

Food Tablet Manufacturing Strategies: Research Data on Effervescent Food Supplements

Ozlem Tokusoglu^{1,2,}

Abstract

In this proceeding, food supplement effervescent tablet manufacturing strategies have been carried out. Activated phenolic antioxidants, bioactives and probiotics that have been naturally extracted to be highly potent and easily absorbed by using food tablets. For safety manufacturing; unit dose, temper evident, solid preparations of active ingredient and ingredient mix, powder quality should be monitored. Through the powder forming, the flexible design of dosage forms as technical manufacturing parameters has been considered. Due to supplement manufacturing, consumer demand, routes of drug delivery, oral utilization capacity should be examined. In this context, the bulk density, the tapped density as pre-compression parameters have been confirmed while thickness, hardness, % weight variation, % friability, % in- vitro drug release as post-compression parameters have been carried out as physiochemical properties. Not only chemical profiles, functional properties, but also detailed clinical nutrition data of expressed effervescent.

Keywords: Food Effervescent, Tablet, Strategy, Manufacturing, Quality, Property

This Proceeding was Presented as Invited Lecture at 2nd International Conference on NUTRITION FOOD SCIENCE and TECHNOLOGY April 08-09 2019 Abu Dhabi, UAE by ConferenceSeries Asia Pacific Middle East Conferences

Introduction

Recently, the potential efficacy of the bioactive phenolics from natural sources has been the focus of great attention owing to their health benefits to human health for reduced risk of coronary heart problems and selected cancers. Food tablets as dietary supplements, and/or fortified foods, food by-product based food powders may be great value-added products for getting healthy bioactive components. The functional constituents of the foods, some preferable functional foods or some functional plant/fruits/vegetables/spice foods has been standardized as the nutraceutical product and generate under good manufacturing practices (GMPs) (Table 1). Meanwhile these plants have been used in effervescent food supplements such as effervescent food tablets (Tokusoglu 2018; Tokusoglu and Swanson,2015; Tokusoglu and Hall,2011).

Nutraceutical food tablets has been prepared by direct compression method through selected tablet machines and has been manufactured according to established prescription methods. The functional constituents of the foods, some preferable functional foods or some functional plant/fruits/vegetables/spice foods has been standardized as the nutraceutical product and generate under good manufacturing practices (GMPs). Primarily, a nutraceutical or selected food must be detected for "non-toxic food constituent strategy" by advanced toxicity analyses, then it must be detected and analyzed in terms of health benefits including disease treatment and/or prevention (Tokusoglu 2018; Pham,2015; Prabhakar and Krishna,2011; Stahl,2003)

Table 1. Plant Parts and Their Main Constituents Utilized as Food Products

Plant Parts	Main Constituents	Uses as Food Products
Fruit	Sugars	Fresh fruits
	Vitamin C	Marmelades
	Betalains	Juices
	Polyphenols	Candys
	Fibre	Liquors Syrup
Cladodes	Fibre	Salad Vegetable
	Mucilage	Pickles
	Minerals	Flour and Additives
Flowers	Chlorophyl derivatives	
	Flavonoids	Infusions
Seed	Betalains	Salad Vegetable
	PUFA, MUFA and sterols	Cosmetic products
Root	polysaccharides	
	Flavonoids	Infusions

Activated phenolic antioxidants are derived from the healthiest of plants,fruit, vegetable and/or spices. A wide range of free radicals are neutralized by absorbtion of antioxidant phenolics through

effervescents; thence body cells are protected from damage and inflammation.

Uniquely containing activated phenolic antioxidants that have been naturally extracted to be highly potent and easily absorbed by your body in food tablets. Activated phenolic antioxidants are derived from the healthiest of plants,fruit, vegetable and/or spices. A wide range of free radicals are neutralized by absorbtion of antioxidant phenolics through effervescents; thence body cells are protected from damage and inflammation. Effervescence tablet has been proved its utility as an oral delivery system in the pharmaceutical and dietary industries for decades

Food Effervescent Tablet Properties

In effervescent nutraceutical technology; a balanced ratio of acids and carbonates are used for forming a buffer and it has optimal compatibility with the stomach. Gas bubbles occur from the liquid after chemical reaction by adding water; alkali metal bicarbonates and acids (majorly citric or tartaric acids) are utilized to produce effervescence. In effervescent system, when organic acid and bicarbonate get together in the water, CO₂ is released; the solving process is performed in 17–20°C water. The foam of them helps to kill the local bacteria.

Food tablet is described as unit dose, temper evident, solid preparations including one or more active ingredients or whole food powder. Patient and/or consumer demand, routes of drug delivery, oral utilization capacity, the flexible design of dosage forms as technical manufacturing parameters has been considered; also the bulk density (g/ml), the tapped density (g/ml) as pre-compression parameters have been confirmed while thickness (mm), hardness (kg/cm²), % weight variation, % friability, % *in-vitro* drug release as post-compression parameters have been carried out as physiochemical properties. Among the alkali sources, sodium carbonate is preferred due to its low cost, high solubility and intensity of reaction than potassium carbonate and bicarbonate.

Polyvinylpyrrolidone (PVP) is used as binder in effervescent; its form is as dry powder or wet forms of aqueous or hydroalcoholic solutions Water-soluble lubricants, colors, flavorings and sweeteners are also added as other ingredients. Mannitol and PEG 6000 are other utilized effective binders. At production stage in tablet machine, relative humidity should be low (≤25%) and ambient temperature should be at room temperature (24±1°C). Tablet forming quality parameters (weight, hadrness, pH, solution time and friability) are inspected.

Dyes or lake color pigments have been added to manufacture colored solutions or products. In effervescent tablets, color stability is also significant. These should be chosen as anhydrous materials. Generally dried flower bud, herbs, chamomile extract may be utilized for this purpose, their percentage may be lower than 1–2%. The remain part of the 0.1–2% in effervescent should be consisted of vitamin E,

squalene, almond oil and cosmetic esters. Besides, PEG-30 castor oil, laureth 4, polysorbate 80 or 85 can be used as emulsifiers.

Probiotics are living microorganisms that confer benefits on the recipient health when administered in appropriate amounts. Probiotics are mainly utilised in nutritional supplements owing to their positive impacts on health (Do Espirito et.al,2011) An adequate selection among different probiotic strains has to be performed to allow manufacturing probiotic-supplemented food and plant consuming products. The aim in administering probiotics is to induce a balanced enteric microbiota, that will have a favorable effect on consumer health. Table 2 shows main probiotic species applied commercially in food and supplements (Anadón et.al,2010) (Table 2).

Table 2. Main Probiotic Species Applied Commercially in Foods and Food Supplements

<i>Lactobacillus acidophilus johnsonii plantarum rhamnosus delbruecki reuteri fermentum Brevis lactis cellobiosus paracasei helveticus</i>	<i>pseudocatenulatus catenulatus bifidus infantis longum thermophilus adolescentis Streptococcus intermedius salivarius cremoris lactis Aspergillus niger oryzae</i>	<i>Leuconostoc mesenteroides Pediococcus acidilactici Enterococcus faesium Lactococcus lactis Saccharomyces boulardii Propionibacterium freudenreichii</i>
--	--	--

The strain selection process guarantees the survival of the probiotic microorganisms in the demanded products during its manufacturing and storage, in addition to provide that the product will confer sufficient technological properties (Bansal and Garg,2008).

The food effervescent matrix selected for incorporating probiotic strains should be carefully fortified so that an adequate selection of the probiotic strain-food pair is attained. The compatibility and adaptability among the selected strains and matrixes is principal. Varied lactic probiotic products, chiefly the fermented as well as some non-lactic products, have been improved as fruit effervescent containing probiotics and have been achieving interest in the global marketplace. To define the composition of effervescent probiotics in tablet form, an assessment of the component's effects on the viability of the microorganisms are performed. Table 3 shows the advantages of probiotic food supplements from different perspectives, in a comparative criterion (Table 3).

Table 3. The Advantages of Probiotic Food Supplements

	Supplement	Description	Food
Efficiency (in the product and in GIT)	Transfer of considerably higher numbers of viable probiotics into GIT without considerable loss during the storage. Therefore, they are preferred when specific therapeutic functions are required.		Good to excellent matrix protection for probiotic cells during delivery in GIT.
Hedonism	-		Being consumed for hedonism and comprise sensory attributes.
Product and market development	-		Have higher potential of variation and therefore, product and market development
Simplicity of production (probiotic stability in product during the storage and sensory properties)	Simpler design and formulation from production point of view; namely, the stability of probiotics during the process and storage as well as not having negative effects of added probiotics on sensory properties of final product.	-	
Regulatory administration and legislation			Foods are subjected to more difficulties

Prebiotics are food ingredients that induce the growth or activity of beneficial microorganisms (e.g., bacteria and fungi). Approximately 47% of chicory root fiber contain the prebiotic fiber inulin; inulin nourishes the gut bacteria, improves digestion and helps relieve constipation. Tablets including prebiotics have metabolic properties and improves the intestinal ecosystem and colon cells, stimulating the peristalsis, improves lipids and reducing the cholesterol and triglyceride serum levels and also facilitates the mineral salt absorption (Brunser and Gotteland,2010).

The powder blend has been thoroughly mixed with talc and magnesium stearate and compressed into a 300-400 mg tablet using single rotatory punching machine based on tablet processing strategy. Among the trial /serial tablet formulations; "mesir effervescent tablet" could be more efficacious owing to majorly cinnamaldehyde (as v/v) whereas "black mulberry effervescent tablet" could be more beneficial due to the presence of morusin and apigenin phenolic anticarcinogenics and also "mandarin peel effervescent tablet" could be salutary because of its naringenin and hesperidin flavonone phenolic bioactives, also "tomato peel effervescent tablet" could be important due to its lycopene and anthocyanidin phenolic antioxidants.

In this context, the innovative and conventional food tablet processing strategies has been focused to chemical characterization, functional properties, their unique bioactive features, antioxidative, anticarcinogenic reports of above-mentioned developed tablets. General usage, bioactive materials from plants and probiotic /prebiotic fortification are so important than ordinary supplement materials. Specific applications are more efficient and are required to meticulous manufacturing.

References

- Anadón A, Martínez-Larrañaga MR, Caballero V, Castellano V. **2010**. Assessment of prebiotics and probiotics: An overview. in bioactive foods in promoting health: probiotics and prebiotics. Watson RR, Preedy VR. Academic Press, London, 19-41.
- Bansal T, Garg S. **2008**. Probiotics: from functional foods to pharmaceutical products. *Curr Pharm Biotechnol.* 2008; 9(4): 267-287. doi: 10.2174/138920108785161587
- Brunser O, Gotteland M. **2010**. Probiotics and prebiotics in human health: An Overview. Watson RR, Preedy VR. *Bioactive Foods in Promoting Health: Probiotics and Prebiotics.* Academic Press, London, 73-93.
- Do Espirito Santo AP, Perego P, Converti A, Oliveira MN. **2011**. Influence of food matrices on probiotic viability-A review focusing on the fruity bases. *Trends Food Sci Tech.* 22(7): 377-385. doi: 10.1016/j.tifs.2011.04.008
- Pham JH. **2015**. Understanding effervescent tableting technology [cited 2015 Nov 29]. Available from: <http://www.naturalproductsinsider.com/articles/2008/05/understanding-effervescent-tableting-technology.aspx>
- Prabhakar CH, Krishna KB. **2011**. A review on effervescent tablet. *International Journal of Pharmacy and Technology*,3:704–12.
- Stahl H. **2003**. Effervescent dosage manufacturing. *Pharmaceutical Technology Europe* ,15:25–8.
- Tokusoglu O. **2018**. *Food By-Product Based Functional Food Powders*, (The Nutraceuticals: Basic Research/Clinical Application Series Book) CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA. ISBN 9781482224375, Cat # K22366.
- Tokusoglu O. & Barry G. Swanson. **2015**. *Improving Food Quality with Novel Food Processing Technologies*. 466 page. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA. ISBN 9781466507241.
- Tokusoglu O. & Clifford Hall III. **2011**. *Fruit and Cereal Bioactives: Sources, Chemistry & Applications*. 2011. ISBN: 9781439806654; ISBN-10: 1439806659. 459 page. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA.