

# The influence of cultivation technology on the production of some varieties of okra

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**Abstract** Okra (*Abelmoschus esculentus* L. Moench) is widespread in all tropical, subtropical and temperate regions. They are leguminous vegetables used in the immature stage in various dishes. The research in this paper was carried out at SCDL Buzău between May and September 2021 and two varieties of okra were studied, 'Smaranda' with green fruits and 'Adela' with red fruits. The objective of this work was to observe the culture behavior of the two varieties in the culture conditions of the southern part of Romania. Okra plants showed different heights, 48.07 cm ('Smaranda' variety) and 65.97 cm ('Adela' variety), different diameters 57.43 cm ('Smaranda' variety) and 56.57 cm ('Adela' variety), different pod appearance, different number of fruits per plant 20.67 ('Smaranda' variety) 24.33 ('Adela' variety), okra production of 6411 t/ha ('Smaranda' variety) and 6295 t/ha ('Adela' variety). Differences were recorded in the culture behavior of the two varieties in the culture conditions of the southern part of Romania; these differences recommend the 'Smaranda' okra variety as being later but more productive per unit area compared to the 'Adela' okra variety.

## Key words

*Abelmoschus esculentus* L. Moench, cultivars, production, technology

Okra (*Abelmoschus esculentus* L. Moench) is widespread in all tropical, subtropical and temperate regions. The optimal temperatures for growth and fruiting are in the range of 20-30°C, supporting minimum temperatures of 18°C and a maximum of 35°C; they need a lot of water but are resistant to drought [2] and light soils [17].

Okra is a vegetable plant whose fruits are eaten in the form of pods, green or purple, from 4 cm to 30 cm long [19] and used in the immature phase [9; 5] in various culinary preparations [1; 14; 11] mentioned that okra can be cultivated for edible oil used in pastry. Also, okra has an antidiabetic remedy due to its biochemical composition [7].

Okra seeds generally have a low germination rate, around 65% [3] but it can also reach 71% [4].

Son et al., 2014 in the conducted study states that the height of the plants in some varieties can reach up to 170 cm in height under certain cultivation conditions. Studies have been carried out on plant density, it can reach 10.8 plants / m<sup>2</sup> for some varieties [8].

The cultivation technology involves preparing the land in the fall by leveling, fertilizing (manure, superphosphate, potassium salt) and deep ploughing.

Pushpavalli et al. (2014) recommend both chemical and organic fertilization with good results.

Shelke et al. (2019) recommend the fertilizer dose of 100:50:50 N: P: K kg/ha applied by fertigation

with a positive effect on production that can reach 11.6 t/ha.

In the spring, the soil is fertilized with ammonium nitrate, then the soil is shredded, and can apply the herbicides. Sowing is done in May using 30-40 kg of seed/ha. Care works are thinning, weeding, fertilization, phytosanitary treatments [20].

Fertilizer application leads to the growth of more shoots per plant and a higher yield of pods. The recommended fertilizations are carried out at intervals of 10 days. The pods develop quickly and are harvested one week after flowering [18].

The pods are harvested at different sizes, depending on the destination, fresh or canned consumption [6].

The objective of this work was to observe the culture behavior of the 'Smaranda' and 'Adela' okra varieties in the culture conditions of the southern part of Romania.

## Material and Method

The preliminary research was carried out at the Buzău Vegetable Research Station between May 12, 2021, and September 28, 2021.

We used two okra varieties in the study, the 'Smaranda' variety with green fruits and the 'Adela' variety with red fruits (figure 1).



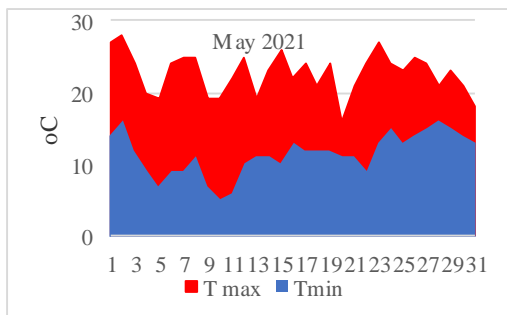
a). b).  
Figure 1. The appearance of okra flowers and fruits in 'Smaranda' (a) and 'Adela' (b) varieties

The area sown for each variety was 100 square meter. The sowing scheme of 70 x 20 cm was used, resulting in a 71428 plants / ha density. Sowing was carried out directly in the field on 12.05.2021 at a depth of about 2 cm. The atmospheric temperature was monitored using our own weather station.

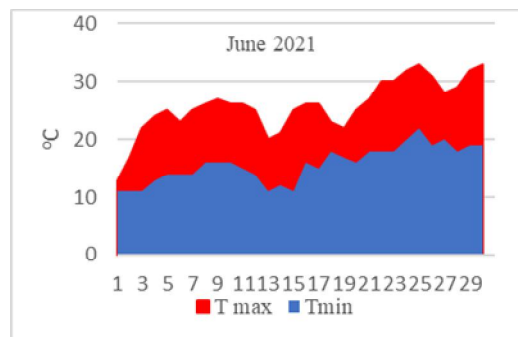
The date of emergence, the appearance of the number of flowers and the setting of the first fruits and the duration of fruiting were followed. Plant height, plant diameter, fruit length and diameter were also recorded. The fruits were harvested in stages, and the production was recorded for each harvest stage. Okra production for 1 ha crop was evaluated.

## Results and Discussions

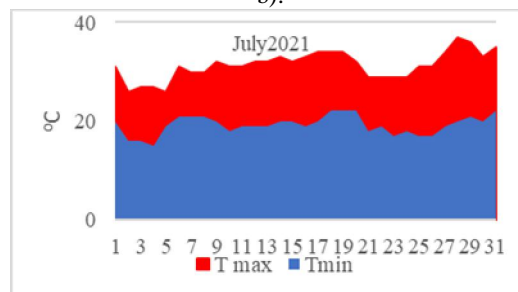
Okra is a thermophile plant and therefore must be cultivated in periods with temperature values above 20°C. During the sowing period above 20°C, temperatures are maintained also during the vegetative growth of the plants. During the fruiting period, the recorded values were over 25°C reaching towards the end of July, but also in August 2021 values were over 30°C (Figures 2 a, b, c and d).



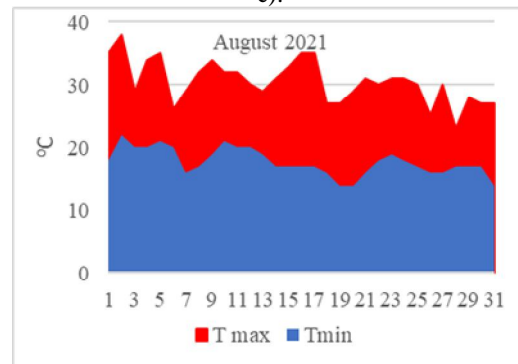
a).



b).



c).



d).

Figure 2. Temperatures recorded during the culture period

The varieties 'Smaranda' and 'Adela' were sown on 12.05.2021. It was recorded that the plants of the 'Smaranda' variety sprouted after 15 days from sowing, and those of the 'Adela' variety after 12 days.

The first flowers from the 'Smaranda' variety appeared after 49 days from mass emergence, and those from the 'Adela' variety after 40 days; we can consider this earlier. In the 'Smaranda' variety, the first fruits were formed after 12 days from the formation of the flowers, and in the 'Adela' variety after 14 days.



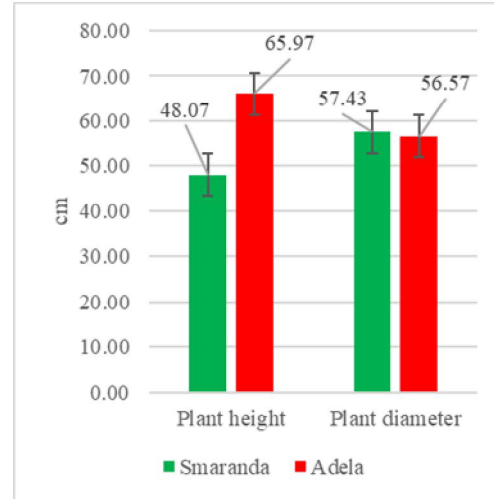
Figure 3. The appearance of the okra crop at the beginning of the first fruits formation

Some varieties of okra can have heights of 121 cm to 136.8 cm [12].

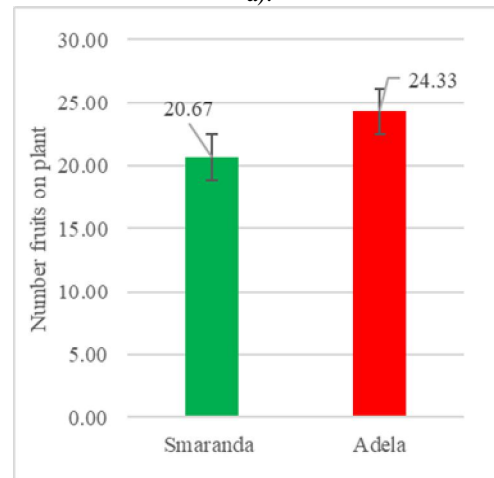
In the case of the culture carried out, the analyzed varieties of okra showed heights between 48.07 cm for the 'Smaranda' variety and 65.97 cm for the 'Adela' variety. The diameter of the plants was 57.43 cm for the 'Smaranda' variety and 56.57 cm for the 'Adela' variety (figure 4.a.).

In the case of the 'Smaranda' variety, 20.67 pods/plant were obtained and in the 'Adela' variety 24.33 pods/plant (figure 4.b).

Shujat et al., (2006) analysed a number of 6 varieties of okra and found that depending on the sowing period there are differences regarding the number of pods per plant. These ranged from 25-28 pods at sowing on 18 May to 29.33 pods/plant at sowing 10 days later. They also observed that sowing later than June 8 leads to obtaining a smaller number of capsules per plant.



a).



b).

Figure 4 a. The average height and diameter of okra plants; b. Number of fruits on plant

The data on the morphological characteristics of the leaves are presented in table 1 and table 2 respectively.

Analyzing the data on the morphological characteristics of okra leaves, we found that the basal leaves, in the case of the 'Smaranda' variety, were 37.3 cm long, those located in the middle part of the plant 35.2 cm, and those located at the top of 31.2 cm. In the case of the 'Adela' variety, we found that the basal leaves were 40.1 cm long, the middle ones 34.9 cm long, and the upper ones 34.5 cm long.

Regarding the width of the leaf, we found that in the 'Smaranda' variety, the width of the basal leaf was 22.5 cm, those located in the middle part 22.6 cm and those located in the upper part of the plant 21.4 cm.

In the 'Adela' variety, the basal leaves had a width of 24.6 cm, the median ones 25.3 cm, and those located towards the upper part of the plant 21.7 cm.

The cutout of the leaf lobe was characterized as being deep, in the case of both varieties.

Table 1.  
Characterization of okra leaves - 'Smaranda' variety

Leaf position	Leaf length	Leaf length	The depth of the leaf cutout
	cm	cm	
base	31.2	21.4	deep
average	35.2	22.6	deep
top	37.3	22.5	deep

Table 2.  
Characterization of okra leaves – 'Adela' variety

Leaf position	Leaf length	Leaf length	The depth of the leaf cutout
	cm	cm	
base	34.5	21.7	deep
average	34.9	25.3	deep
top	40.1	24.6	deep

Analyzing the length of the petiole in the analyzed varieties, we noticed that in the 'Smaranda' variety the petiole of the basal leaves had a length of 15.7 cm and a diameter of 0.8 cm, that of the median leaves of 16.1 cm with a diameter of 1.8 mm, and for those located in the top part of 20.2 cm and the petiole diameter of 1.2 cm (table 3).

Table 3.  
Leaf petiole length – 'Smaranda' variety

Leaf position	petiole length	petiole diameter
	cm	mm
base	15.7	0.8
average	16.1	1.8
top	20.2	1.2

Analyzing the length of the petiole in the analyzed varieties, we noticed that in 'Adela' the petiole of the basal leaves had a length of 16.9 cm and a diameter of 0.9 mm, that of the median leaves of 16.4 cm with a diameter of 1, 6 mm, and for those located in the top part of 21.3 cm and the petiole diameter of 1.0 cm (table 4).

Table 4.  
Leaf petiole length – 'Adela' variety

Leaf position	petiole length	petiole diameter
	cm	mm
base	16.9	0.9
average	16.4	1.6
top	21.3	1.0

Okra fruits were harvested when they were 5.1 cm to 7.2 cm long in the 'Smaranda' cultivar and 6.1 cm to 7.6 cm in the 'Adela' cultivar. The appearance of the fruits is shown in the figure 5.



'Smaranda' variety



'Adela' variety

Okra production for the two varieties, evaluated per hectare, was 6411 t/ha for the 'Smaranda' variety and 6295 t/ha for the 'Adela' variety (figure 6). We noted that the 'Smaranda' variety although it was later than the 'Adela' variety presented a higher total production.

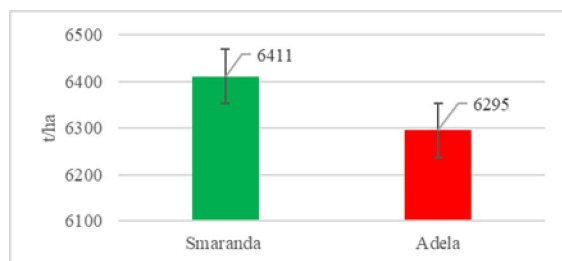


Figure 6. Evaluation of production per 1 ha of 'Smaranda' and 'Adela' varieties

## Conclusions

The analyzed okra plants showed different heights, 48.07 cm ('Smaranda' variety) and 65.97 cm ('Adela' variety), different plant diameters, 57.43 cm ('Smaranda' variety) and 56.57 cm ('Adela' variety), the different appearance of pods, different number of fruits per plant 20.67 ('Smaranda' variety) and 24.33 ('Adela' variety), production of 6411 t/ha ('Smaranda' variety) and 6295 t/ha ('Adela' variety).



The first flowers from the 'Smarranda' variety appeared after 49 days from mass emergence, and those from the 'Adela' variety after 40 days; we can consider this 9 days earlier.

Differences were recorded in the culture behavior of the two varieties in the culture conditions of the southern part of Romania; these differences recommend the 'Smarranda' okra variety as being later and more productive per unit area compared to the 'Adela' okra variety.

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