Phenology and morphology of cucumber hybrids in greenhouses

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Abstract. The aim of the experiment was to select high-yielding cucumber (*Cucumus sativus* L.) hybrids suitable for cultivation in unheated film greenhouses. In unheated film greenhouses, the morphological, biological and economic characteristics of 20 F1 cucumber hybrids were comprehensively evaluated, and it was found that Khan F1 (55 days) was superior in terms of early maturity; the standard fruit diameter for the Orzu F1 hybrid was 3.8 cm, while for all the studied hybrids it was 3.5-3.9 cm; plants were found to be 225 to 265 cm tall with 28 to 35 leaves; the total weight of fruits per plant during the period of technical ripeness of fruits was 4.7 kg in the control Orzu F1 hybrid, and Dayara F1, Sardor F1, Fontina F1 hybrids were 111.1-114.8% higher than the control, or 5.2-5.4 kg; in terms of yield, Fontina F1, Dayara F1 and Sardor F1 hybrids were 16.2-16.7 kg/m^2 or 111.0-114.8% higher than the standard.

1 Introduction

Cucumber is a common plant among crops in the legume family (Cucurbitaceae) [1; 2]. Cucumber (*Cucumis sativus* L.) Is a member of the family of crustaceans, which includes 90 generations and 750 species. This crop is one of the oldest vegetable crops grown in almost all countries with temperate climates [3-10].

Cucumber is one of the most important marketable vegetables [1; 7]. This makes the plant have a high aqueous content in its leaves, and the large leaves that form act as an umbrella over the fruit. It will be possible to grow cucumbers with wire ties or strung on a string. The fruit is cylinder-shaped, eaten during technical ripeness with blunt or pointed ends on three sides [1; 3].

In terms of crop importance, it ranks fourth in Asia after vegetables such as tomatoes, cabbage, and onions, and second in Western Europe to tomatoes [1; 9].

The genetic diversity of cucumbers is a major factor in its development and improvement [8]. However, limited genetic diversity in cucumber processing in the U.S. has led to higher yields, spurring the development of a number of inbred bexross lines originating from Cucumis hystrix to expand the genetic base [5].

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Chinese Gen Che and Xiaolan Zhang have made significant progress in understanding the genetic and molecular basis of cucumber fruit domestication in recent years studies of scientists [2]. Also, studies by Haiyan Luo and Bahare Salehi as well as other scientists have led cucumbers to identify key features such as motherhood, fruit band, chopping, leaf Bandin size, color, and plant development, as well as the bitterness of the fruit. The type of Cucurbita containing cucumber has also been studied for its pharmacological effects and phytochemical composition with potential applications in biotechnology [1; 4]. In addition, progress has been made on gender differentiation in cucumbers, especially the identification of sex-determining genes, environmental conditions, and the effects of plant hormones [4].

2 Research methods

Studies have shown that in a greenhouse with an unheated polyethylene coating closed hangar (block), local Sardor F_1, Durafshon F_1, Dayara F_1, Elegant F_1, Khon F_1, Yagona F_1, Osiyo F_1, Chempion F_1, Bahora F_1, Netherlands Orzu F_1, Azamat F_1, Espanada F_1, Pikolino F_1, Khoplayn F_1, Nano (304) F_1, Avante F_1, Fontina F_1, Colet F_1 of South Korea, Iskandar F_1 of Russia and German Acsent F_1 hybrids tested.

Research was carried out in unheated light-construction greenhouses of the farm "Shoislom orzu kelajagi" of the Oltinkol district of the Andijan region. The greenhouse is 6 meters wide, 50 meters tall, with a total area of 300 m^2 each.

After sowing, cucumber seeds are soaked for 20 minutes in a 1% solution of potassium permanganate (10 g per 1 liter of water), then mixed well and placed in cassettes measuring 50 × 7 cm. A mixture of rotten clay (40%), clay (40%) and crushed stone (20%) was used to make the cassettes.

Seedlings of 25-30 days with vigorous, well-developed roots, which released 3-4 leaves into the greenhouse, were planted on March 10 in a scheme of 80x40 CM. Seedlings planted in the greenhouse were watered immediately to catch well, then transplanted back to the fault in 2-3 days. When planted in the experimental area, it was noted that the seedlings held 100 %.

In experiments, as a control variety, a foreign Orzu F1 hybrid of cucumbers was obtained, which was included in the State Register of Agricultural Crops and recommended for planting on the territory of the Republic of Uzbekistan.

Phenological observations of F_1 hybrids of cucumbers showed that the germination of 10% of sprouts after germination of seeds all hybrids, except for the Chempion F1 hybrid, began to sprout in 4 days. It took 6-7 days for all hybrids to germinate sprouts by 75%. 10% of the emergence of sprouts motherhood flowers with a standard Orzu F_1 to open Khon F_1, Osiyo F_1, Bahora F_1, Sardor F_1, Espanada F_1, Pikolino F_1,Fontina F_1, Iskandar F_1, Khoplayn F_1, Acsent F_1 hybrids with 41 days, 1-2 days late standard Elegant F_1, Yagona F_1, Chempion F_1, Azamat F_1, Avante F_1, Colet F_1, Nano (304) F_1 also 4 days late Durafshan F1 and Dayara F1 hybrids made up 45 days.

The opening of plants 75% of maternity Flowers was 4 days earlier than the standard in the Khon F1 hybrid, Sardor F1 1 day earlier. 1-2 days later than the standard, or 50-51, Durafshon F1, Elegant F1, Yagona F1, champion F1, Azamat F1, Avante F1, Colet F1, Nano (304) opened in F1 hybrids. The rest of the hybrids were on par with the standard variety.

If the standard Orzu F1 hybrid requires 49 days from the emergence of sprouts, the hybrid of Sardar F1 and Asia F1, Durafshon F1, Champion F1 Avante F1 Colet F1 Nano (304) 3-4 days from the standard F1, and the rest of the hybrids 1- It ripened 2 days late. In this phase, the technical variation coefficient of 10% fruit is small (v = 9.0%).

Technical maturity of 75% of the fruit of cucumber hybrids is standard Orzu F1 and Elegant F1, Single F1, Hoplain F1, Azamat F1 - 59 days, Khon F1 hybrid 4 days earlier - 55 days, Dayara F1, Asia F1, Bakhora F1, Espanada F1, Pikolino F1, Fontina F1, Accent F1, Durafshon F1, Sardor F1, Iskandar F1 hybrids ripened 1-2 days earlier - on 57-58 days, and the remaining hybrids ripened 1-2 days later (Table 1).

Table 1. Growing F1 hybrids of cucumbers in unheated film greenhouses (2019–2020)

Hybrid name	Germination of seeds, day		Maternal flower opening, day		Technical processing of fruit, day	
	10 %	75 %	10 %	75 %	10 %	75 %
Orzu F_1 (st)	4	6	41	49	49	59
Durafshon F_1	4	6	45	50	52	58
Dayara F_1	4	6	45	49	51	57
Elegant F_1	4	7	42	52	51	59
Khon F_1	4	6	41	45	50	55
Yagona F_1	4	7	42	50	50	59
Osiyo F_1	4	6	41	49	49	57
Chempion F_1	5	7	43	50	52	61
Bahora F_1	4	6	41	49	50	57
Sardor F_1	4	6	41	48	49	58
Azamat F_1	4	7	42	50	51	59
Espanada F_1	4	6	41	49	51	57
Pikolino F_1	4	6	41	49	51	57
Avante F_1	4	7	43	51	52	61
Fontina F_1	4	6	41	49	51	57
Iskandar F_1	4	6	41	49	51	58
Colet F_1	4	7	43	51	53	62
Khoplayn F_1	4	6	41	49	50	59
Acsent F_1	4	6	41	49	50	57
Nano (304) F_1	4	6	42	50	53	60

As a result of testing cucumber hybrids, the correlation coefficient between 10% and 75% technical ripening of fruits from the emergence of sprouts to the technical maturity of phenological parameters was statistically processed ($r = +0.90 \pm 0.10$).

Biometric measurements of cucumber F1 hybrids were analyzed in plants 40 and 70 days after seed germination.

When the plants were 40 days old, the height of the standard Orzu F1 plant was 175 cm, and a similar figure was recorded in Durafshon F1, Elegant F1, Khon F1, Asia F1, Bahara F1, Azamat F1, Iskandar F1, Colet F1 and Khoplain F1 hybrids (Table 2). .

Table 2. Biometric measurements of 40-day-old plants of cucumber F1 hybrids in unheated film greenhouses (2019–2020)

Hybrid name	of 40-day-old plants									
	tall		side branch		leaf		maternal flower		leaf surface area	
	см	%	the number	%	the number	%	the number	%	dm2	%
Orzu F_1 (st)	175,0	100,0	12,0	100,0	19,0	100,0	22,0	100,0	27,2	100,0
Durafshon F_1	174,0	99,4	13,0	108,3	18,0	94,7	23,0	104,5	28,0	102,9
Dayara F_1	184,0	105,1	11,0	91,7	19,0	100,0	26,0	118,2	37,4	137,5

Elegant F_1	171,0	97,7	13,0	108,3	19,0	100,0	22,0	100,0	34,5	126,8
Khon F_1	165,0	94,3	11,0	91,7	17,0	89,5	23,0	104,5	28,0	102,9
Yagona F_1	155,0	88,6	12,0	100,0	18,0	94,7	22,0	100,0	33,0	121,3
Osiyo F_1	166,0	94,9	10,5	87,5	19,0	100,0	23,0	104,5	31,2	114,7
Chempion F_1	161,0	92,0	11,0	91,7	19,0	100,0	21,0	95,5	30,0	110,3
Bahora F_1	178,0	101,7	12,0	100,0	21,0	110,5	24,0	109,1	33,6	123,5
Sardor F_1	184,0	105,1	12,0	100,0	22,0	115,8	23,0	104,5	29,9	109,9
Azamat F_1	176,0	100,6	13,0	108,3	19,0	100,0	25,0	113,6	30,8	113,2
Espanada F_1	156,0	89,1	10,0	83,3	20,0	105,3	22,0	100,0	24,0	88,2
Pikolino F_1	162,0	92,6	11,0	91,7	21,0	110,5	21,0	95,5	28,5	104,8
Avante F_1	155,0	88,6	12,0	100,0	22,0	115,8	22,0	100,0	25,2	92,6
Fontina F_1	152,0	86,9	11,0	91,7	21,0	110,5	24,0	109,1	28,6	105,1
Iskandar F_1	168,0	96,0	12,0	100,0	22,0	115,8	22,0	100,0	32,2	118,4
Colet F_1	175,0	100,0	13,0	108,3	20,0	105,3	21,0	95,5	24,2	89,0
Khoplayn F_1	171,0	97,7	11,0	91,7	20,0	105,3	19,0	86,4	28,5	104,8
Acsent F_1	154,0	88,0	10,0	83,3	21,0	110,5	21,0	95,5	29,9	109,9
Nano (304) F_1	145,0	82,9	11,0	91,7	19,0	100,0	20,0	90,9	22,0	80,9
V%	7,9 %		30,2 %		23,1 %		21,7 %		18,9 %	
$\bar{x}$	169,5±13,4		11,6±3,5		19,8±4,6		22,3±4,8		29,3±5,6	

Higher than the standard variety was returned in Dayara F1 and Sardor F1 hybrids and was 184 cm or 105.1% higher.

Compared to the standard Orzu F1 hybrid, shorter plants (82.9–92.6 %) were observed in Single F1, Espenado F1, Avante F1, Fontena F1, Pikolino F1, Accent F1 and Nano (304) F1 hybrids.

The number of side branches in the standard Orzu F1 hybrid was 12, while in Asia F1, Espenada F1 and Accent F1 hybrids there were 2 less, and in other hybrids the number of side branches was close to the standard 11–13.

As a result of biometric measurements of hybrids, the correlation coefficient between 40-day-old plants and side branches was positive (r = +0.49±0.20).

The standard Orzu F1 hybrid had 19 leaves per bush, while only the Khon F1 hybrid had fewer leaves (17). 2-3 units more than the standard (21-22 units) or 115.8% more - in Bahara F1, Sardor F1, Pikolino F1, Avante F1, Fontina F1, Iskandar F1 and Accent F1 hybrids, in other hybrids close to the standard 18-20 ta leaf organized.

Leaf surface area in plants varied among hybrids. While the standard Orzu F1 hybrid was 27.2 dm2, it was 118.4-137.4% higher in Dayara F1, Elegant F1, Single F1, Asia F1, Bahara F1, Azamat F1, Iskandar F1 hybrids. Compared to the standard, Espenada F1, Colet F1, Avante F1 and Nano (304) F1 hybrids had a small 80.9-89% and the remaining hybrids were close to the standard.

Nano (304) F1, Accent F1, Colet F1, Pikolino F1, Champion F1 hybrids formed 1-2 less (20-21 pieces) compared to the standard. The least Khoplain F1 hybrid had 19 pieces.

Correlation coefficient of maternal flowers with the number of leaves on one plant was negative (r= – 0.14±0.23). When the plants are 70 days old, the height of the standard Orzu F1 plant is 255 cm, compared to it, the plants are taller (101.2-103.9%) in the hybrids Dayara F1, Bakhora F1, Sardor F1, Azamat F1, Pikolino F1, Fontina F1, Avante F1, observed.

An indicator close to the standard (96.1-99.2%) was recorded in Khon F1, Iskandar F1, Colet F1, hybrids. In the rest of the hybrids, a low indicator of height (88.2–94.5%) was observed compared to the standard Orzu F1 hybrid.

The number of lateral branches was 19 pieces in the standard Orzu F1 hybrid, while it was 21-23 pieces in Dayara F1, Sardor F1, Pikolino F1, Fontina F1, Azamat F1 hybrids. In Elegent F1, Khon F1, Bakhora F1, Avante F1, Colet F1 hybrids, the number of side

branches was equal to the standard (19-20 pieces), and in the remaining hybrids, the number of side branches was 11-18 below the standard (Table 3).

Table 3. Biometric measurements of 70-day-old plants of cucumber F1 hybrids in unheated film greenhouses (2019–2020)

Hybrid name	of 70-day-old plants									
	tall		side branch		leaf		maternal flower		leaf surface area	
	cm	% relative to st	quantity	% relative to st	quantity	% relative to st	quantity	% relative to st	dm^2	% relative to st
Orzu F_1 (st)	255,0	100,0	19,0	100,0	32,0	100,0	46,0	100,0	66,0	100,0
Durafshon F_1	235,0	92,2	18,0	94,7	28,0	87,5	45,0	97,8	62,0	93,9
Dayara F_1	261,0	102,4	22,0	115,8	34,0	106,3	52,0	113,0	75,9	115,0
Elegant F_1	232,0	91,0	19,0	100,0	30,0	93,8	40,0	87,0	63,0	95,5
Khon F_1	253,0	99,2	19,0	100,0	32,0	100,0	44,0	95,7	66,7	101,1
Yagona F_1	223,0	87,5	18,0	94,7	28,0	87,5	43,0	93,5	53,2	80,6
Osiyo F_1	237,0	92,9	17,0	89,5	30,0	93,8	40,0	87,0	54,0	81,8
Chempion F_1	233,0	91,4	18,0	94,7	31,0	96,9	41,0	89,1	57,0	86,4
Bahora F_1	260,0	102,0	20,0	105,3	33,0	103,1	45,0	97,8	68,2	103,3
Sardor F_1	265,0	103,9	23,0	121,1	36,0	112,5	51,0	110,9	72,5	109,8
Azamat F_1	261,0	102,4	21,0	110,5	33,0	103,1	45,0	97,8	69,0	104,5
Espanada F_1	234,0	91,8	18,0	94,7	31,0	96,9	40,0	87,0	58,8	89,1
Pikolino F_1	261,0	102,4	21,0	110,5	34,0	106,3	50,0	108,7	70,2	106,4
Avante F_1	258,0	101,2	20,0	105,3	34,0	106,3	46,0	100,0	67,2	101,8
Fontina F_1	259,0	101,6	21,0	110,5	35,0	109,4	49,0	106,5	75,0	113,6
Iskandar F_1	253,0	99,2	18,0	94,7	31,0	96,9	42,0	91,3	60,8	92,1
Colet F_1	245,0	96,1	19,0	100,0	31,0	96,9	43,0	93,5	64,0	97,0
Khoplayn F_1	236,0	92,5	18,0	94,7	29,0	90,6	40,0	87,0	54,0	81,8
Acsent F_1	241,0	94,5	17,0	89,5	28,0	87,5	43,0	93,5	53,2	80,6
Nano (304) F_1	225,0	88,2	17,0	89,5	29,0	90,6	44,0	95,7	55,0	83,3
V%	6,5 %		23,4 %		18,3 %		15,4 %		12,9 %	
$\bar{x}$	246,4±16,1		19,2±4,5		31,5±5,8		44,5±6,8		63,3±8,2	

If in one Bush a standard Dream F1 hybrid has formed 32 leaves, then in Dayara F1, Spring F1, Captain F1, Azamat F1, Picolino F1, Avante F1, Fontina F1 hybrids (34-36 pieces) 2-4 pieces or 106.3-112.5% more.

In plants, the area of leaf level has varied in hybrids. While the standard Dream F1 hybrid had 66 dm2, the Dayara F1, Captain F1, Azamat F1, Fontina F1 hybrids had 68.2 - 75 dm2 or 103.3-113.6% higher. Close to stantdart were the Khon F1, Avante F1 hybrids (66.2-67.7 dm2), which in the rest of the hybrids were small compared to the standard Dream F1 hybrid and accounted for 80.3-97.0%. Maternity flowers were 46 pieces in a single plant in a standard Dream F1 hybrid, while Dayara F1, Captain F1, Pikolina F1, Fontina F1, hybrids were 49-52 pieces or more than 3-6 pieces. In hybrids Durafshon F1, Bakhora F1, Azamat F1, Avante F1, 45-46 pieces are equal to the standard, and the rest of the hybrids are 2-5 less than the standard. In greenhouses with an unheated film, the structure of the leaves of F1 hybrids of cucumbers was studied (Table 4).

Table 4. The structure of the leaves of F1 hybrids of cucumbers in greenhouses with an unheated film (2019-2020 yy.)

Name of hybrids	Leaf	
	shape	color
Orzu F_1 (st)	Five edge	green
Durafshon F_1	Five edge	Light green
Dayara F_1	Five edge	Light green
Elegant F_1	Five edge	green
Khon F_1	Five edge	green
Yagona F_1	Five edge	green
Osiyo F_1	Five edge	Dark green
Chempion F_1	Six edge	Dark green
Bahora F_1	Five edge	Light green
Sardor F_1	Five edge	Dark green
Azamat F_1	Five edge	Dark green
Espanada F_1	Five edge	green
Pikolino F_1	Four edge	green
Avante F_1	Five edge	green
Fontina F_1	Five edge	green
Iskandar F_1	Five edge	green
Colet F_1	Five edge	green
Khoplayn F_1	Five edge	green
Acsent F_1	Five edge	green
Nano (304) F_1	Five edge	green

3 Research results

Morphological signs of the plant of hybrids in the collection it was found that the color of the leaves varied if The Shape of the Picolino F1 hybrid by leaf shape and color was observed as four-pointed, the champion F1 hybrid as six-pointed, and the other hybrids as five-pointed. In hybrids Durafshon F1, Dayara F1, spring F1, the leaf color was noted to be light green, in hybrids Asia F1, champion F1, dream F1, Azamat F1, dark green, in hybrids Captain F1 and the color of the leaves of the remaining 13 hybrids is Green (Table 4).

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