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Impact of wall material physicochemical characteristics on the stability of encapsulated phytochemicals: A review

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ABSTRACT

Phytochemicals are plant-derived chemicals that have a number of protective or health-promoting properties. However, their health benefits and thus commercial potential can be restricted due to their instability to environmental factors such as moisture, heat, light, oxygen etc. A common approach to improve stability is via encapsulation whereby the phytochemical is encased inside a wall material, thereby forming a protective barrier between the phytochemical and the external environment. The impact of a wide range of wall materials and their combinations on the stability of various phytochemicals has been studied in the last twenty years. This review focuses on the specific inherent physicochemical characteristics of the wall material as well as the encapsulation process dependant physical characteristics that has shown to have the greatest impact on the stability of encapsulated phytochemicals. The information contained in this review could assist researchers in addressing some of the most important considerations when designing a wall material for increased phytochemical stability.

Keywords: *Phytochemicals, stability, encapsulation, wall materials, physical characteristics, chemical characteristics.*

1. Introduction

Phytochemicals are plant derived chemicals that can be classified into a few major groups: polyphenols (flavonols, flavones, anthocyanins etc.), terpenoids (carotenoids, phytosterols etc.), alkaloids (capsaicin, caffeine etc.), betalains (betanin), nitrogen containing compounds (sinigrin, alliin etc.), lipids (fatty acids, triglycerides etc.) and volatile oils, namely essential oils. (Del Río, Prinsen, & Gutiérrez, 2013)(Kennedy & Wightman, 2011)(Harborne, Baxter, & Moss, 1999). Extensive in vitro and in vivo studies have shown evidence of the protective or health-promoting properties of these phytochemicals. For instance, several studies have shown the cancer inhibiting properties of lycopene, quercetin, monoterpenes and ellagitannins (Adams, Zhang, Seeram, Heber, & Chen, 2010; Crowell, 1999; Giovannucci, 1999; Holzapfel et al., 2013; Lamson & Brignall, 2000; Russo et al., 2014; Seeram et al., 2007). Antidiabetic properties are found in certain flavonoids such as grape seed procyanidins and resveratrol, a flavonol abundant in red wine (Pinent et al., 2004; Sharma et al., 2011; Su, Hung, & Chen, 2006). Dietary carotenoids, specifically β -cryptoxanthin found

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