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Results of cucumber (*Cucumis sativus* L.) breeding at the Institute for Vegetable Crops, Smederevska Palanka

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Abstract: Market significance of cucumber for fresh consumption and the new technology of growing make it one of the most attractive vegetable variety. Interest of producers is higher every day, while the selection of new varieties is very low. The aim of this research was the selection of cucumber intended for fresh consumption with good agronomic traits intended for growing in the greenhouses and in the open field. The researchers of the Institute for Vegetable Crops, Smederevska Palanka created new

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cucumber hybrid which was recognized by Ministry of Agriculture Forestry and Water Management of the Republic of Serbia, Department for Plant protection in 2013, under the name “Kralj”.

Key words: cucumber for fresh consumption, breeding, hybrid, “Kralj”.

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Introduction

The cucumber is one of the mostly grown vegetable in greenhouses. Due to new technologies it can be grown in the agro-ecological conditions that are not suitable for normal growth and development of this plant species. At the same time, growing tomato in the greenhouses enables the consummation of the cucumber almost throughout the year.

Consumers taste became more subtle and demanding by the time. Besides that, producers were setting new demands and expected improved traits of the cucumber. The desirable traits were, at the first place, absolutely female type of sex without any male flowers, that resulted in introducing hybrids in production practice (Stanković i sar., 2004). Other desirable traits are: uniform ripening, long lasting exploitation, inbred resistance to diseases, especially to *Pseudoperonospora cubensis*, causer of the downy mildew, (M. Mijatović i sar., 2001).

Characteristics of the fruits changed trough time, which was directly influenced by market and its habits. On our market, today, the most preferable are those varieties with uniform dark green colour, without stripes, with few spines, properly shaped, about 22cm long without hole and bitterness. Institute for Vegetable Crops has been continually working on this issue for more than 30 years. This resulted in many varieties and hybrids. However, selection work with cucumber for fresh consumption is specific, demanding and time consuming. This is probably the reason why the lack of Serbian selections is present (Pavlović i sar., 2006). The last breeding program resulted in new cucumber hybrid that joins all these characteristics.

The aim of this study was to set comparative trail in order to have the most objective insight in agronomic properties of new hybrid called “Kralj” and compare it with the most common assortment of this kind in our country.

Materials and methods

Institute for Vegetable Crops has formed excellent germplasm of cucumber which gives possibility to use desirable genes and its commercialization through preferable agronomic traits (Pavlović et all, 2002). A serious approach and good equipment of the Institute, both in terms of human and material resources, has resulted in new cucumber hybrids that fit international standards.

A new hybrid was formed by selecting monoecious and gynoecious genotypes, starting from the second generation of self-pollination, by applying pedigree method and deriving clean lines of the ninth generation of inbreeding, which was then included in the program of experimental crosses.

In order to research the traits and collect biometric parameters, the trial was set at the Institute for Vegetable Crops in the open field, with three replications in standard block system. Standard technology for growing cucumber plants was applied. Early ripening represents the number of days from germination to first yield. Fruits were picked once or twice a week, depending on the moment of technological maturity. Mean values of biometrical traits (weight, length, fruit width and the number of fruits) from five harvests were calculated and tested with LSD test (Hadživuković, 1991).

Results and Discussion

The results of phenological study and comparative trial clearly show (Table 1), that time from germination to appearance of first flowers was not significantly different for the researched genotypes. Noticed differences were only two days (Table 1). However, time from germination to the first yield (which is the main parameter of the early yield) was significantly different. The difference was five days. The noted difference was significant from the commercial point of view. Producers highly value the early ripening of cucumber, very often even more than the total yield. The results show that "Kralj" was an early hybrid among the analysed genotypes. Very important trait of cucumber is a sex expression. Cucumber is a typical representative of a wide range of plant sex diversity.

Table 1: Phenological observation

Varieties	Sowing-germination (number of days)	Germination – flowering (number of days)	Germination - the first yield (number of days)	Sex expression (number of days)
Sprinter	9	26	36	Male sex type
Renesansa	9	27	41	Predominantly male sex type
Raider	9	28	41	Predominantly male sex type
Darina	9	26	36	Female sex type
"Kralj"	9	26	36	Female sex type

Sex expression is important characteristic in evaluation of cucumber varieties. Cucumber plants are characterized by different sex phenotypes (Staub et al., 2008). Wild types of cucumber genotypes are mainly monoecious with separate male and female flowers on the same plant (Wehner and Kumar, 2012). Also, exist cucumber cultivars with gynoecious (only pistillate flowers on plant), androecious (only staminate flowers on plant) and the combination of these two: “predominantly” male or female (Stanković, 1999). Then, they can have parthenocarpy i.e. plants do not require pollination to produce fruit. Parthenocarpy was applied on plants grown in greenhouses. Table 1 show that our study included all sex types. Producers prefer female sex type, since these plants give stabile and high yield. Hybrids “Darina” and “Kralj” were female sex type hybrids. For normal production of seeds of these hybrids, the seed of male varieties (pollinators) must be added for pollination.

For cucumber fruits intended for fresh consumption, the appearance is of a major importance. Moreover, buyers taste i.e. the taste of the market directly impacts the price. The appearance of cucumber is the most important variety characteristic and the result of the growing conditions. In our study, the cucumber with the highest fruit weight was “Darina” (363.42 g), while the lowest weight had “Sprinter” (192.39 g). The new hybrid “Kralj” was at the second place of this chart and not statistically significant different than “Darina” (Table 2).

Table 2: The average value of main characteristics of cucumber fruits:

Variety	Number of fruits per plant	Fruit weight (g)	Fruit length (cm)	Fruit width (cm)
Sprinter	11.80	192.39	15.52	4.25
Renesansa	13.36	256.5	19.44	4.67
Raider	12.40	249.05	15.42	4.47
Darina	14.26	363.42	20.45	5.41
“Kralj”	14.73	339.62	22.50	4.92
LSD ₍₀₀₅₎	0.79	35.37	1.80	0.33
LSD ₍₀₀₁₎	1.31	58.66	2.98	0.55

When it comes to fruit length, which is very important in evaluating the total appearance, hybrid “Kralj” stands out as the longest (22.50 cm). The shortest fruit in our study had hybrid “Raider” (15.42 cm). The highest volume had hybrid “Darina” while the thinnest fruit had variety “Sprinter” (Table 2). Thick and short fruits have low market value and the producers avoid growing these varieties.

Trait that besides weight directly influences total yield is the number of fruits per plant. This is the reason why producers insist more and more on gynoecious type of cucumber varieties. In our study, the leading place regarding

this matter had hybrids “Kralj” and “Darina“. These two hybrids had the greatest number of fruits throughout vegetation (Table 2). Therefore, they provide producers the largest total yield.

Conclusion

New cucumber hybrid “Kralj” showed great results in our study. It has the longest fruit of a good volume (width), which directly affects the good appearance on the fruit market. Its fruits have uniform, dark green colour and seldom white needles. Moreover, this gynoeious hybrid stands out with its number of fruits, which indicates its high yield potential.

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**REZULTATI OPLEMENJIVANJA SALATNOG KRSTAVCA
(*Cucumis sativus* L.) U INSTITUTU ZA POVRTARSTVO,
SMEDEREVSKA PALANKA**

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Rezime

Tržišna značajnost salatnog krastavca i nove tehnologije gajenja čine da on postaje jedna od najatraktivnijih povrtarskih vrsta. Zainteresovanost proizvođača je sve veća a domaća selekcija sorata na ovoj povrtarskoj vrsti je jako oskudna.

Cilj ovog istraživanja je selekcija salatnog krastavca sa dobrim agronomskim osobinama namanjenog za gajenje u zaštićenom prostoru i na otvorenom polju. Novi hibrid salatnog krastavca Kralj, kreiran je u Institutu za povrtarstvo, Smederevska Palanka. Hibrid je priznat kod MPVŠ, RS, Uprava za zaštitu bilja, 2013 godine pod nazivom Kralj.

Ključne reči: salatni krastavac, selekcija, hibrid, Kralj