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Fate of Nutritional and Bioactive Compounds of Innovative Chickpeas-Based Vegan Diets Incorporating Different Vegetables

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Abstract

Advances in nutrition research during the past few decades recommended the contribution of vegetarian diets for improving human health and reducing risk diseases. In current study, six innovative ready-to-use and ready-to-eat chickpea-based vegan diets (CVDs) incorporating different vegetables (cauliflower, taro, green zucchini, pea, bean and spinach) at 20% were prepared. These formulated CVDs with 30% chickpea were supplemented by additional edible ingredients. Herein, fate of nutritional and bioactive compounds of those CVDs was investigated. Chemical composition, minerals content, bioactive compounds and antioxidant activity of CVDs before and after cooking were determined. Ready-to-eat CVDs were organoleptically evaluated after stir-frying cooking. Results of composite analysis indicated 67.13 to 71.65, 25.02 to 33.96, 1.87 to 2.36, 7.83 to 9.15, 8.14 to 8.84 and 46.79 to 56.16% for moisture, crude protein, lipids, ash, fiber, and carbohydrates contents in ready-to-use CVDs, respectively. Significant differences ($p < 0.05$) were found between macro- and micro-nutrients content of ready-to-use and ready-to-eat as well as caloric value of CVDs. The ready-to-use CVDs exhibit appropriate content of ascorbic acid, chlorophylls, carotenoids, flavonoids, and flavonols which basically depends on their ingredients. Frying process dramatically reduced the ascorbic acid, chlorophylls, carotenoids, flavonoids, and flavonols contents. High organoleptic acceptability of ready-to-eat CVDs was noticed to confirm the consumer attractiveness further. In conclusion, the possibility of healthy ready-to-eat and ready-to-use CVDs incorporated with common consumed vegetables manufacturing could provide a promising approach for improving the human health and dietary pattern practices.

Keywords: Bioactive compounds; Chemical composition; Cooking; Antioxidant activity; Vegan diets; Health benefits

Introduction

Recently, there has been a renewed interest in vegetarian diets. Vegetarian diets are often diverse formulated in composition and shape, comprising a wide range of dietary sources for numerous and individual dietary requirements. Practically, adopting a vegetarian dietary pattern is traditionally interpreted to mean an absence of meat [1,2]. Basically, the vegetarian diets were classified into (i) lacto-ovo-vegetarians (includes dairy and eggs), (ii) lacto-vegetarians (includes dairy), (iii) ovo-vegetarians (includes eggs), and (iv) vegan which have further restrictions imposed and exclude all animal origin foods. Additionally, vegetarians are distinguished by high consumption of fruit, vegetables, legumes, nuts, grains and soy protein-food components, and each of these may independently be associated with positive health impacts [2-5]. Particularly, the meat substituting industry was highly encouraged to reduce the meat consumption and thereby reduce the risk of related disease. Obviously, substituting the meat consumption by alternative protein rich products made from plant proteins, so-called Novel Protein Foods, would be an attractive choice [6]. The University of Oxford suggests that vegetarian diets could significantly reduce people's risk of heart disease. It is observed that vegetarians have up to 32% less risk of developing heart disease than non-vegetarians [1,7,8]. This finding could encourage the processed meat consumers to change their nutritional behavior and prevent themselves from 42% higher risk of heart disease, a 19% higher risk of type 2 diabetes and bladder cancer as mentioned previously [4,9].

Expressively, a new study from Harvard School of Public Health (HSPH) researchers has found that red meat consumption is associated with an increased risk of total cardiovascular and cancer mortality. The results also showed that substituting other healthy protein sources such as fish, poultry, nuts, and legumes was associated with a lower risk of mortality [10]. Additionally, vegetarians tend to have lower overall cancer rates, lower body mass index (BMI), adjustable blood pressure by eating diets lower in saturated fats, have higher levels of dietary fiber, magnesium, iron and potassium, vitamins E and folate, carotenoids,

flavonoids and other phytochemicals [4,8,9,11,12]. Practically, vegetables are commonly eaten as fresh or cooked for improving its sensory properties. The phytochemicals are not only contributing to the vegetable's color and taste, but also have been described to possess antimutagenic or even anticarcinogenic activity [11,13]. The Egyptian cuisine is notably conducive to ready-to-use and ready-to-eat vegetarian diets, as it rely heavily on vegetable dishes. However, several commonly consumed vegetables such as cauliflower, green pea, green bean, spinach and green zucchini were favorable for Egyptian consumers over the years ago. There are many studies reviews the health benefits of mentioned vegetables considering their phytochemicals content and potential antioxidant, anticarcinogenic, antimicrobial activities [14-21]. Indeed, carefully planned vegetarian and vegan diets can provide adequate nutrients for optimum health [2]. Clearly, evidence suggests that infants and children can be successfully reared on vegan and vegetarian diets [22,23]. However, still the most presented vegetarian diets are lack in vitamin B₁₂ and essential amino acids in valuable amounts which could make them not sufficient to provide the all essential nourish requirements [20]. In spite of all dietary practices, including non-vegetarian diets can be deleterious for health when essential nutrients are not consumed. Therefore, vegetarian and vegan diets need to ensure a balance of nutrients from a wide variety of foods, especially for vulnerable groups. Improving dietary habits is a societal, not just an individual problem. Thus it demands a population-based, multisectoral, multidisciplinary, and culturally relevant approach.

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