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Research Article

Formulation and Evaluation of Polyherbal Chewable Tablets for Reducing Nicotine Dependence

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Nicotine dependence is one of the major public health concerns worldwide and is associated with smoking-related disorders such as lung cancer, cardiovascular diseases, chronic obstructive pulmonary disease, and psychological dependence. The present research work focused on the formulation and evaluation of polyherbal chewable tablets for reducing nicotine dependence using natural herbal ingredients including Glycyrrhiza glabra, Foeniculum vulgare, and Elettaria cardamomum. The tablets were formulated using direct compression technique with suitable pharmaceutical excipients. Pre-compression parameters such as bulk density, tapped density, angle of repose, Carr's index, and Hausner's ratio were evaluated to determine flow properties of the powder blend. Post-compression evaluation included hardness, friability, weight variation, thickness, disintegration time, dissolution study, and antioxidant activity using DPPH assay. The optimized batch showed satisfactory pharmaceutical properties within acceptable pharmacopoeial limits. The results indicate that polyherbal chewable tablets may provide a safer, economical, and patient-friendly alternative for smoking cessation therapy.

Keywords: Nicotine dependence, Polyherbal formulation, Herbal tablets, Glycyrrhiza glabra, Smoking cessation, DPPH assay, Antioxidant activity.

INTRODUCTION

Nicotine dependence is a chronic addictive disorder caused by continuous consumption of tobacco products such as cigarettes, cigars, bidis, and smokeless tobacco. Nicotine stimulates dopamine release in the brain reward pathway, resulting in temporary pleasure and relaxation. Repeated use of nicotine leads to tolerance, dependence, and withdrawal symptoms such as anxiety, irritability, headache, and strong craving. Tobacco addiction has become a serious healthcare issue worldwide because of its harmful effects on respiratory and cardiovascular systems. Conventional treatments for nicotine addiction include nicotine replacement therapy, nicotine gum, nicotine patches, behavioral therapy, and medications such as bupropion and varenicline. However, these therapies are associated with several disadvantages including side effects, relapse, high treatment cost, and poor patient compliance. Herbal medicines are increasingly preferred because of their natural origin, reduced toxicity, and economical nature. Polyherbal formulations combine multiple medicinal plants to achieve synergistic therapeutic effects. Glycyrrhiza glabra helps reduce nicotine craving and provides soothing activity. Fennel acts as a carminative and refreshing agent, while cardamom improves mouth freshness and taste masking. Chewable tablets were selected as the dosage form because they improve patient compliance, provide pleasant taste, and allow rapid drug release in the oral cavity.

LITERATURE REVIEW

Benowitz reported that nicotine is a highly addictive substance that stimulates dopamine release and causes psychological and physical dependence. Kamboj emphasized the importance of herbal medicines and stated that polyherbal formulations show synergistic therapeutic action with fewer side effects.

Khandelwal explained various methods for standardization and phytochemical evaluation of herbal drugs. Banker discussed the importance of excipients in chewable tablet formulations and highlighted evaluation parameters such as hardness, friability, and disintegration time. Kokate described the pharmacological activities of Glycyrrhiza glabra, fennel, and cardamom including antioxidant, anti-inflammatory, soothing, and flavoring properties. Previous studies confirmed the effectiveness of herbal formulations in smoking cessation and nicotine dependence management.

MATERIALS AND METHODS

The formulation contained Glycyrrhiza glabra powder, fennel powder, cardamom powder, mannitol, lactose, talc, magnesium stearate, starch, and HPMC. Herbal powders and excipients were passed through sieve no. 40 to achieve uniform particle size. The direct compression method was used for tablet preparation. The powders were blended uniformly in a mortar and pestle. Lubricants and glidants were added at the final stage of mixing. The prepared blend was compressed using a tablet punching machine.

Pre-compression evaluation included:

- Bulk density
- Tapped density
- Angle of repose
- Carr's index
- Hausner's ratio

Post-compression evaluation included:

- Thickness
- Hardness
- Weight variation
- Friability
- Disintegration test
- Dissolution study

DPPH assay was performed to evaluate antioxidant activity of the formulation using UV spectrophotometer at 517 nm.

4. Phytochemical Screening

Phytochemical screening confirmed the presence of various bioactive constituents including alkaloids, flavonoids, tannins, steroids, and saponins. These phytoconstituents are responsible for antioxidant, anti-inflammatory, anti-craving, and therapeutic activities. Dragendorff's test confirmed alkaloids by formation of reddish-brown precipitate. Ferric chloride test confirmed tannins by development of dark green coloration. Stable foam formation indicated the presence of saponins. The phytochemical profile supports the medicinal value of the polyherbal formulation.

RESULTS AND DISCUSSION

The prepared tablets showed satisfactory flow properties and tablet characteristics. Batch F4 was considered the optimized formulation because it exhibited good flowability and acceptable pharmaceutical properties.

Pre-compression parameters:

- Bulk density: 0.54 g/mL
- Tapped density: 0.63 g/mL
- Carr's index: 14.28%
- Hausner's ratio: 1.16
- Angle of repose: 29.4°

Post-compression parameters:

- Hardness: 4.5 kg/cm²
- Thickness: 4.2 mm
- Friability: 0.76%
- Weight variation: 2.38%
- Disintegration time: 18 min
- Dissolution: 83.31%

The antioxidant activity observed in DPPH assay indicated strong free radical scavenging activity. This suggests that the herbal ingredients may help reduce oxidative stress associated with nicotine dependence. The chewable tablets also demonstrated good mouthfeel, pleasant taste, and better patient compliance.

7. Advantages of Polyherbal Chewable Tablets

The developed formulation provides several advantages over conventional nicotine replacement

therapies. Herbal medicines are economical, safe, and associated with fewer side effects. The chewable tablet dosage form improves patient compliance and convenience. Polyherbal formulations provide synergistic action and improve therapeutic efficacy. The use of Glycyrrhiza glabra may reduce tobacco craving, while fennel and cardamom improve palatability and freshness. The antioxidant activity of the herbs may help reduce oxidative stress caused by smoking.

CONCLUSION

The present research successfully formulated and evaluated polyherbal chewable tablets for reducing nicotine dependence. The optimized formulation demonstrated acceptable pre-compression and post-compression properties within pharmacopoeial limits. The herbal ingredients exhibited antioxidant and anti-craving properties which may help in smoking cessation therapy. The study concludes that polyherbal chewable tablets may serve as a promising, safer, economical, and patient-friendly alternative for reducing nicotine dependence and improving patient compliance.

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