嘉南藥理科技大學專題研究計畫成果報告

茄紅素之固體製劑研發：錠劑劑型

Investigation of solid products for lycopene：tablet dosage forms

計畫編號：CNPH-93-06
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一、中文摘要

現今的消費者使用乾燥製品的情形相當普遍，就經濟上與方便性而言，其具有可增加製品的架貯期、減少包裝、降低價格與改善操作特性等優點。本研究中，乾燥之蕃茄粉末混合適當的賦形劑經壓製成為咀嚼錠或快速溶解之錠劑。接著評估其崩散劑性質—錠劑崩散時間與受壓破裂壓力；結果顯示，崩散劑的種類、添加模式、添加濃度與相對密度顯著影響錠劑的崩散時間，但對錠劑受壓破裂壓力的影響則不顯著。

關鍵詞：茄紅素，吸濕性，固體製劑，粉體，錠劑，崩散

Abstract

Dry products have a high level of popularity with today's consumers. Dry mixes are economical and convenient with increased shelf-life, reduced packaging, decreased cost and improved handling properties. In the study, the dried tomato powder combined with the appropriated excipients was pressed into chewable or a quick dissolve tablet dosage form. The disintegrant properties – tablet disintegration time and crushing strength were evaluated. The results show that the kinds of disintegrants, the mode of addition of disintegrants, disintegrant concentration and relative density had a significant impact on the disintegration time, but not on the crushing strength.

Keywords: Lycopene, Hygroscopicity, solid product, powder, tablet，disintegration

二、Introduction

Lycopene, a bioactive carotenoid without provitamin-A activity, is principally responsible for the characteristic deep-red color of ripe tomato fruits and tomato products. It has attracted attention due to its biological and physicochemical properties, especially related to its

effects as a natural antioxidant. Although it has no provitamin A activity, lycopene does exhibit a physical quenching rate constant with singlet oxygen almost twice as high as that of beta-carotene. This makes its presence in the diet of considerable interest. Increasing clinical evidence supports the role of lycopene as a micronutrient with important health benefits, because it appears to provide protection against a broad range of epithelial cancers. Serum and tissue lycopene levels have also been inversely related with the chronic disease risk. [1-3] Although the antioxidant properties of lycopene are thought to be primarily responsible for its beneficial properties, evidence is accumulating to suggest other mechanisms such as modulation of intercellular gap junction communication, hormonal and immune system and metabolic pathways may also be involved. [4] Tomatoes and related tomato products are the major source of lycopene compounds, and are also considered an important source of carotenoids in the human diet. Undesirable degradation of lycopene not only affects the sensory quality of the final products, but also the health benefit of tomato-based foods for the human body. [5] Lycopene content of tomatoes remained unchanged during the multistep processing operations for the production of juice or paste and remained stable for up to 12 months of storage at ambient temperature. Moreover, lycopene is fat-soluble, including a small amount of fat in a formulation can help increase its bioavailablility. [6] It is well known that putting tomato ingredients in wet systems where tomato color, flavor and texture are desirable is generally not a problem, but dry systems might be another story. For instance, including tomato powder in a low-moisture cracker can be a challenge because of its attendant hygroscopicity. In our previous study, dehydrated powders from tomato pulp made by various drying techniques include freeze-drying, hot air drying and vacuum drying. As small amounts of appropriate excipients added to tomato pulp during drying process to enhance the stability of final powder, the resulted dried products will keep without special packaging from the humidity for several months and the senses （taste, color, odor etc. ）remain unchanged. To avoid the necessity of measuring loose powder to make beverages and to increase the convenience of usage, the purpose of this study is desired to press the

dried powder into chewable or a quick dissolve tablet dosage form that disperses almost immediately and completely in water.

三、Results and discussion

The formulation used in the experiments is shown in Table 1. The dried powder was obtained from tomato paste by hot air drying technique. A little amount of water was added as a binder. A damp mass resembling dough is formed and used to prepare the granulation and dried. The appropriate excipients to be mixed are directly combined with dried granules in exactly the correct proportion. The disintegrant may be incorporated into the powder mixture before granulation, or it may be added as a dry powder to the already prepared granules, or it may be added both internally and externally. The mixture is then press to form tablet. In the crushing strength test, A high crushing strength value （about 7 Kg）was obtain. It was equally observed that as the relative density increased, the crushing strength of the tablets increased. However, there was no significant difference among the modes of addition of disintegrant. The disintegration test result shows that Primogel® added as a disintegrant in the tablet fail to disintegrate within the required times. This could be due to the sticky and the relative low porosity of tablet, which led to the absorption of few quantities of water and subsequent generation of very low swelling force. The mixture of citric acid and sodium bicarbonate was added as an effervescent disintegrant. The rank order of disintegration rate for the mode of added was observed be internal＜ external＜internal- external. It can be seen that increase in concentration of effervescent disintegrant led to a decrease in the disintegration time. This could be due to the increase in the porosity of tablet.

Table 1. Formulae of tomato solid product

Composition	Amount ratio (%,W/W)
Tomato dried powder	83.0~97.1
Disintegrants	0~2.5
Citric acid	0~2.5
Sod. bicarbonate	0~7.5
Lubricants	0~2.5
Total	100

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