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**Review Article**

# An Overview Of Pharmacological Action On Herbal Chewable Tablets

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## ABSTRACT

Herbs are defined as plants or plant parts (leaves, flowers, or seeds) with flavouring, medicinal, or fragrant qualities. Usually, they are grown for their aromatic, culinary, or medicinal properties. Traditionally, local or regional healing techniques have used naturally occurring plant-derived substances with little to no industrial processing to treat illnesses. Since ancient times, phyto-medicines have been an essential source of medication; as a result of their therapeutic activity and lower side effects than other medications, their use has expanded. Chewable pills that must be broken up and gnawed on in between teeth before consumption. Both people who detest swallowing and youngsters who have trouble swallowing are prescribed these medications. Chewable tablets are designed to dissolve smoothly in the mouth at a moderate pace, either with or without actual chewing. They often have a smooth texture when they dissolve, taste well, and leave no aftertaste. It is easy-to-swallow dosage forms, such as Chewable pills, are especially necessary for patients who are elderly, young, or traveling and may not always have access to water. A formulator can combine formula and procedure to produce a product with good organoleptic qualities by using one or more approaches. When creating Chewable tablet formulations using natural ingredient extracts, extra care must be taken to ensure that the active ingredients' stability and purity are maintained.

## INTRODUCTION

Ancient Hindu saints and healers combined their knowledge to create Ayurveda, which developed into a medical science. The traditional system, sometimes referred to as indigenous, folk or alternative medicine, consists of medical knowledge and disease-treating practices based on various cultures and ethnicities. However, the primary goal of ancient Ayurveda was to promote health rather than to treat illness. [1] Herbal medicine is gaining popularity all over the world. It is a crucial part of complementary and alternative medicine and a great place to find novel

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drugs [2]. The drug delivery technology is applied in herbal medicine, it may help in increasing the efficacy and reducing the side effects of various herbal compounds and herbs. [3] Approximately 75–80% of the world's population still relies mostly on herbal therapy for primary healthcare, particularly in underdeveloped nations. This is primarily due to the widespread perception that herbal medications are safe, affordable, and readily available in one's community without any negative effects. [4] Oral pharmaceutical administration is the preferred method since it is stable, easy to make, and most convenient for people requiring long-term care. [5] The finest and most recommended method of delivering therapeutic medicines for systemic therapy is through oral formulation. Solid oral formulations are extensively used and chosen by patients for a variety of reasons, including ease of swallowing, portability, compactness, non-invasiveness, self-administration, relative physical and chemical stability. Although developing novel medications that have adequate systemic absorption is getting more challenging, oral drug delivery is still the cornerstone of patient care. In order to try for a more predictable result, the field of oral administration thus constitutes a significant area of innovation for pharmaceutical formulation, including altering solubility, taking advantage of windows of absorption, and robustly enhancing bioavailability. [6] Drug delivery through oral means is the most widely used and simple approach. Traditional pills or capsules are difficult for confined to bed, elderly, or paediatric patients to swallow due to the medication's incompatibility. They also find it difficult to tolerate the taste of many medications when they are made into liquid dosage forms, which leads to poor patient compliance in order to overcome these incompatibilities Chewable tablets are emerged, these are flexible dosage form with a number of benefits, including patient-centered medication, ease of ingesting, stability advantages over traditional dosage forms [7] In order to develop such dosage forms different compression techniques are employed such as, direct compression, dry granulation, wet granulation, melt granulation, active coating and spray-drying.[8] The evaluation of Chewable tablet was done by using the pre- compression and post-compression parameters. [9] [10] Thus, the Chewable tablets with added advantages with addition of herbal ingredients plays major role in emphasising the disadvantages of other traditional dosage forms.

## MEDICINAL HERBS


**Figures A- I List of medicinal herbs**

**Table 1: Important herbal medicine and its pharmacological activity**

| Sr. No | HERB | SOLVENT USED | PLANT PART | PHARMACOLOGICAL ACTIVITY | Ref. |
|---|---|---|---|---|---|
| 1 | Perilla frutescens (l) Britton | Distilled water | Leaf | Lower risk of cardiovascular disease and cancer | [11] |
| 2 | Quercetin from Camellia sinensis | Ethanol | fruits | Gastric ulcers | [12] |
| 3 | Camellia sinensis | Ethanol | Leaf | Anti-viral activity, analgesic activity,Anti-inflammatory activity,Anti-mutagenicity | [13] |
| 4 | Fiscus auriculata | - | Leaf and fruits | Anti-oxidant activity | [14] |
| 5 | Zingiber officinale | Distilled water | Rhizome | Anti-oxidant,Anti-microbial,Anti-diabetic | [15] |
| 6 | Punica granatum | Ethanol | Peel powder | Anti-microbial activity | [16] |
| 7 | Liquorice, ginger, turmeric | - | Stem , dried rhizome | Cough relieving activity | [17] |
| 8 | Acacia utriculiform | - | Acacia catechu extract | Mouth ulcers | [18] |
| 9 | Boswellia, | - | Branches | Treatment of osteoarthritis | [19] |
| 10 | Curcuma longa, Foeniculum | Mannitol | Rhizome and seeds | Carminative | [20] |

| | | | | | |
|---|---|---|---|---|---|
| | vulgare, Curcuma amada | | | | |
| 11 | Piper nigrum Linn, Cuminum cyminum L, Zingiber officinalr Rosc. | Alcohol, Water | Fruit , Rhizome | Digestive Activity | [21] |
| 12 | Curacao Aloe | Ethanol | Leaves | Laxative agent, Diabetes mellitus, Purgative | [22] |
| 13 | Psidium guajava L | Distilled water | Leaves | Anti-carcinogenic | [23] |
| 14 | Emblica officinalis | Ethyl alcohol | Fruit pulp | Gastroprotective | [24] |
| 15 | Piper longum | Diethyl ether and Menthol | Fruits | Treatment of digestive disorders and respiratory problem | [25] |
| 16 | Ocimum tenuiflorum | Ethanol | Leaves | Diabetic mellitus | [26] |
| 17 | Semecarpus anacardium(linn.) | Ethanol | Stem bark | Anti-diabetic ( natural sugar lowering compound) | [27] |
| 18 | Syzgium cumini | Ethanol | Seed | Active against Escherichia cell and Bacillus subtilis | [28] |
| 19 | Fragaria vesca and Vitis vinifera | Mannitol | Leaves | chronic inflammatory and Degenerative liver conditions | [29] |
| 20 | Hemidesmus indicus | Hydro-alcoholic solvent | Dried plant | Anti-oxidant and Anti-inflammatory | [30] |
| 21 | Clerodendrum serratum | Ethanol | Root and Leaves | Common cold, Chronic sinusitis, allergic rhinitis | [31] |
| 22 | Piper nigrum | Hydroalcoholic solvent | Dry seeds | Treatment of oral infections | [32] |
| 23 | Carica papaya starch and banana starch | - | Dried powder of papaya | Relieve from Peptic ulcer | [33] |
| 24 | Syzygium aromaticum | Mannitol | Dried flower buds | Dental analgesic, carminative, Anti-septic | [34] |
| 25 | Panax quinquefolius | Mannitol | Fleshy root | Anti-tumour and Anti- stress | [35] |

**Pharmacological activity for the selected herbals plants :-**

1. Jinhong Wu et al., developed a leaf aqueous extract for the preparation and nutritional characterization of a Chewable Perilla tablet to reduce the risk of cancer and cardiovascular disease. The homology of food and medicine, Perilla, has a very high exploitation potential. This study effectively established a method for preparing Perilla Chewable tablets using wet granulation methods to create a granules and it identified the ideal product formula discovered by an orthogonal test. When the full nutritional composition of Perilla

Chewable pills was examined, the findings indicated that the tablets were high in vital vitamins and minerals that are beneficial to human health, particularly when it comes to promoting calcium supplementation. [11]

2. Suputra Bunlung et al., evaluated the liquid and Chewable tablet dosage forms, raft-forming gastro-retentive systems with quercetin PVP K30 solid dispersions was created as a possible treatment for stomach ulcers. After being exposed to the acidic medium, both types of formulations showed favourable raft strength, prolonged flotation (>24 hours), and quick flotation (<1 minute). Both formulation methods showed sustained release of more than 80% of the quercetin content over the course of 8 hours in SGF at 37°C. At a dose of 15 µg/mL equivalent quercetin, the raft-forming liquid and tablet formulations preserved the high viability of both AGS and RAW 264.7 cells in culture. They also demonstrated Anti-inflammatory activity against LPS-stimulated RAW 264.7 cells and wound healing activity in the AGS cell monolayer "scratch" model. These results show how highly promising both raft. [12]
3. Oznur Karaoglu et al., developed a Chewable pill containing herbal extracts and propolis arrests. The Wuhan B.1.36 and Omicron BA.1.1 forms of the SARS-CoV-2 virus are also used for Anti-viral, analgesic, Anti-inflammatory, and Anti-mutagenic properties, with a 100% ethanol extract of Camellia sinensis leaf. The Chewable tablet form was developed to give a protective effect around the mouth and throat, where the SARS-CoV-2 virus first enters the body. This pill is safe to chew and can be used as a dietary supplement to prevent not just the SARS-CoV-2 virus, but also a variety of other bacterial or viral illnesses. [13]
4. Thangsei Nengneilhing Baite et al,.developed exploring gallic acid-rich leaf extract: Formulation and characterization of Anti-oxidant blends for Anti-oxidant activity based on Fiscus auriculata leaf and fruit extract. The formulations containing a higher concentration of hygroscopic components were sticky and unsuitable for tableting, while free-flowing formulations were formed into tablets. The disintegration times of all the tablets were less than 15 min, satisfying Indian Pharmacopoeia norms. The Anti-oxidant activity of the formulations increased with an increase in the extract. The formulations demonstrated good stability in acidic and alkaline environments. Findings from the present study showed that Anti-oxidant tablets with desirable properties can be prepared using plant extract. Anti-oxidant formulations was effectively created employing gallic acid-enriched extract as the active component. [14]
5. Shrishail M. Ghurghure et al., developed and evaluated Chewable tablets containing aqueous extract of Zingiber officinale for Anti-oxidant, Anti-bacterial, and Anti-diabetic properties utilising aqueous extract of rhizome. The study found that an aqueous extract of Zingiber officinale can be effectively tableted into Chewable tablets utilising concentrated syrup as a binder by using wet granulation method. The tablets produced excellent results for the majority of the criteria evaluated, including pre-compression parameters and Quality Control Tests of Formulated Tablets. [15]
6. Mrinalini C. Damle et al., formulated Chewable Tablets using Pomegranate Peel ethanolic extract for Anti-microbial activity against the gram positive bacteria Streptococcus mutans. The minimum inhibitory concentration was 6.24 mg/ml. A

Chewable tablet with 10x MIC pomegranate peel powder was tested for Anti-bacterial activity against Streptococcus mutans using the cup plate method. The study found that pomegranate peel extract, a natural Anti-bacterial source, can be used to create Chewable tablets that outperform mouthwashes due to their extended stay-in-mouth time, ensuring good Anti-bacterial activity and organoleptic properties. A Chewable tablet containing pomegranate peel powder extract could be used to treat dental caries. It has been shown that prepared Chewable tablets can be an effective dosage form for dental caries treatment. The activity was retained even after tablets were exposed to accelerated storage conditions of 400°C and 75% RH for three months. [16]

7. Vinayak Dasharath Gaikwad et al., developed the evaluation of herbal Chewable tablet for Cough Relieving Activity by extracting Liquorice, Ginger (dried rhizome) and Turmeric (stem) by using wet granulation method. Liquorice (Glycyrrhiza Glabra), Ginger (Zingiber Officinale), and Turmeric (Curcuma longa) are highly effective and necessary Ayurvedic (herbal) medicines that physicians recommend for cough treatment. Finally, the study found that these medication powders may be effectively tableted into Chewable tablets. The prepared tablets produced satisfactory results in all of the pre-compressional and post-compressional tests evaluated. As a result, it is considered that the designed Chewable pills may be a more effective alternative to traditional herbal usage. [17]
8. Bhardwaj P et al,. formulated Chewable Tablets of Acacia catechu extract as an alternative to Betel (Paan) for Mouth Ulcers. Formulation and In-vitro evaluation for Mouth Ulcers using Acacia catechu extract extraction. The overall results showed that the constructed Chewable tablets satisfied the specifications and performed satisfactorily in terms of drug release, chewing difficulty index, and other relevant factors. [18]
9. Sachin S Marihal et al., preparation and evaluation of a Chewable tablet utilised as a nutraceutical for osteoarthritis treatment, based on Boswellia branch extraction. Glucosamine HCl, Chondroitin Sulphate, and Boswellia are all marketed as nutraceuticals that are commonly used to treat osteoarthritis in both people and animals. Glucosamine HCl is a nutritional building block that aids in the formation of proteoglycans that sit within the gap in the cartilage. Chondroitin Sulphate functions as liquid magnets, attracting fluid into the proteoglycan molecule. Boswellia acts as an Anti-inflammatory agent. Hence it was felt prudent to formulate these drugs into Chewable tablets using suitable excipients. Different formulations were prepared using various concentrations of sweetener, binders and super disintegrant by direct compression method and evaluated for pre-compression and post-compression parameters. Among all the formulations, F-D-I(b) formulation shows the better pharmacological activity, which was characterized by FT-IR and subjected to accelerated stability studies according to ICH guidelines. FT-IR studies reveled that there is no interation between drug and polymers. Stability data indicated that there was no significant change in organoleptic properties, drug content and release profile. [19]
10. Bapan Banik et al., formulated and evaluated the Carminative Herbal Chewable Tablets based on carminative properties using mannitol extract of Curcuma longa, Foeniculum vulgare, and Curcuma amada seeds and rhizomes. Wet granulation and direct compression methods might be utilized

successfully to create tablet formulations. As a result, the current study proposes that equivalent data be generated for other herbal medications or Ayurvedic formulations, which is critical in industrial applications as well as meeting customer preferences and requests. It is considered that the created Chewable pills may be a more effective alternative to traditional herb usage. Furthermore, this research may illuminate the field of herbal technology in the future. [20]

11. PATEL HARDIKKUMAR B.et al evaluation of Hazmakar digestive tablet various parameters were tested the acid secretion activity, gastric motility activity and Anti-oxidant activity was carried out. Hazmakar digestive tablet consists of four ingredients which are powders of (Fruit), Zingiber officinale Rosc. (Rhizome), (Fruit) and Cuminum cyminum L. (Fruit) are used to elevate digestive process, gives relief from gas troubles and indigestion. Results point out that all raw materials of Hazmakar tablet has passed through all organoleptic, physicochemical, preliminary phytochemical screening and physical parameters. Hazmakar digestive tablet has acid secretion and gastric motility activity in dose dependent manner. [21]
12. Dito Galih Prasetyo et al. formulated a Chewable tablet using Aloe vera and 96% ethanolic leaf extract of Aloe vera. This investigation came to the conclusion that while ethanol does not alter consumer acceptance, variations in the excipient of Avicel PH 102 maltodextrins will effect the physical qualities of powder blends and Chewable tablet aloe vera extracts. [22]
13. S. Saraya, et al. developed a guava Chewable tablet formulation with an aqueous leaf extract of guava for Anti--cariogenic action. The research findings suggested that the 32× MIC tablet had the highest growth inhibitory efficacy against S.mutans. This makes it a promising candidate to be developed and applied as an Anti-plaque agent for the treatment of dental caries by the agar diffusion method. It can be made into consumer herbal oral hygiene items like dental floss, mouthwash, toothpaste, and chewing gum. The formulation ought to taste better, nevertheless, as the 32× MIC tablet's bitter taste and unpleasant mouthfeel are caused by the preparation's numerous organic medicinal components stimulating the bitter taste buds. [23]
14. Santhosh, S. B et al. the result shows that although, those results support the traditional use of P.guava for the treatment of dental caries, further study is required for this medicinal plant. The physico-chemical investigation of the Amalaki standard shows no foreign matter. Acid insoluble Ash: 0.51%w/w, Water soluble Ash: 2.01%w/w, Alcoholic Extractives: 44.48%, Aqueous Extractives: 67.52%, pH: 3.1, moisture content: 8.19%. The Chewable tablet underwent a quality control test and was found to be suitable in terms of general tablet characteristics such as hardness 1.8, disintegration time 15-20 min, friability 0.5%, and weight variation +/-3%. The TLC analysis of Amalaki powder revealed three spots with Rf values of 0.14, 0.4, and 0.73, while Chewable pills exhibited two spots with Rf values of 0.31 and 0.89 at 254 nm. The use of modern techniques or methods to convert Ayurvedic formulations without modifying their therapeutic properties is required to make them appropriate for current trends in novel medication delivery dosage forms. [24]
15. Shailendra Mani Tripati et al., developed of Chewable tablet of trikatu churna and standardization by densitometry for treatment

of digestive disorders and respiratory problem by using diethyl ether and menthol extract of Piper longum fruit. Due to its strong flavour and low compliance, trikatu churna is a very popular and effective ayurvedic composition that physician recommend for a variety of diseases. Therefore, it was determined to improve the organoleptic properties of the Chewable tablet, increases its shelf control analysis and quantitative assessment of the piperine and six-gingerol contain in the extract and tablet.The HPTLC method was created and validated approach standardizes newly developed dosage forms from traditional formulation with enhanced organoleptic qualities. [25]

16. Pawar, Harshal A et al. developed the Ocimum santum Linnoral Chewable tablets for Anti--diabetic properties with 70% ethanol extract of tulsi leaves by using the direct compression method. The study revealed that the proposed herbal formulations will improve bioavailability and patient compliance when compared to conventional tablets. Several allopathic tablets for cough and cold are available in market but contained high concentration of sucrose that are unacceptable for consumption by diabetic patients. [26]
17. Raquel Vieira et al. developed the Chewable tablet for Anti-diabetic activities utilising ethanol extract for Type 2 diabetes mellitus of Semecarpus anacarbium (linn.). The Anti--glycemic agents have shown poor effectiveness in maintaining a long-term glycemic control, thus being associated with severe adverse effects and leading to an emerging interest in natural compounds (e.g., essential oils and other secondary plant metabolites, namely, flavonoid-rich compounds) as a novel approach for prevention, management and/or treatment of either non-insulin-dependent diabetes mellitus (T2DM, type 2 DM) and/or Metabolic Syndrome (MS). Several of these prospective glucose-lowering medications will be thoroughly investigated. [27]
18. Palakurthi Sushesh Srivatsa et al. Syzygium cumini Seed Powder Chewable tablet was prepared and evaluated for Anti-bacterial activity using an ethanol extract of the seed. The study concluded that the FTIR measurements revealed no interaction between the seed powder and tablet excipients. The Anti-microbial experiments demonstrated that the formulation has Anti-bacterial efficacy against E. coli and B. subtilis. The Chewable tablet formulation has the potential to be employed as a nutraceutical based on criteria such as weight variation, hardness, friability, thickness, and disintegration rate. [28]
19. Tavakoli N et al. developed and evaluated a Chewable tablet including grapes and strawberry leaves for Chronic Anti-inflammatory action using mannitol extract. The study concluded that the tablet has acceptable physicochemical properties and might be used as a herbal therapy for several chronic inflammatory and degenerative liver illnesses, employing characteristics such as weight variation, hardness, friability, and disintegration time. [29]
20. P. Joshi et al., developed Anti-oxidant and Anti-inflammatory activity of selected medicinal herbs and their polyherbal formulation using the dried plant of Hemidesmus indicus and the extraction process was carried out using the hydro-alcoholic solevent. The prepared formulation can be used for the treatment of inflammation and pain. Further investigations, such as COX enzyme assays, in-vivo tests and formulation toxicity are conducted for the potent drug

development process before it is used as a medicine. The current study's findings can be utilised to medicinal health and neutraceutical applications because herbal plants have Anti-oxidant and Anti-inflammatory characteristics. [30]

21. Pramod J Hurkadale et al. developed and evaluated a polyherbal Chewable tablet for the common cold and chronic sinusitis using 70% ethanol based on the pill evaluation parameters, the study concluded that Anti-bacterial activity against infectious diseases has a good effect on the treatment of upper respiratory tract infections. [31]
22. Priyanka Gupta et al., a poly-herbal formulation based on traditionally used medicinal plants as a therapy for oral hygiene and the treatment of oral infections, employing a hydro-alcoholic extract of Piper nigrum dry seeds. This study clearly indicate that PHF 12-05 is an effective herbal treatment for maintaining oral hygiene, since it has significant Anti-bacterial action against bacterial and yeast strains that are common causes of tooth infections. Additionally, this mixture has Anti-inflammatory properties, particularly those induced by bacteria. This formulation is appropriate for human use due to its quality control characteristics, stability, and reduced heavy metal and microbial contamination. Further research may be necessary to isolate and chemically characterise the active components in plant extracts in order to create innovative agents against dental caries. [32]
23. Nikita Patil et al., developed a formulation and optimization of Chewable tablet for peptic ulcer relief using Box-Behnken design. The study examined the formulation,evaluation and optimization of Famotidine Chewable tablets utilizing the Box-Behnken design and software. Two natural disintegrants, Carica papaya starch and banana starch, along with a synthetic Crospovidone, a disintegrant, was utilized. Crospovidone was shown to be the most effective disintegrant, resulting in an optimal solution formulation. This complete strategy combines natural and synthetic disintegrants. The Box-Behnken design successfully optimized the famotidine Chewable tablet. composition, resulting in improved disintegration and overall tablet performance. [33]
24. Kawade Swapnali et al. developed and evaluated the Chewable tablet using Syzygium aromaticum which has the ability to relieve tooth pain using dried flower buds of Syzygium aromaticum. The study found that the wet granulation method was used to make the nutraceutical tablets, and the resulting product was satisfactory and acceptable. Because the conventional nutraceutical tablet is directly compressed, the medicine releases instantly. The presence of eugenol in the clove formulation may make it more effective as an analgesic than a tablet containing cinnamon. It was also determined that herbal nutraceuticals prepared in the form of affordable tablets would minimise patient compliance in terms of suppressing side effects and enhancing positive effects. [34]
25. Xiangwei Kong, et al., developed a immediate release ginseng Chewable tablet and sustained release amino acid pellets based on dry powder coating technology platform using fleshy roots of Ginseng.The Successful production of coating goods based on the dry powder coating technology platform was achieved. Ginseng Chewable tablet with an immediate release in five minutes are made possible by electrostatic powder coating technology, which also guarantees a certain level of wear resistance and visual appeal. Using the plasticizer-assisted powder coating

method, the sustained release amino acid pellets produced a sustained release in two to three hours. [35]

**Table 2: Excipients for the formulations of Chewable tablets [11-34]**

| SL.NO | EXCIPIENTS | USES |
|---|---|---|
| 1. | Lactose , Gums and mucilage, Acacia, Gelatin | Filler and binder |
| 2. | Aspartame, Sucraloses, Sucrose, Mannitol | Sweetener |
| 3. | Magnesium stearate, Glycerol | Lubricant |
| 4. | Glucose | Humectant |
| 5. | Vitamin c | Acidity regulator |
| 6. | Agar, Xanthan gum | Gelling stabilizer |
| 7. | Starch | Diluent |
| 8. | Citric acid | Preservative |
| 9. | Orange oil, Perilla essence, Menthol, Rose oil | Flavoring agent |
| 10. | Plant cellulose | Compressibility enhancer |
| 11. | Turmeric | Coloring agent |

**Importance of excipients in formulation: -**

In a solid dosage form, excipients are usually the main constituents and are included for various purposes, like supporting the manufacturing process or enhancing the formulation's functionality. Excipients are added along with the APIs to enhance their stability, preservation, in order to maintain their tonicity and facilitate drug delivery of the formulated dosage forms. This ensures that the best drug is developed without causing immunogenic or other side effects. [36] On the basis of their functions, excipients can be categorized as binders, co-solvents, fillers, disintegrates, lubricants, surfactants, emulsifying agents, suspending agents, Anti-microbial, preservatives, etc. [37]

## CONCLUSION

In this study, herbal Chewable tablets was formulated and evaluated for their pharmacological efficacy. It is concluded that the Chewable tablet has better patient acceptance and may offer improved biopharmaceutical properties, improved efficacy and better safety. This study also illustrates the wide range of applications for herbal Chewable tablets, demonstrating various pharmacological activities such as treatments for cardiovascular diseases and cancer to remedies for dental concerns, digestive disorders, and respiratory problems, among others. The Chewable tablets was evaluated for pharmacopeial parameters such as pre-compression parameter and post-compression parameters. The Chewable tablet is a versatile dosage form that combine the manufacturability and stability advantages of solid products while providing favourable organoleptic and administration benefits.

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