

Determination of Some Physical Characteristics of Seeds of Different Golden Strawberry (*Physalis peruviana* L.) Cultivars

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Abstract

Golden strawberry is among the tropical fruits that are consumed fondly in Turkey as well as in the world. More and more research is being done on this fruit day by day. This study was carried out in 2022 at Bingol University, Faculty of Agriculture, Department of Biosystem Engineering and Ege University, Faculty of Agriculture, Department of Field Crops. In the study, some physical properties of seeds of two different golden strawberry cultivars (Denizli and Konya) were investigated. It is foreseen that the obtained values will benefit the breeding studies, mechanization practices and product processing steps, thus increasing the production possibilities.

Keywords: Goldenberry, *Physalis peruviana* L., seed properties

1. Introduction

Golden strawberry (*Physalis peruviana* L.) named as Cape Gooseberry is a tropical plant with orangecolored fruits and a weight of 5-10 g, belonging to the *Solanaceae* family (Hassanien, 2011, Meriçli, 2011, Perk, 2013, Yaşar et al., 2023). The most produced type of golden strawberry, which has over 70 different species, is *Physalis peruviana*. The plant of *Physalis peruviana* L. can be grown as a single or perennial and can grow about 1-meter height. Golden strawberry, which has a production capacity of 162.390 tons year⁻¹ in an area of 30,622 ha in the world, is in an increasing position in Turkey (Ramadan and Moersel, 2007; Ramadan, 2011; Celikli et al., 2017; Bilenler and Karabulut, 2019). It is an exotic fruit originating from the Amazon and Andes Mountains in all North and South African countries in the world (Rodrigues et al., 2009). *Physalis peruviana* L. species is grown commercially in Antalya and Denizli besides its also natural distribution (Meriçli, 2011). *Physalis peruviana* L. fruit is rich in vitamins A, B, K1, ascorbic acid (vitamin C), tocopherol (vitamin E) (Meriçli, 2011; Perk, 2013; Puente et al., 2011). It also contains phosphorus, iron, potassium and zinc elements (Perk, 2013; Rodrigues et al., 2009; Valdenegro et al., 2010; Yen et al., 2010). *Physalis peruviana* L. contains glucose, sucrose and a small amount of fructose (Ramadan, 2011; Puente et al., 2011). Moreover, the fruit of *Physalis peruviana* L. comprises 2% oil and fatty acids such as linoleic, oleic, and palmitic (Perk, 2013). Therefore, golden strawberry fruits have a high juice yield as they have optimal sugar and acidity values (Aşkın et al., 2015). However, it was stated according to the analysis results of the phytochemical composition of *Physalis peruviana* L. fruits with different origins that the genotype and production conditions are significant factors for fruit quality and composition (Popova et al., 2020). In addition to its high nutrient content, it has been reported as a negative aspect that it contains some secondary

metabolites such as alkaloids at a high rate (Perk, 2013; Pomilio et al., 2008). It is consumed as fresh as well as processed and evaluated as jam and marmalade. The fruits of the golden strawberry plant contain secondary metabolites such as carotenoids and phenolic compounds. Besides, it has good antioxidant activity with its high organic acids and ascorbic acid content (Ramadan and Moersel, 2007; Bilenler and Karabulut, 2019). With this antioxidant property, it is used in the treatment of many diseases such as cancer and cardiovascular diseases (Cheng et al., 2003; Stanner et al., 2004; Chang et al., 2008; Ersoy and Bağcı, 2011). Golden strawberry (*Physalis peruviana* L.) is a versatile plant due to its rich nutritional content in terms of both the fruit industry and health. Therefore, that plant should be evaluated for the economy of Turkey (Ozturk, 2020). The fruits of the golden strawberry plant have high storage properties. So fruits can be stored in this way for a long time (Ramadan, 2011; Gökçe and Yılmaz, 2018). In this study, it was not only aimed to determine some of the characteristics of the seeds of the *Physalis peruviana* L. genus of golden strawberry but also using the results of these characteristics, seeds will be evaluated in different applications such as pelleting and film coating for next working. Because of the rich content of its fruit, it can be provided to Turkey's economy.

2. Materials and Methods

This study was carried out in 2022 at Bingöl University, Faculty of Agriculture, Department of Biosystem Engineering and Ege University, Faculty of Agriculture, Department of Field Crops. Seeds of two different cultivars of golden strawberry (Denizli and Konya) examined in this research (sowing was carried out in March and harvested in October) were obtained from Ege University, Faculty of Agriculture, Department of Field Crops (at the intersection of 38° North latitude and 27° East Longitude-Field) (Figure 1). Some physical properties of the seeds such as length (mm), width (mm), surface area

(mm²), mean arithmetic diameter (mm), mean geometric diameter (mm) and

sphericity were determined (Ozturk & Dumanoglu, 2021).

Table 1. Classification of the seeds according to their geometric characteristics and shapes (Yağcıoğlu, 2015)

Classification by geometric characteristics	Grain width/Grain length (b/a) (mm)	Classification by shape	Length (a), Width (b), Thickness (c) (mm)
Long	0.6	Round	$a \approx b \approx c$
Medium	0.6 – 0.7	Oval	$a/3 < b \approx c$
Short	> 0.7	Long	$c < b < a/3$

Seeds of two different cultivars of golden strawberry plants were first selected randomly from each variety and examined under a stereo microscope (Nikon SMZ 745T) with its own software (Dumanoğlu and Geren, 2020).. From here, parameters such as length, width and surface area of the seeds were measured. By using the obtained values, the mean arithmetic diameter

$((L+W)/2)$, mean geometric diameter $((L*D^2)^{1/3})$ and sphericity (D_0/L) values of the seeds were determined. (L: Seed length value (mm) W: Seed width value (mm), D: Average arithmetic diameter (mm); D₀: Average geometric diameter (mm)) (Mohsenin, 1970; Alayunt, 2000; Kara, 2012; 2017).



Figure 1. Growing the golden strawberry (*Physalis peruviana* L.) plant and obtaining seeds

3.Results and Discussion

Generally, the fruits of the golden strawberry plant are yellow-orange in color, close to a round shape, about 20-25 cm in diameter and 4-5 g in weight. There is an average of 150 to 300 golden colored seeds in each fruit (Kara et al., 2021). In this study, it was determined that the seeds of two different golden strawberry cultivars (Denizli and Konya) had an average length of 1.745 mm, a width of 1.402 mm, a surface area of 2.003 mm², an arithmetic diameter of 2.001 mm, a geometric diameter of 2.412 mm and a sphericity of 1.389. In addition to these, it was determined that the parameters of some physical properties of seeds belonging to

Denizli and Konya cultivars were close to each other (Figure 2). Furthermore, Figure 2, which has higher values than Denizli variety, is also seen in Konya variety. Except for the mean geometric diameter (3.278 mm) and sphericity (1.913) values of the Denizli cultivar, lower values were determined compared to Konya cultivar in other parameters. Because of this situation, the Konya cultivar may be preferred more by producers than the Denizli cultivar. When the results obtained are evaluated according to the order stated by Yağcıoğlu (2015); it was determined that both varieties of golden strawberry seeds had short and oval seed structure.

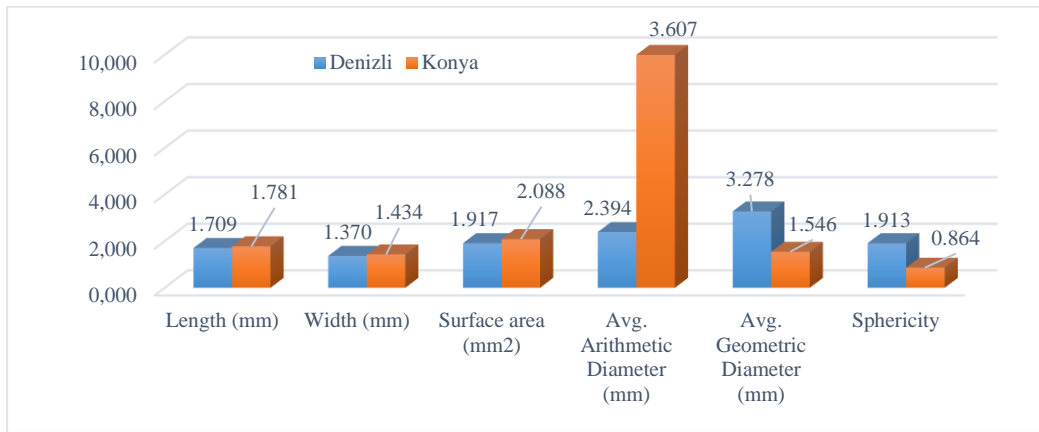


Figure 2. Some physical characteristics of golden strawberry cultivars

It is foreseen that the values obtained from this study will be beneficial in the development and spread of the production possibilities of this tropical plant, which provides economic income to the producers. Although the fruit and content properties of this plant are mostly investigated, there is no study on the physical characteristics of the seeds. It is thought that this research will benefit future studies and producers who want to grow this plant. Moreover, it is predicted that the data obtained will be beneficial for breeding studies. In addition, it is thought that the seeds of this economically valuable plant will reach consumers through markets by processing (packaging and sales).

Declaration of Author Contributions

The authors declare that they have contributed equally to the article. All authors declare that they have seen/read and approved the final version of the article ready for publication.

Declaration of Conflicts of Interest

All authors declare that there is no conflict of interest related to this article.

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