Consumers around the world are growing increasingly wary of synthetic ingredients and chemical-laden products, actively seeking cleaner, greener alternatives for their daily routines. An areca-based tooth powder steps right into that space, offering a fluoride-free option that is gentle on the mouth, kind to the environment, and rooted in the rich heritage of Ayurvedic practice. To make it even more appealing, complementary herbs like clove and peppermint are blended in, lending a familiar freshness that modern users expect from their oral care products.
3. Of course, moving from a promising idea to an actual product on store shelves requires far more than good intentions. Researchers are putting the formulation through detailed phytochemical testing to confirm that it genuinely protects against cavities and gum disease without irritating sensitive oral tissues. Equal attention is being paid to the physical properties of the powder, ensuring its particle size is fine enough to clean effectively without causing unnecessary abrasion. Beyond the science, there is a compelling human story here too. Supporting this product also means supporting local farmers who grow the very ingredients that make it work. In that sense, this small tin of herbal powder carries a much larger promise: that natural, sustainable solutions can absolutely hold their own in the future of personal care.

Objectives:

1. To formulate a safe, herbal, chemical-free tooth powder using areca nut as the primary ingredient.
2. To reduce dependency on synthetic oral-care products containing harmful chemicals.
3. To validate oral health benefits such as gum health improvement, stain reduction, and sensitivity relief.
4. To study market feasibility and develop a sustainable business and distribution model.
5. To create a scalable and affordable oral-care product for mass adoption.

Methodology:

1. The first step in bringing this formulation to life was making sure that every ingredient entering the process was of the highest possible quality. Areca nut was carefully sourced from local certified growers who could vouch for its botanical authenticity, while supporting herbs like clove, peppermint, neem, and rock salt were obtained from trusted and verified suppliers. Each ingredient was thoroughly washed, slowly dried in the shade to preserve its natural properties, and then ground into a fine powder using a laboratory pulverizer. The powders were sieved to ensure an even, consistent texture that would ultimately feel comfortable and safe inside the mouth.
2. With the ingredients ready, the next priority was understanding exactly what was inside them. A detailed phytochemical screening was carried out to map out the key active compounds — tannins, flavonoids, alkaloids, and saponins — that give these herbs their medicinal character. Of particular concern was arecoline, a naturally occurring alkaloid in areca nut that can be harmful in higher concentrations. Using High Performance Liquid Chromatography, its levels were carefully measured and the formulation was fine-tuned until everything fell within safe limits. From there, the team began the hands-on work of blending — mixing the areca base with the chosen herbs in different ratios, tasting, testing, and adjusting until the texture, color, scent, and feel were just right. Peppermint oil and clove extract were added not just for their therapeutic value but also to give the powder a pleasant, familiar freshness that everyday users would actually enjoy.
3. Once a satisfying formulation was achieved, it was put through a thorough round of quality checks covering everything from pH levels and moisture content to how smoothly the powder flows and how gently it interacts with tooth enamel. Its ability to fight harmful bacteria like *Streptococcus mutans* and *Candida albicans* was then tested in the laboratory, confirming that it could genuinely protect against cavities and oral infections. Careful safety evaluations were also conducted to ensure the powder would not irritate or harm the delicate tissues inside the mouth. The formulation was then stored under different temperature and humidity conditions over time to understand how well it holds up on a shelf and what kind of packaging would keep it stable longest. Rounding everything out, a practical market study was conducted — speaking with potential consumers, calculating production costs, and exploring the

best ways to get the product into people's hands, whether through local stores or online platforms

Result and Conclusion:

The herbal tooth powder prototype that emerged from months of careful research and formulation work proved to be a genuinely promising product, one that passed every quality checkpoint placed before it. The pH sat comfortably within the safe range for daily oral use, the powder's texture was fine and consistent enough to clean effectively without scratching enamel, and the moisture levels were stable enough to support a reasonable shelf life. More importantly, the bioactive compounds that make areca nut medicinally valuable, particularly its tannins and flavonoids, were well preserved in the final blend, while potentially harmful alkaloid levels were successfully reduced to safe concentrations. When tested against the bacteria most commonly responsible for cavities and oral infections, the formulation held its own, showing real inhibitory activity that gives it credibility as a functional oral care product rather than just a natural novelty. Safety evaluations added further confidence, confirming that the powder was gentle enough for regular contact with the sensitive tissues inside the mouth. On the commercial side, the picture was equally encouraging. Consumer surveys pointed to a genuine and growing appetite for plant-based, chemical-free oral care in India, and the cost analysis showed that this product could realistically reach everyday households without being priced out of reach. Perhaps most heartening was the realisation that sourcing areca nut locally could create a meaningful and steady income stream for farming families who have long grown the crop without this kind of value-added opportunity. Taken together, these findings make a compelling case that areca-based herbal tooth powder is not just scientifically sound but socially purposeful, a clean, scalable, and community-rooted solution that bridges ancient botanical wisdom with the very real oral health needs of the modern world.

Project Outcome & Industry Relevance:

This project addresses the growing market demand for chemical-free, herbal oral-care products by developing an areca-based tooth powder that is safe, sustainable, and cost-effective. It supports the oral-care industry with a viable natural alternative while strengthening agro-based supply chains and adding value to areca farmers. For the institution, the project promotes research, innovation, and entrepreneurship, offering students hands-on experience in product formulation, testing, and market analysis, while enhancing the institution's contribution to community development and sustainable practices.

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Future Scope:

The next logical step is to advance the formulation into clinical trials and pursue AYUSH certification to build the regulatory credibility needed for large-scale market entry. The product line could be expanded to include herbal mouthwashes and gum gels, while incorporating additional botanicals like babool, miswak, and tulsi to strengthen its therapeutic range. Sustainable, compostable packaging could further reinforce its eco-friendly identity and appeal to the growing base of environmentally conscious consumers. Building partnerships with farmer cooperatives and rural self-help groups would complete the vision.