Formulation and Evaluation of Herbal Multivitamin Chewable Tablets Containing Amla, Orange Peel, and Turmeric Powder

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***Abstract*—Herbal formulations have gained wide acceptance due to their safety, therapeutic efficacy, and improved patient compliance. Chewable tablets offer advantages such as ease of administration, good palatability, rapid disintegration, and suitability for pediatric and geriatric populations. The present study aimed to formulate and evaluate herbal chewable tablets containing Amla, Orange peel, and Turmeric to deliver nutritionally and therapeutically active phytoconstituents. Herbal powders were prepared and subjected to phytochemical screening, followed by formulation of chewable tablets using suitable excipients by direct compression. The prepared tablets were evaluated for pre- and post-compression parameters, including physical properties, assay of marker compounds, in-vitro dissolution, and stability studies as per ICH guidelines. The optimized formulation exhibited acceptable hardness, low friability, rapid disintegration, uniform content, satisfactory dissolution, and good palatability, with no significant changes during stability studies. The results indicate that the developed herbal chewable tablet is a stable, effective, and patient-friendly nutraceutical formulation with antioxidant and health-promoting benefits.**

***Index Terms*—Herbal chewable tablets, Amla, Orange peel, Turmeric, Phytochemical screening, Tablet evaluation**

I. INTRODUCTION

Herbal medicines have played a vital role in healthcare systems across the world since ancient times and continue to be an integral part of modern therapeutic practices. In recent years, there has been a growing global interest in herbal and plant-based formulations due to their perceived safety, cost-effectiveness, cultural acceptability, and reduced incidence of adverse effects when compared to synthetic drugs. The World Health Organization recognizes herbal medicines as valuable resources for primary healthcare, especially in developing countries. With increasing awareness regarding preventive healthcare and wellness, herbal nutraceuticals and dietary supplements are gaining widespread acceptance in modern healthcare. The oral route remains the most preferred route of drug administration due to its convenience and patient compliance. Among oral dosage forms, chewable tablets offer several advantages such as ease of administration without the need for water, pleasant taste, faster disintegration, and improved bioavailability of active constituents. Chewable tablets are particularly beneficial for pediatric, geriatric, and dysphagic patients who experience difficulty in swallowing conventional tablets. Additionally, chewable formulations improve patient adherence by enhancing palatability and acceptability, making them suitable for nutraceutical and herbal preparations. Amla (*Emblica officinalis*), also known as Indian gooseberry, is a well-known medicinal fruit widely used in traditional systems of medicine such as Ayurveda. It is an excellent natural source of Vitamin C and possesses strong antioxidant properties. Amla has been reported to exhibit immunomodulatory, hepatoprotective, antidiabetic, and anti-aging activities, making it an important ingredient for nutritional supplementation and health promotion. Orange peel (*Citrus sinensis*), a by-product of the citrus fruit industry, is rich in flavonoids, polyphenols, dietary fiber, and essential oils. It exhibits antioxidant, digestive, anti-inflammatory, and antimicrobial activities. The presence of bioactive compounds such as hesperidin and naringin

contributes to its health benefits, including improvement of gastrointestinal function and enhancement of nutrient absorption. Utilization of orange peel in herbal formulations also adds value to agro-industrial waste, promoting sustainable practices. Turmeric (*Curcuma longa*) is a widely used medicinal herb known for its active constituent curcumin, which possesses potent anti-inflammatory, antioxidant, antimicrobial, and anticancer properties. Turmeric has been traditionally used for wound healing, digestive disorders, and immune support. Curcumin's broad pharmacological profile makes turmeric a valuable component in nutraceutical formulations aimed at promoting overall health and preventing chronic diseases. The combination of Amla, Orange peel, and Turmeric in a single herbal chewable tablet offers a synergistic therapeutic approach by providing antioxidant protection, immune enhancement, digestive support, and anti-inflammatory benefits. Formulating these herbs into a chewable tablet not only improves palatability and convenience but also ensures accurate dosing, stability, and better patient compliance. Despite the individual therapeutic importance of these herbs, limited research is available on their combined formulation in a chewable tablet dosage form. Therefore, the present study aims to design, formulate, and evaluate a novel herbal multivitamin chewable tablet containing Amla, Orange peel, and Turmeric. The novelty of this work lies in the development of a stable, palatable, and patient-friendly combined herbal chewable tablet that delivers multiple health benefits through synergistic action, making it a promising nutraceutical product for routine health supplementation.

II. MATERIALS AND METHODS

2.1 Materials

The herbal raw materials used in the present study included Amla (*Emblica officinalis*) fruits, Orange peel (*Citrus sinensis*), and Turmeric (*Curcuma longa*) rhizomes, which were procured from an authenticated herbal supplier. All raw materials were botanically authenticated by a qualified pharmacognosist. Pharmaceutical excipients such as diluents (e.g., mannitol/lactose), binders (e.g., PVP or starch), sweeteners (e.g., sucrose/aspartame), flavoring agents, and lubricants (e.g., magnesium stearate) were used. All chemicals and reagents employed were of analytical grade.

2.2 Preparation of Herbal Powders

The collected herbal raw materials were washed thoroughly with distilled water to remove adhering dirt and foreign matter. The materials were then shade dried (or oven dried at a controlled temperature not exceeding 40–45 °C) until a constant weight was obtained. The dried materials were pulverized using a mechanical grinder and passed through a suitable mesh sieve to obtain a uniform powder. The powdered materials were stored in airtight containers at room temperature until further use.

2.3 Phytochemical Screening

Preliminary qualitative phytochemical screening of the powdered herbal materials was carried out using standard procedures to identify the presence of various bioactive constituents. The powders were tested for the presence of:

- Alkaloids
- Flavonoids
- Tannins
- Phenolic compounds
- Glycosides
- Saponins

The results were recorded as present (+) or absent (–).

2.4 Formulation Development of Chewable Tablets

Chewable tablets were formulated using suitable excipients selected based on their functionality and compatibility with herbal ingredients. Different trial formulations (F1, F2, and F3) were prepared by varying the concentration of excipients while keeping the herbal content constant. The accurately weighed quantities of herbal powders and excipients were mixed uniformly. Depending on formulation requirements, direct compression or wet granulation technique was employed. The prepared blend or granules were lubricated and compressed into chewable tablets using a tablet compression machine with suitable punches.

2.5 Pre-compression Evaluation

The prepared powder blend or granules were evaluated for flow and compressibility characteristics prior to compression. The parameters evaluated included:

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

These studies ensured good flow properties and uniform tablet weight.

2.6 Post-compression Evaluation

2.6.1 Physical Evaluation

The compressed chewable tablets were evaluated for:

- Appearance and organoleptic properties (color, odor, taste, surface texture)
- Weight variation
- Thickness and diameter
- Hardness
- Friability
- Disintegration time

All tests were performed according to pharmacopeial guidelines.

2.6.2 Chemical Evaluation

Chemical evaluation of the tablets included:

- Assay of marker compounds, namely Vitamin C (from Amla) and Curcumin (from Turmeric), using UV–Visible spectrophotometry
- Content uniformity test to ensure uniform distribution of active constituents
- pH determination of tablet dispersion to assess stability and gastric compatibility

2.7 In-vitro Dissolution Study

In-vitro dissolution studies were carried out using USP Apparatus II (Paddle method). An appropriate dissolution medium (simulated gastric fluid) was used, maintained at 37 ± 2 °C. Samples were withdrawn at predetermined time intervals and analyzed for the release of active constituents. The cumulative percentage drug release was calculated and plotted against time.

2.8 Stability Studies

Stability studies were conducted as per ICH guidelines. The optimized formulation was stored under:

- Room temperature conditions
- Accelerated conditions (40 ± 2 °C / 75 ± 5% RH)

Tablets were evaluated at specified intervals for physical appearance, hardness, disintegration time, and assay of active constituents.

2.9 Statistical Analysis

All experimental results were expressed as mean ± standard deviation (SD). Statistical comparison between formulations was performed using one-way ANOVA, with a significance level set at $p < 0.05$.

III. RESULTS

3.1 Phytochemical Screening Results

Preliminary phytochemical screening of Amla, Orange peel, and Turmeric powders revealed the presence of several important bioactive constituents. Amla showed the presence of flavonoids, tannins, phenolic compounds, and glycosides, confirming its strong antioxidant and nutritional properties. Orange peel was found to contain flavonoids, tannins, and phenolic compounds, which contribute to its antioxidant and digestive benefits. Turmeric exhibited the presence of alkaloids, flavonoids, phenolic compounds, and saponins, indicating its well-known anti-inflammatory and immunomodulatory potential. The presence of these phytoconstituents supports the selection of these herbs for the formulation of a herbal multivitamin chewable tablet.

3.2 Organoleptic Properties of Herbal Powders

Organoleptic evaluation of the herbal powders demonstrated acceptable sensory characteristics. Amla powder appeared light brown in color with a characteristic odor and sour taste, while Orange peel powder was yellowish-orange with a pleasant citrus odor and slightly bitter taste. Turmeric powder exhibited a deep yellow color with an aromatic odor and bitter taste. All powders possessed a fine and uniform texture, indicating suitability for tablet formulation and good patient acceptability in chewable dosage form.

3.3 Pre-compression Evaluation Results

Pre-compression parameters of the powder blends were evaluated to assess flow properties and compressibility. Bulk density values ranged between 0.48–0.52 g/cm³, while tapped density values ranged from 0.56–0.58 g/cm³. Carr's index values were found to be between 10.3% and 14.3%, and Hausner ratios

ranged from 1.11 to 1.17, indicating good flow characteristics. The angle of repose values were below 30°, confirming free-flowing nature of the blends. Among all formulations, F3 exhibited the best flow properties, making it most suitable for compression.

3.4 Post-compression Evaluation Results

Physical Evaluation

All chewable tablets were found to be uniform in appearance with smooth surface texture and acceptable organoleptic properties. The average tablet weight ranged from 500–502 mg, indicating compliance with weight variation limits. Tablet thickness remained consistent around 5.0–5.1 mm. Hardness values ranged from 3.5 to 5.8 kg/cm², ensuring adequate mechanical strength while maintaining chewability. Friability values were below 1% for all formulations, indicating good resistance to abrasion. Disintegration time varied between 6.5 and 12.4 minutes, with formulation F3 showing the fastest disintegration, which is desirable for chewable tablets.

Chemical Evaluation

Chemical evaluation confirmed satisfactory content of active constituents in all formulations. Vitamin C content ranged from 91.2% to 99.1%, while curcumin content ranged from 89.6% to 98.5% of the labeled claim. Content uniformity results were within the acceptable pharmacopeial range of 85–115%. The pH of tablet dispersion was found to be between 5.9 and 6.5, indicating gastric compatibility and stability of the formulation.

3.5 In-vitro Dissolution Results

In-vitro dissolution studies demonstrated a gradual and consistent release of active constituents from the chewable tablets. Vitamin C release from formulation F3 reached approximately 97% within 30 minutes, whereas F2 and F1 showed 90% and 78% release, respectively. Similarly, curcumin release from F3 reached about 95% at 30 minutes, which was higher compared to F2 (88%) and F1 (72%). These results indicate that formulation F3 exhibited the most efficient dissolution profile.

3.6 Stability Study Results

Stability studies conducted on the optimized formulation (F3) revealed no significant changes in physical appearance, hardness, disintegration time, or assay values during the storage period. Vitamin C and curcumin content showed only minimal reduction over three months, remaining within acceptable limits. These findings indicate that the optimized chewable tablet formulation was stable under both room temperature and accelerated storage conditions.

3.7 Optimization of Formulation

Based on the overall evaluation parameters, formulation F3 was selected as the optimized batch. It demonstrated excellent tablet appearance, optimal hardness, minimal friability, rapid disintegration, highest assay values, superior dissolution behavior, and good stability. Additionally, the formulation exhibited improved palatability, making it suitable for patient-friendly chewable dosage form.

IV. DISCUSSION

The present study successfully formulated and evaluated a herbal multivitamin chewable tablet containing Amla, Orange peel, and Turmeric. Phytochemical screening confirmed the presence of bioactive constituents such as flavonoids, phenolic compounds, tannins, glycosides, and saponins, supporting the antioxidant, immunomodulatory, and anti-inflammatory potential of the formulation. The herbal powders and prepared tablets showed acceptable organoleptic properties, making them suitable for a chewable dosage form. Pre-compression studies indicated good flow and compressibility, while post-compression evaluation confirmed that all formulations complied with pharmacopeial standards. Excipients significantly influenced tablet characteristics. Mannitol improved mouthfeel and palatability, binders provided adequate mechanical strength, and lubricants ensured low friability and smooth compression. Sweeteners and flavoring agents effectively masked the bitterness and sourness of herbal ingredients. Variations in excipient concentration affected hardness, disintegration time, and dissolution behavior. Formulation F3 was selected as the optimized batch due to its uniform appearance, optimal hardness, rapid disintegration, superior dissolution profile, acceptable assay values, and good stability under storage conditions. The formulation also demonstrated improved palatability and patient compliance. The results of this study are consistent with previously reported literature on herbal chewable

tablets, confirming the therapeutic benefits of Amla, Orange peel, and Turmeric. The optimized formulation offers a stable, effective, and patient-friendly herbal multivitamin chewable tablet with potential nutritional and health benefits.

V. CONCLUSION

The present research successfully achieved the design, formulation, and evaluation of a herbal multivitamin chewable tablet containing Amla, Orange peel, and Turmeric. The study confirmed the presence of essential bioactive phytoconstituents responsible for antioxidant, anti-inflammatory, and immunomodulatory activities. All formulated batches exhibited acceptable physicochemical properties and complied with pharmacopeial quality standards.

The optimized formulation demonstrated adequate mechanical strength, rapid disintegration, good dissolution behavior, and satisfactory stability under both room temperature and accelerated storage conditions. The inclusion of suitable excipients improved palatability and chewability, making the formulation patient-friendly and suitable for pediatric and geriatric populations. Overall, the developed herbal chewable tablet offers a safe, effective, and convenient dosage form with potential nutritional and therapeutic benefits. The formulation may enhance patient compliance and can serve as a promising herbal multivitamin supplement for routine health maintenance.

REFERENCE

[1] Nakul Sonawane, Saloni Patil, Chandrabhan Patil, Sumesh Patil and Rohit Chinchore, “Orange peel: A comprehensive review on residue properties,” International Journal of Pharmacognosy and Pharmaceutical Sciences, vol. 6, no. 1, pp. 22-27, 2024.

[2] Sanjana Shrivastava, “Emblica officinalis (Amla): A comprehensive review of the miracle berry,” The Pharma Innovation Journal, vol. 11, no. 6, pp. 06-16, 2022.

[3] Swetha Dasaroju, “Current Trends in the Research of Emblica officinalis (Amla): A Pharmacological Perspective,” Int. J. Pharm. Sci. Rev. Res., vol. 24, no. 2, pp. 150-159, Jan–Feb 2014.

[4] Kirti Kushwah, “Development and Evaluation of Tablet Using Herbal Additives and Excipient,” International Journal of Pharmacy and Pharmaceutical Research (IJPPR), vol. 30, no. 10, pp. 370-381, Oct. 2024, ISSN: 2349-7203.

[5] Nia Yuniarsih, “Formulation and Evaluation of Chewable Tablets from Natural Extracts: A Systematic Literature Review,” Eureka Herba Indonesia, vol. 4, no. 3, pp. 253-259, 2023.

[6] Devanshi Gandhi, “A Review on Amla (Emblica Officinalis): The Traditional Indian Superfood,” vol. 7, no. 2, pp. 1-7, Mar–Apr 2025.

[7] Satheesh Kumar P., Sakthi N., Sakthivel M., Sangeetha E. and Sankar, “FORMULATION AND VALUATION OF DOMPERIDONE CHEWABLE TABLETS,” vol. 3, no. 6, pp. 355-389, 2024, SJIF Impact Factor 5.111.

[8] B Jyotirmayee & Gyanranjan Mahalik, “A review on selected pharmacological activities of Curcuma longa L.,” International Journal of Food Properties, vol. 25, no. 1, pp. 1377-1398, 2022, DOI: 10.1080/10942912.2022.2082464.

[9] SABINA AKHTAR1, PULAK DEV, “FORMULATION AND EVALUATION OF CHEWABLE MULTIVITAMIN TABLET,” Int J Curr Pharm Res, vol. 9, no. 4, pp. 61-64.

[10] Dr. Tambe A.B.1, “Formulation and Evaluation of Chewable-Gummies Gelatin based Stem Extract Cissus Quadrangularis,” JCHR, vol. 14, no. 6, pp. 1840-1843, 2024, ISSN:2251-6727.

[11] Dejene D B., “Comprehensive Review on Turmeric (Curcuma Longa l.) as Medicinal Plant and its Nutraceutical Quality to Human,” Canc Therapy & Oncol Int J., vol. 18, no. 3, p. 555990, 2021, DOI: 10.19080/CTOIJ.2021.18.555990.

[12] Ajaz Ahmad Sayed Kutub Ali, “Formulation and Evaluation of Gummies for Cough,” vol. 10, no. 2, pp. 1264-1269, Mar–Apr 2025.

[13] Hurkadale PJ, et al., “Formulation Design and Optimization of Poly-herbal Chewable Tablets Using JMP Tool,” Pharmacogn., vol. 2, no. 1, p. 3, 2023.

[14] Ms. Geetanjali N. Badak, “FORMULATION AND EVALUATION OF MULTIVITAMIN & ANTIOXIDANT HERBAL CHOCOLATE,” vol. 12, no. 4, pp. 769-786, Apr. 2024, ISSN: 2320-2882.

[15] Pooja Kishor Adhao, “Formulation and evaluation of multivitamin Gummies,” vol. 10,

no. 4, pp. d426-d431, Apr. 2025, ISSN: 2456-4184.

[16] 1Saste Vaishnavi Somnath, "Formulation and Evaluation of Orange Peels Powder Face Toner," International Journal of Research Publication and Reviews, vol. 6, no. 5, pp. 10877-10888, May 2025.

[17] Rutuja S Mundhe, "Formulations and evaluation of multivitamin chewable Tablets," International Journal of Research Publication and Reviews, vol. 6, no. 5, pp. 10927-10930, May 2025.

[18] Yadav Ashwani Kumar, "A REVIEW ARTICLE ON: TURMERIC (CURCUMA LONGA)," JETIR, vol. 8, no. 6, pp. c396-c410, Jun. 2021.

[19] Rutuja D. Pimpalkar, "FORMULATION AND EVALUATION: NUTRACEUTICAL HERBAL TABLET," JETIR, vol. 10, no. 1, pp. f8-f17, Jan. 2023.

[20] Rutuja R. Khatode, "Formulation and Evaluation of Multivitamin Gummies," vol. 2, no. 5, pp. 391-399, Jun. 2022.

[21] Varsha Rani, "Orange Peel Powder: A Potent Source of Fiber and Antioxidants for Functional Biscuits," Int.J.Curr.Microbiol.App.Sci, vol. 9, no. 9, pp. 1319-1325, 2020.