LUPINE PUBLISHERS

Scholarly Journal of Food and Nutrition

DOI: 10.32474/SJFN.2022.04.000188

ISSN: 2638-6070

Mini Review

A Review on Physical and Functional Properties of Lepidium sativum L

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Received: June 10, 2022 **Published:** June 20, 2022

Introduction

Garden cress is an annual herb that grows in the Middle East, Europe, and the United States. It belongs to the Brassicaceae family and the Kingdom Plantae. Garden cress is thought to have originated in Ethiopia, according to scientific evidence. Garden cress can thrive in any climate and soil type. The seeds resemble some oil seeds in appearance, with dicotyledonous endosperm accounting for 80-85 percent of the seed content and the seed coat and embryo accounting for 12-17 percent and 2-3 percent, respectively [1,2]. Garden cress seeds are used in a variety of foods as a gelling agent, a water retention agent, a thickening agent, an emulsifying agent, and a binding agent. As a result, the purpose of this review is to compile the physical and functional properties of garden cress seeds. The present article is mainly divided into two sections

a) Physical Characteristics of Garden Cress Seeds

b) Functional Characteristics of Garden Cress Seeds Flour

Physical Characteristics of Garden Cress Seeds

Garden cress seeds are small oval-shaped, pointed and triangular at one end, smooth, about 2-3 mm long, 1-1.5 mm wide, slightly broader at base and notched at apex, dorsiventrally bulging, with a furrow present on both surfaces extending up to two thirds downward, and a slight wing-like extension present on both edges of seed. By absorbing water, the seeds swell and become slippery when combined with water, and after boiling, they form a gel-like material with strong adhesive properties [3] and [4]. According to Paranjape and Mehta [5] garden cress seeds are morphologically similar to oilseeds, with the dicotyledonous endosperm accounting for 80-85 per cent of the seed matter, the seed coat 12-17 percent, and the embryo 2-3 percent. Gokavi et al. [6] conducted study on physical composition of garden cress seeds and found that the seeds were brownish red in colour and oval in shape. The seed length and width were 298±3.2µm and 100 ±1.9 µm respectively. The weight, volume and bulk density of one thousand kernels was 2.5 ±0.13g, 3.3±0.15 ml and 0.75±0.01g/ml, respectively.

A study of Vaishnavi et al. [7] revealed that garden cress seeds were oval shaped and reddish-brown in colour. Dimensional properties viz. length, width and thickness measured using vernier calliper were found as 2.6mm, 1.2mm and 0.94mm, respectively. Sphericity was 54.59 per cent and the average weight of 1000 garden cress seeds was 1.86g. True density and bulk density of garden cress seeds were measured using a graduated cylinder and were calculated as 1230 kg/m3 and 729.74 kg/m3 respectively. Porosity of garden cress seeds was 40.67% and angle of repose for garden cress seeds was calculated as 20.590.

Patel et al. [8] studied the physicochemical properties of Lepidium sativum mucilage powder in which they found that particle size (µm), swelling ratio, viscosity, bulk density (g/ml) and tapped density (gm/ml) were 189.57, 3.7, 8.05, 0.37 and 0.62 respectively. Najia et al. [9] analyzed the influence of thermal treatments on textural characteristics of cress seed gum gel. In this study, the cress seeds were treated with different thermal treatments viz. 600C for 30min, 800C for 23min, 1000C for 18min and 1210C for 15min. Textural stability were studied by using penetration and Instrumental Texture Profile Analysis (TPA) tests. The obtained results revealed that cress seed gel was heat stable in almost all of the textural attributes and gel at 7 per cent concentration had a cohesiveness value of 0.43, hardness 11 g, consistency 77 g, adhesiveness 9.2 g, elasticity 11.23 g/s, springiness 3.8 mm, gumminess 44 g, chewiness 170 g mm. Wadhwa et al. [10] found that garden cress seeds were ovoid and flattened, measuring 2-3 mm in length and varied in colour from pale brown to brownish red to black. The seedling germinated epigeally; the cotyledons were tri-foliolate, the leaflets were spatulate, and the lateral leaflets were smaller than the central one. Deshmukh et al. [11] observed true density and bulk density of garden cress seeds as 0.76 and 1.25 g/ml, respectively. The porosity of seed was 39.2 per cent and angle of repose was 190. The bulk and tapped densities of dried garden cress seeds mucilage powder before and after roasting process was examined by Hassan and Abdel-Rahman [12]. The bulk density of mucilage extracted from raw and roasted

sample was recorded as 0.1396 and 0.17013 g/ml, respectively. The tapped density was 0.2178 and 0.3162 g/ml, respectively for raw and roasted samples. They found that increase in bulk and tapped density was directly proportional to roasting time. Sonawane et al. [13] studied the physicochemical characteristics of extracted cress seed mucilage and reported the swelling index, bulk density, tapped density, compressibility index, pH, extractive values, particle length and breadth as 11ml, 0.2857 g/cc, 0.3389 g/cc, 15.69 per cent, 5.6, 13.36 per cent, 1.3674 mm and 0.875 mm, respectively. Gaikwad et al. [14] reported 1000 kernel weight, true density, bulk density, porosity and angle of repose of garden cress seeds as 1.96 g, 1182 kg/ m3, 0.76 g/ml, 36 per cent and 25.170 respectively. Different dimensional properties like length were 2.6, width was 1.2 and thickness was measured 0.94 (mm).

Functional Properties of Garden Cress Seeds Flour

Functional properties come under the essential physicochemical properties of foods that explain the interactions between structures, molecular conformation, compositions, and physicochemical properties of food components with the nature of the environment and the conditions under which these are examined. Functional properties are needed to effectively determine and precisely evaluate how different proteins, fats, carbohydrates (starch and sugars), and fibres may function in specific food systems [15,16]. Toliba and Mohamed [17] studied the functional properties i.e., water holding capacity, oil holding capacity, emulsifying activity and stability of garden cress seeds powder and reported these as 4.51±0.83 ml/g, 2.79±0.32 ml/g, 44.54±1.35 per cent and 40.65±1.02 per cent, respectively. Hanan et al. [18] reported the water absorption capacity and oil absorption capacity of garden cress seeds flour as 11.21 g/g and 0.726 g/g, respectively. Kilor and Bramhe [19] reported the water retention capacity of garden cress seeds as 10.5ml/g found with precipitation of soaked and blended seed in acetone and 16.3ml/g in alcohol. Emulsifying and foaming properties of cress seeds gum (1% w/w) were measured by Najia et al. [9]. The observed results revealed that garden cress seeds gum solution has high emulsifying (92 percent) and foaming (25.4 percent) capacity at 250C. Functional properties of protein isolated from garden cress seeds were studied by Ali [20]. The water absorption, fat absorption, emulsification capacity and forming capacity of garden cress seeds were 229+2.89, 350+0.99, 65+3.02 and 39.50+1.57 per cent, respectively.

Ghada et al. [21] studied the functional properties and antihyperlipidemic activities of garden cress seed oil. They reported the refractive index of oil as 1.475, peroxide value (meq. peroxide/kg oil) as 2.06, saponification value (KOH/g oil) as 179.5, iodine value (g of I2 absorbed/ 100g oil) as 120.6 and oxidative stability (hrs) as 30. Zia-Ul-Haq et al. [22] reported the refractive index, specific gravity, unsaponifiable matter, acid value and saponification values of garden cress seeds as 1.47, 0.82, 0.57 µg/g, 1.04 mg KOH/g and 179.03 mg KOH/g, respectively. Rajshri and Haripriya [23] evaluated the effect of roasting on functional properties of garden cress seeds. They found out that water absorption and oil absorption of untreated garden cress seeds powder was 9.56±0.40ml/g and 7±0.72ml/g respectively, while it was 8.93±0.30ml/g and 7.4±1.07ml/g respectively for roasted garden cress seeds. There was a significant decrease in water absorption (6.58 per cent) and oil absorption (5.71per cent) on dry roasting. The untreated and roasted seed's powder swelling capacity was found as 11.2±0.68 and 12.1±0.69 per cent, respectively. On dry roasting a significant increase (8.0 percent) in swelling capacity was observed. The Bulk density of untreated and roasted seed powder was reported as 1±0.5g/ml and 0.63±0.01g/ ml respectively. 37 percent decrease in bulk density on dry roasting was recorded.

Conclusion

Food physical and functional properties are important in explaining cooking and processing characteristics because they explain how foods perform in a system as a chemical intermediate or as a significant participant of product attributes. Information on the physical and functional characteristics of garden cress seeds provides the data needed to evaluate and maintain the quality of developed products, as well as an indication of how they would behave in the food system. All of the reviews came to the same conclusion: garden cress seeds have good physical and functional properties and can be used in the food industry as a healthy substitute.

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DOI: 10.32474/SJFN.2022.04.000188