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RESEARCH ARTICLE

Agrotechnical Characteristics of Some Vegetable Seeds Commonly Grown in Denizli-Acıpayam

Zeynep Dumanoglu[1]✉ • Gülsüm Ozturk[2]

[1]Bingol University, Faculty of Agriculture, Department of Biosystem Engineering, Bingöl/Türkiye
[2]Ege University, Faculty of Agriculture, Department of Field Crops, İzmir/Türkiye

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ABSTRACT

Vegetables are not only consumed fresh but also have an important place in nutrition in terms of vitamins, carbohydrates, fats and proteins. Parts of these plants such as roots, stems, leaves, fruits and seeds are used and consumed. This study was carried out in the laboratories of Bingol and Ege Universities in 2022. In the study, some physical properties (length, width, surface area, mean arithmetic and geometric diameters, and sphericity) of seeds belonging to five different vegetables (dill, lettuce, parsley, arugula and tongue grass) were investigated. Since the seeds examined in the study are "heirloom seeds", the values obtained will enable sowing operations to be carried out with minimum seed loss by making use of mechanization applications in small and narrow areas as well as breeding studies.

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1. Introduction

Vegetables are not only consumed fresh but also have an important place in nutrition in terms of vitamins, carbohydrates, fats and proteins. Parts of these plants such as roots, stems, leaves, fruits and seeds are used and consumed. Vegetables are used in human nutrition and they are rich in minerals such as Ca, P and Fe, as well as vitamins A, B, C and D (Vural et al., 2000). Moreover, some of the spices are considered as medicinal plants, are added to food products and are used to enhance the sensory properties of that food product such as taste and flavor. Furthermore, these spice extracts have antimicrobial activity against many microorganisms. This creates a great advantage in terms of human and food health against synthetic preservatives in extending the shelf life of products naturally (Negi, 2012). There are approximately 100 families of aromatic plants within the *Apiaceae* (*Umbelliferae)* family (Al, 2019). Some of these plants, which are used both as vegetables and spices, are given below:

Arugula (*Eruca Sativa* L.): It is an annual gramine plant in the Cruciferae (*Brassicaceae*) family. Arugula is pile-rooted and its stem is rosette-shaped (Vural et al., 2000). The arugula plant can be 10-50 cm tall, its leaves are toothed, and its flowers are white and purple (Keleş, 2015). Arugula, which is a biennial plant, is used for its leaves in the first year and for seed formation in the second year. It is grown in Mediterranean

✉Correspondence
E-mail address: zdumanoglu@bingol.edu.tr

countries as fresh salad and garnish (Bianco & Boari, 1996). In the Far East, it is used as an oil plant for human nutrition and medicine (Eşiyok, 1996; Vural et al., 2000). For cultivation, between 100-150 kg of seeds is taken per decare (Vural et al., 2000). Its leaves contain plenty of vitamin C, and its seeds have stimulant, cough suppressant and aphrodisiac properties (İşbilir, 2008).

Dill (*Anethum graveolens* L.): It is an annual cool climate plant belonging to the *Apiaceae* or *Umbelliferae* family from the *Apiaceae* family (Elik, 2010). The roots of dill are stinger-shaped and white in color, the plant grows up to 90 cm in height and has yellow flowers with umbrella shape and hermaphrodite characteristics. The number of seeds per gram is 500-600. Spread sowing is common in dill planting and the planting norm is 1.5-2 g/m^2 (Eşiyok, 2012). Dill seeds are used as essential oil and spice, and its dried leaves are used as tea. Moreover, it has been stated that it reduces the risk of cancer (Elsayed et al., 2020). Its seeds have carminative, stomachic and diuretic properties, moreover, relieve intestinal spasms and eliminate bad breath. It is generally used as a sweetener in the food industry as well as flavoring various foods such as pickles, salads, sauces and soups. Since it prevents the growth of various bacteria, it has a versatile use as a preservative (Jana & Shekhawat, 2010).

Parsley (*Petroselinum crispum* L.): Parsley is a biennial herb belonging to the genus *Petroselinum* from the *Apiaceae* family. Parsley is used as a spice and medicinal plant for food use and therapeutic purposes. Parsley, which is a Mediterranean plant, is pile-rooted, 120 cm tall and has umbrella-shaped white flowers (Vural et al., 2000; Menglan et al., 2005; Halaç, 2018). In the first year the green parts are grown for leaves and flowers and in the second year the seeds are used (Telli & Üremiş, 2010; Al, 2019). Its seeds are rich in essential oil, while its green leaves are rich in vitamins A, C and E (Ceylan et al., 2005). It is consumed fresh in salads and meals. Parsley is harvested 3-5 times a year (Öztürk et al., 2014; Al, 2019). It has been determined that parsley is effective against inflammatory diseases and protects the liver with its high antioxidant properties (Çağın, 2005; Özbek et al., 2008).

Lettuce (*Lactuca sativa* L.): Lettuce is one of the most important vegetables whose leaves are used. It is produced in many countries around the world (Devlez, 2022). It is considered as one of the most important vegetables of the leafy vegetables group. The seeds are generally 3-6 mm long, 0.8-1.0 mm wide and 0.3-0.6 mm thick, and the color of the seeds can vary between dirty white, yellow, cream, brown and black (Çekim & Özarslan, 2020). It can be grown in about 30-60 days under field and greenhouse conditions in Türkiye and can be produced throughout the year (Karaağaç & Balkaya, 2017).

Cress (*Lepidium sativum* L.): It is an annual *gramineas* plant belonging to the cruciferous family (*Brassicaceae*) whose leaves are consumed as a spice. This plant, whose origin is Asia and North Africa, is consumed as a salad or side dish vegetable due to its pleasant smell and slightly spicy structure (Karaali, 2011). The roots are pile rooted, the stem is rosette-shaped and green in color. Flowers are scattered on the stem and on the lateral and main branches. Erselic flowers are white and purple in color. Seed yield per decare is between 60-70 kg (Vural et al., 2000). Its leaves are rich in calcium, magnesium, phosphorus, potassium, copper and manganese and vitamins A, B6, C and K. Tongue grass is used in the treatment of diseases such as cancer and asthma (Yanmaz et al., 2010; Hazıroğlu, 2022). Since the leaves and seeds of the plant contain secondary metabolites called glucosinolate, they are especially used in cancer treatment (Gil & Macleod, 1980; Yavaşoğlu, 2012).

In this study, some agrotechnical characteristics of seeds belonging to five different vegetables (dill, lettuce, parsley, arugula and cress) were determined. These vegetables, which can be produced not only commercially but also in hobby gardens, are among the products that are mostly produced and consumed. Production can be made in large areas by using mechanization from sowing/planting to harvest. However, in the absence of sufficient facilities, portable agricultural tools can be used. It is much easier to use these tools on narrow, non-uniform, uneven and sloping land with leveling problems or in hobby gardens. Determining the appropriate planting unit, especially for such simple agricultural tools used for sowing and planting, increases the possibility of producers to produce without loss of seed under limited conditions. Therefore, it is predicted that the basic physical properties investigated in the study will be beneficial for the design and production stages of such machines and for manufacturers.

2. Materials and Methods

This study was carried out in the laboratories of Bingol and Ege Universities in 2022. The seeds examined in the study were obtained from Acıpayam district of Denizli province in Türkiye (Figure 1). Five different vegetable seeds have been growing in this region for about 30 years and are known as “heirloom seeds”. These seeds, which are known to have 98-99% germination ability, were sown in the 2021-2022 production period.

Since Acıpayam plain has a sandy soil structure, it creates a suitable environment for growing vegetables and fruits. However, due to the insufficient level of irrigation canals, producers benefit from alternative irrigation methods (www.acipayam.bel.tr/coğrafya-iklimi/).

Figure 1. Map of Türkiye and Denizli province (www.cografyaharita.com).

In this study, some agrotechnical characteristics such as length (mm), width (mm), surface area (mm^2), mean arithmetic and geometric diameters and sphericity of seeds belonging to five different plants were determined (Dumanoglu & Ozturk, 2021). For the examination, 100 seeds were selected randomly for each vegetable. Parameters such as length, width and surface area were measured by using a stereo microscope (Nikon SMZ 745T) with its own software (Dumanoglu & Geren, 2020). Using the data obtained, mean arithmetic diameter ((L+W)/2), geometric diameter ($(L*D^2)^{1/3}$) and sphericity (D_0/L) values were determined (L: Seed length value (mm) W: Seed width value (mm), D: Mean arithmetic diameter (mm); D_0: Mean geometric diameter (mm)) (Mohsenin, 1970; Alayunt, 2000; Kara, 2012, 2017).

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

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

3. Results and Discussion

In this study, some agrotechnical characteristics of seeds belonging to five different vegetables, which are produced intensively, were investigated.

According to the data obtained (Table 2), it was determined that dill seeds had an average length of 3.835 mm, a width of 1.648 mm, a surface area of 4.711 mm^2, an arithmetic diameter of 2.742 mm, a geometric diameter of 9.828 mm and a sphericity of 2.525. The values found coincide with the seed characteristics stated (its seeds are fragrant, small, 4-5 mm long, 1.5-3.5 mm wide, flat and slight, with gray-brown lines on it) by some researchers (Ceylan, 1997; Rekha et al., 2010; Elsayed et al., 2020).

Table 2. Agrotechnical characteristics of some vegetable seeds.

Seed Properties	Dill	Lettuce	Parsley	Arugula	Cress
Length (mm)	3.835	3.387	2.685	1.686	2.580
Width (mm)	1.648	0.927	1.125	1.333	1.137
Surface area (mm^2)	4.771	2.171	2.423	1.891	2.622
Mean arithmetic diameter (mm)	2.742	2.157	1.905	1.510	1.859
Mean geometric diameter (mm)	9.828	5.366	3.328	1.298	2.992
Sphericity	2.525	1.562	1.219	0.763	1.154

Lettuce seeds were found to have an average length of 3.387 mm, a width of 0.927 mm, a surface area of 2.171 mm^2, an arithmetic diameter of 2.157 mm, a geometric diameter of 5.366 mm and a sphericity of 1.562. Çekim and Özarslan (2020) determined that lettuce seeds had a length of 3.36 mm, a width of 0.84 mm and a thickness of 0.54 mm, and a projection area of 2.79 mm^2 with a sphericity value of 0.34. The values obtained coincide with the data found in this study. Furthermore, it was determined that parsley seeds had 2.685 mm length, 1.125 mm width, 2.423 mm^2 surface area, 1.905 mm arithmetic diameter, 3.328 mm geometric diameter and 1.219 sphericity. Arugula seeds were found to have a length of

1.686 mm, a width of 1.333 mm, a surface area of 1.891 mm^2, an arithmetic diameter of 1.510 mm, a geometric diameter of 1.298 mm and a sphericity of 0.763. Besides, it was determined that cress seeds had 2.580 mm length, 1.137 mm width, 2.622 mm^2 surface area, 1.859 mm arithmetic diameter, 2.992 mm geometric diameter and 1.154 sphericity.

According to the values obtained and the seed characteristics in Table 1, it was determined that dill, lettuce, parsley and cress seeds had a long and oval structure, while arugula seeds had a short and oval structure. Accordingly, dill, parsley, arugula and cress seeds have similar seed properties, thus, it is possible to plant them using the same planting arrangement. However, the morphological structure of lettuce seeds is different from the other four vegetable seeds. Hence, choosing a planting unit suitable for lettuce seeds is important in terms of preventing possible seed losses.

The seed of each plant has its own characteristics. However, knowing these agrotechnical characteristics makes the sowing process more practical and economical. The ancestral seeds used in this study meet the predictions of the producers in terms of yield and quality because they maintain their seed characteristics over time and adapt to the climatic characteristics of the region. It is also expected to contribute to the design of new machinery and tools.

Conflict of Interest

The authors declare that they have no conflict of interest.

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