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GROWING POSSIBILITIES OF SOME ARTICHOKE VARIETIES IN THE BISHKEK–CHUY REGION OF KYRGYZSTAN

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ABSTRACT

This study was conducted to determine whether artichoke can be cultivated in Chuy (Bishkek) region of Kyrgyzstan during 2017-2018. As plant material, Olympus, Green Globe, Imperial Star and Sambo F_1 hybrid artichoke varieties were used. Seeds were sown in a plastic tunnel on March 15, 2017. Artichoke seedlings were planted in the field on April 28, 2017. The research was planned according to a randomized complete block design with 4 replications, each containing 20 plants. The plants showed only vegetative growth in the first year after planting, and heads were harvested in the second year. The maximum head weight was obtained from Sambo F_1 *with 260.57 g, followed by Imperial Star, Olympus, and Green Globe varieties with 221.75 g, 194.50 g, and 143.35 g, respectively. This research, first of its kind in the Chuy region of Kyrgyzstan, indicated that artichoke can be grown in the region.*

INTRODUCTION

Artichoke, belonging to Asteraceae (syn. Compositae) family, was previously classified botanically as Cynara scolymus L., now the new classification of artichoke is named Cynara cardunculus var. scolymus (L.) Fiori. It is known that artichoke plants originated from Cynara cardunculus var. sylvestris (Lamk) Fiori. The Asteraceae family has about 1000 genera and nearly 20,000 species around the world. In Türkiye, there are 133 genera and 1156 species (Baytop, 1999). Cynara cardunculus L. var. altilis is also cultivated in Mediterranean countries including Southern Europe, North Africa, and the Canary Islands (Sonnante et al. 2007a). Wild species mostly occur in countries from the Mediterranean Region. The origin of the artichoke is stated as the Mediterranean basin and the island of Cyprus. Within the genus Cynara, there are eight wild species and another newly defined species that has not yet been included in the classification. All these wild species are perennial and are distributed in the Mediterranean basin, located between 32° and 44° north latitudes. Although the flowers are hermaphroditic, due to protandry, cross pollination and fertilization occur (Sonnante et al. 2007a; Abak, 2025; Korkmaz & Kurtar, 2024). Artichokes are produced and consumed in many countries around the world. Leading producing countries are Egypt, Morocco, and Tunisia in Africa; in Asia, China, Israel, Lebanon, United Arab Emirates and Türkiye; Argentina, Brazil, and Chile in South America; and the USA (California) in North America (Portis et al. 2005). Nowadays, both wild forms and cultivated forms of the artichoke are mostly

found in Western and Eastern Mediterranean countries, North Africa, and Southern European countries. Italy and Spain come first in the cultivation of artichoke, which has a wide production network in Mediterranean countries (Llorach et al. 2002; Curadi et al. 2005). Although the Mediterranean countries play a major role in the consumption of artichoke as food, it is a plant species that is used as a supplement in treatments and registered in various pharmacopeias and monographs (Curadi et al. 2005; Korkmaz & Kurtar, 2024).

According to the 2023 statistics of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2023), the global artichoke cultivation area is 114,221 ha and total production is 1,609,935 tons. In Türkiye, the cultivation area is 2,550 ha and production is 36,473 tons. With this production, Türkiye ranks 6th in the world. Examining yield statistics, Türkiye, with a yield of 14.3 tons/ha, is slightly above the world average (14.1 tons/ha), ranking 8th globally. Approximately 74.9% of the world's artichoke cultivation area and 80% of its production are concentrated in Mediterranean countries (Abak, 2025; Salem et al. 2015; Fadda et al. 2018). The largest producers are Egypt (449,800 tons), Italy (369,720 tons), Spain (182,580 tons), Algeria (139,912 tons). No scientific record of artichoke cultivation exists in Kyrgyzstan to date. For this reason, this research represents the first study in Kyrgyzstan and is of significant value.

Artichoke is a vegetable propagated by seed and mostly vegetatively through basal shoots. This situation brings along certain problems. One of them is that propagation via basal shoots results in a low multiplication rate. The second issue is that clonal propagation often carries pathogens (such as root rot, wilt, Botrytis, downy mildew, powdery mildew, yellow mosaic and curly dwarf viruses). Obtaining pathogen free planting material through in vitro micropropagation techniques offers a solution to this problem. In this way, existing genetic resources can also be preserved (Tavazza et al. 2004; Sonnante et al. 2007b). However, the use of annual varieties grown from seed is increasingly common in commercial cultivation today, alongside vegetative propagation.

The edible heads of artichoke and the fleshy stems and petioles of its wild form, cardoon, are of great medicinal importance. Owing to their content of caffeoylquinic acid derivatives, especially chlorogenic acid, apigenin, luteolin, and various cyanidin caffeoyl glucoside derivatives-these plants have notable health benefits (Schütz et al. 2004; Sonnante et al. 2007b; Pandino et al. 2010; Yoo et al. 2012; Pandino et al. 2013). Artichoke is known for its antioxidant capacity, choleretic effect (stimulating bile secretion), protection against chemical-induced liver damage, and lipid lowering properties. In addition to its significance in the Mediterranean diet, artichoke has various other uses. These include bioethanol-based bioenergy production due to its lignocellulosic biomass (Gominho et al. 2011), paper pulp production (Gominho et al. 2009), using the seed oil for biodiesel production, inulin extraction owing to its high dietary fiber content (Raccuia & Melilli, 2004), and obtaining pharmaceutical compounds from its leaves and heads (Pandino et al. 2011; Ciancolini et al. 2013; Hejazi et al. 2013).

Artichoke cultivation and its primary growth stages in the Mediterranean basin occur as follows: seed germination and seedling formation in September–October, winter rosette formation in November, stem elongation in April–May, full inflorescence formation in June, fruit maturation in July, and complete senescence of aerial parts in August. Thereafter, the aboveground tissues dry, and the plants enter dormancy until the next growing season. Carbohydrates serve as the main

reserve for perennial organs. Members of the Asteraceae family use inulin as a reserve carbohydrate; therefore, they are an excellent source of inulin (Abak, 2025; Raccuia & Melilli, 2007).

Although Central Asia is known mainly for cereal production, the production of crops such as sunflower, potato, tomato, melon, watermelon and carrot has started to intensify, especially in Chuy (Bishkek, Kyrgyzstan) region. In this process, the production areas of watermelon and tomatoes, especially melons, have increased and vegetable producers have been searching for alternative vegetable types that can have a high income. The successful introduction of alternative crops into new geographical regions depends on their adaptability to local environmental and growing conditions. The importance of crop adaptation to specific soil and climatic conditions has also been highlighted for cowpea cultivation in drought-prone areas with sandy soils (Matei et al., 2015). In addition to environmental suitability, soil nutrient availability represents an important consideration in crop production, as illustrated by studies on nutrient dynamics in the soil-plant system under mineral fertilization (Dodocioiu &Buzatu, 2024). The relationship between fertilization and crop quality has also been investigated in horticultural production, including apple cultivation (Dodocioiu & Buzatu, 2023).

Therefore, this study aimed to investigate the possibilities of growing artichokes in regional conditions, to determine the plant growth and head characteristics, and to obtain literature information that will be a source for artichoke.

MATERIAL AND METHODS

This study was conducted to determine whether artichoke can be cultivated in Chuy (Bishkek) region of Kyrgyzstan during 2017-2018. As plant material, Olympus, Green Globe, Imperial Star and Sambo F1 hybrid artichoke varieties were used. Seeds of each variety were sown on March 15, 2017, inside a tunnel covered with polyethylene film. A substrate mixture of 3:1:1 composed of sieved well decomposed farmyard manure, sieved garden soil, and coarse river sand was used for seedling production. Irrigation was applied immediately after sowing.

The field was prepared with deep and shallow plowing suitable for artichoke cultivation. Seedlings (~15 cm) were transplanted to the field on April 28, 2017, with a spacing of 100 × 100 cm. The experiment was set up in a randomized complete block design with four replications and 20 plants per replication. All cultural practices-fertilization, irrigation, hoeing, etc-were performed on time (Şalk et al. 2008). Plants exhibited vegetative growth during the first year, and heads were harvested in the second year. During the winter months (December, January and February), air temperatures fell to about −4 to −6 °C. The plants were protected from cold by covering them with animal manure and a polyethylene plastic cover.

Climate data for the experimental field are presented in Figure 1. Average temperatures during April and May (vegetative growth) ranged between 12–18 °C. In June (inflorescence formation), the average was 22 °C. During fruit maturation in July, the average temperature was 25 °C. August was the driest month with only 11 mm of rainfall, whereas April had the highest rainfall with an average of 74 mm.

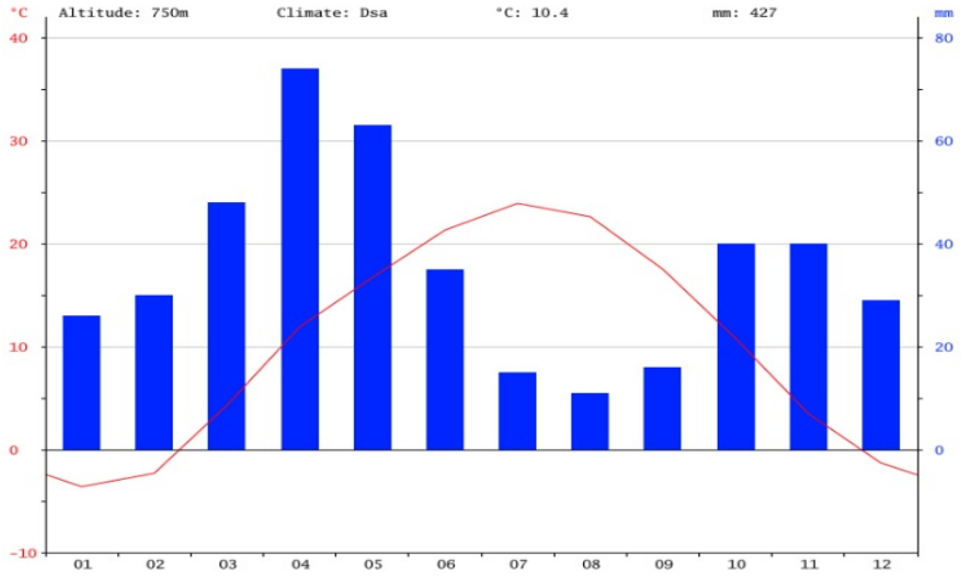


Figure 1. Climate data for the experimental field

Measurements on the experimental plants were based on UPOV guidelines (TG/184). These parameters included plant height (cm), leaf length (cm), leaf width (cm), number of leaf lobes (count), stem diameter (mm), head length (mm), head diameter (mm), head weight (g), receptacle weight (g), receptacle diameter (mm), and receptacle thickness (mm).

The obtained data were subjected to analysis of variance in the JMP Pro 17 software, and means were compared using the LSD test ($p \leq 0.05$).

RESULTS AND DISCUSSIONS

1. Plant Growth Characteristics

Detailed information about plant growth characteristics is presented in Table 1

Plant Height: Differences among varieties were statistically significant ($LSD_{0.05}$ = 28.22). The highest plant height was recorded in Green Globe (101.15 cm), followed by Imperial Star (98.33 cm) and Olympus (92.30 cm). The lowest was observed in Sambo F_1 (67.75 cm). These results are approximately similar to those of Hejazi et al. (2013), Ciancolini et al. (2013), Allahdadi and Broujeni (2018) but higher than Korkmaz and Kurtar, (2024). The difference may be due to differences in ecological conditions and varieties.

Stem Diameter: No statistically significant differences were observed. Values ranged between 19.72–22.12 mm.

Leaf Length: Statistically significant differences were observed. Green Globe (104.02 cm) had the longest leaves, followed by Imperial Star (101.85 cm), Olympus (81.85 cm), and Sambo F_1 (72.37 cm). These results are approximately similar to those of Hejazi et al., (2013), Ciancolini et al. (2013). The difference may be due to different ecological conditions and varieties.

Leaf Width: The differences in leaf width between varieties were not found to be statistically significant. Leaf widths ranged from 38.08 to 39.86 cm. These results are approximately similar to those of Hejazi et al., (2013) and Ciancolini et al. (2013). The difference may be due to different ecological conditions and varieties.

Number of Leaf Lobes: Significant differences were found ($LSD_{0.05}$ = 1.84). Olympus had the highest number of lobes (13.50), while the other varieties showed similar values (11.35–11.65).

Table 1.

Plant growth characteristics

Varieties	Plant height (cm)	Stem Diameter (mm)	Leaf length (cm)	Leaf width (cm)	Number of leaf lobes
Olympus	92.30ab	19.72	81.85bc	39.30	13.50a
Green Globe	101.15a	19.92	104.02a	39.86	11.65b
Imperial Star	98.33a	22.12	101.85ab	39.21	11.50b
Sambo F_1	67.75b	20.75	72.37c	38.08	11.35b
$LSD_{0.05}$	28.22	n.s.	20.54	n.s.	1.84

n.s. – not significant; means followed by the same letter are not significantly different (LSD, $p \leq 0.05$)

2. Head Characteristics

Detailed information about head characteristics of artichoke were shown in Table 2.

Head Length: No significant differences were found. Values ranged between 69.20–76.62 mm.

Head Diameter: No significant differences were detected. The highest diameters were found in Imperial Star (85.72 mm) and Sambo F_1 (84.45 mm).

Head Weight: Significant differences were observed. Sambo F_1 had the highest head weight (260.57 g), followed by Imperial Star (221.75 g). The lowest values were recorded for Olympus (194.50 g) and Green Globe (143.35 g). These results are similar to those of Korkmaz and Kurtar (2024). The difference may be due to different ecological conditions and varieties.

Table 2.

Head characteristics of artichoke varieties

Varieties	Length (mm)	Diameter (mm)	Weight (g)
Olympus	69.20	80.50	194.50bc
Green Globe	70.82	70.22	143.35c
Imperial Star	76.62	85.72	221.75ab
Sambo F_1	74.62	84.45	260.57a
$LSD_{0.05}$	n.s.	n.s	61.07

n.s.-not significant; means followed by the same letter are not significantly different (LSD, $p \leq 0.05$)

3. Flower Receptacle Properties

Flower receptacle properties of artichoke were given in Table 3.

Receptacle Weight: Differences were statistically significant ($LSD_{0.05}$ = 8.69). Olympus had the highest receptacle weight (38.97 g), followed by Imperial Star (37.35 g) and Sambo F_1 (32.52 g). The lowest value belonged to Green Globe

(29.55 g). These results are similar to those of Korkmaz and Kurtar (2024). The difference may be due to different ecological conditions and varieties.

Receptacle Diameter: No significant differences were observed (56.32–59.80 mm).

Receptacle Thickness: Significant differences were found ($LSD_{0.05}$ = 1.37). Olympus had the greatest thickness (22.29 mm), and Green Globe had the lowest (19.25 mm).

Table 3.

Flower receptacle properties

Varieties	Flower Receptacle Weight (g)	Flower Receptacle Diameter (mm)	Flower Receptacle Thickness (mm)
Olympus	38.97a	59.72	22.29a
Green Globe	29.55b	56.32	19.25b
Imperial Star	37.35ab	59.80	20.10b
Sambo F_1	32.52ab	59.22	20.45b
$LSD_{0.05}$	8.69	n.s.	1.37

n.s. - not significant; means followed by the same letter are not significantly different (LSD, $p \leq 0.05$)

CONCLUSIONS

This study demonstrated clear differences among artichoke varieties in plant growth and head characteristics. Green Globe showed superior performance in vegetative traits such as plant and leaf length, while Olympus stood out in number of leaf lobes and receptacle weight and thickness. Sambo F_1 had the highest head weight. Overall, variety selection should be based on production targets since each variety may have distinct agronomic advantages.

With winter protection using animal manure and a polyethylene cover, the plants overwintered successfully and produced heads in the second year.Further studies including the number of heads per plant and the total yield per plant and per hectare are recommended to confirm the production potential of artichoke in the region.

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