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Biological and Agronomical Characteristics of Local and Introduced Plum (*Prunus domestica* L.) Cultivars in Georgia

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Abstract

Plum local varieties and forms are widespread in all regions of Georgia. Despite the wide dissemination of this crop, the number of cultivars is not quite a lot. Due to this reason, study of cultivars has been carried out in a collection plot of the Scientific-Research Center of Agriculture, in village Jighaura. Eight plum (*Prunus domestica* L.) cultivars including: Amers, Bluefree, Chanchuri, Empresss, President, Stanley, Shaviqliavi, Tophit were used in this study. The following agronomic and biological characteristics were studied for the cultivars: calendar periods of phenological phases, pomological description of fruits, fruit chemical analysis and productivity. The results showed that average time of maturity was from 02.08. to 30.09. The average fruit yield in this trial for Empress and President Stanley cultivars was 88.4- 98.1 kg per tree. The weight of fruit ranged from 58.4 g to 26.2 g. The cultivars Tophit, Empresss and President contain the highest contents for soluble solid substance – respectively 14.23%, 12.81%, 12.64%. According to the obtained results, the following cultivars of plum can be chosen for further cultivation which can improve the local assortment of plum like Tophit and President (fresh production), Empress and Stanley (fresh/dry production). They are characterized by early starting production, high-productivity and high quality of fruits.

Keywords: Flowering, ripening time, yield, fruit size.

Introduction

Plums are fruits best adapted to moderate climate, but they are widely grown all throughout the world, from the cold climate of Siberia to the sub-tropical conditions of the Mediterranean region (Son, 2010). Plums have a greater range of flavor, aroma, texture, color, size and other characteristics which make their fruits more desirable, than other horticultural crops (Westwood, 1993; Baden and Byrne, 2012) Considering the fact that the demand for plum fruits is increasing each year, in perspective, there is a reasonable ground to expand production, and at the same time to enlarge its economic significance. This is due to the pleasant taste of the fruit, as well as its great importance for human health.

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Plum fruit has refreshing, diuretic, energetic and anti–infective effects. It is used as fresh or dried fruit, as well as for various kinds of processed food production (compote, jam, candied fruit, juice, brandy, etc.). Fresh plum fruit contains: sugars - up to 20% solids - 20%, pectin - 2.5% free acid - up to 3%, vitamin C - 22 mg / 100 g, Vitamin B9 - 2.5 mg / 100 g of vitamin E - 1.0 mg / 100 g, etc. By the content of vitamins, it surpasses pear, cherry, strawberry, raspberry and apple. In a sense of energetic effects, plum fruit is surpassed only by grapes and cherries, however apples, pears, apricots, peaches, currants, raspberries and strawberries are all inferior to it in this case (Eristavi and Gambashidze,1978).

Five Prunus species are originate in Georgia including: *P. domestica* L; *P. cerasiferaEhrh*; *P. vachuschtii Breg*; *P. institia* L and *P. spinosa* L. All of the aforementioned species are widely grown throughout the world (Zhukovsky, 1971; Vavilov, 1935)

The plum *(Prunus domestica L.*) is one of the most important stone fruit cultivated in Georgia and has a great potential as a commercial crop of the country. Local varieties and forms are widespread in different ecological conditions. According to the data of Agency for Statistics of Georgia, plum production per annum estimates 5.0 thousands of tons (2015 year). The main portion of the harvest was put on the domestic market (80%). The most important plum production area is Shida Kartli (Eastern Region of Georgia), where it produces 2.0 thousands of tons (2015 year). According to the market studies plum has high potential due to high demand and margin price on the domestic market (Geostat, 2016). An increase in production of plums, as well as profitability of its growing, depends on biological and economic properties of the cultivar.

Despite the wide distribution of plum culture in Georgia, the assortment of cultivars is poor. Plum assortment is mainly comprised of the following varieties Altans Reine-Claude (20%); Shavi qliavi (15%); Italian prune (30%), Peach plum (30%).

Several new cultivars of foreign origin have been introduced to Georgia during the last ten years, but adaptability of these cultivars to the environmental conditions of Georgia has not been evaluated yet, including agronomical and commercial peculiarities as well as suitability of their cultivation to various regions of Georgia (Avanzato, 2002)

The goal of our research was to study introduced and local plum cultivars with different ripening period in the fruit growing area of Georgia – Shida Kartli - and selection of the best cultivars with further recommendation for cultivation within this region.

Materials and Methods

Phenological development of cultivars

Phenological development of cultivars was conducted according to the modified version of the BBCH scale (Meier, 2001). The calendar periods of the following phenological phases were studied: swelling of bud, blossoming, fruit ripening. The beginning of bud swelling time was taken when light brown scales of buds were visible, scales with light colored edges. The date of beginning of blossoming was taken when about 10% of flowers were open. Full blossoming, – when at least 50% of flowers were opened and first petals were fallen. The end of blossoming, – when 90% of petals were fallen. The duration of blossoming, was determined by the number of days from the beginning to the end of blossoming.

The date of harvest has been taken as the time of ripening of fruit and seed, and when fruits had typical taste and firmness. The date when ripening started was estimated for each cultivar, considering typical coloring of the majority of fruits, strength of fruit stem attachment and

characteristic taste of fruit. On that date samples of 50 fruits were taken at random from each replication.

Pomological characteristics

Pomological characteristics of cultivars were collected by instructions of UPOV (2003) harmonized descriptors for plum fruit. Fruit characteristics were measured on fruits harvested in full maturity stage. The samples of 50 fruits per tree were randomly harvested for each cultivar. Fruit samples were repeatedly taken in 3 day's interval (usually 3 times) during harvest time for each cultivar for determining of physical properties (length of fruit and fruit stalk, weight of fruit and stone). Fruit length and width was measured by caliper in mm. Fruit shape index was calculated as the ratio between fruit length and fruit width. Fruit weight and stone weight was measured for each fruit in gram totally for 50 fruits and average was calculated. Output was determined as ratio between fruit weight and stone weight. Fruit stalk length was measured in cm by a ruler.

Productivity characteristics

Productivity characteristics of the plum cultivars were studied according to program and methods cultivar fruit, berry and nut crops (Program, 1999).

Productivity was studied according to following parameters: the yield per tree and yield efficiencies were computed from the harvest date. Harvest date was determined as the date when fruits were on full (commercial) maturity stage. Since it is difficult to state definitely to the day when plum cultivars are ripe, because they are edible long before they are really ripe or at best quality. We took picking fruits when it was in fully ripe stage (when the berry is dark red or black). The yield efficiency was expressed as the ratio of total cumulative yield per final trunk circumferences sectional areas. The trunk circumferences were converted into trunk cross-sectional areas. Additional the canopy diameter (in two opposite directions) were annually recorded.

Biochemical analysis

Biochemical analysis of cultivars was carried out for detection of dry soluble solids, total sugars, inverse sugars and titratable acidity. Samples were prepared according to general laboratory procedures (Program, 1999). Fruits were homogenized with a manual blender. Homogenate was used as first step for several analyses as listed below. Manual press was used to obtain clear juice from homogenized fruit for sugar evaluation. The soluble solids were determined by refractmeter, (PAL-1, Atago, Tokyo Tech) and expressed as degree Brix (°Brix). Total sugar content and inverse sugars content were measured according to Luff - Schoorl method (Milosevic et al., 2013). The acid content in sweet cherries is low and has no dominating influence on the taste quality (Vangdal, 1985). Total acidity is determined by titration with 0.1N NaOH.

Statistical analyses

The mean values of the studied properties were determined. Statistical differences among cultivars were verified using ANOVA for each year separately. When the *F*-test was significant, means were compared with the LSD test at $P = 0.05$.

Plant materials

The research included 8 plum (*Prunus domestica* L.) cultivars: Amers, Bluefree, Chanchuri, Empresss, President Stanley, Shaviqliavi, Tophit. Each of them was represented in the collection by 15 plants grafted on the rootstock Ishtara.

Collection site

The experiment was carried out in the collection plot of the Scientific - Research Center of Agriculture, Georgia located in village Jighaura of Saguramo (Mtskheta municipality) during two years (2014-2015). The orchard has been established with 5.0×2.4 m planting layout in 2009.

Plants grafted on the same rootstock Ishtara have been used for each cultivar. Eight plum cultivars were investigated: Amers, Bluefree, Chanchuri, Empresss, President Stanley, Shaviqliavi, Tophit.

The trees were treated with the same agro technique and irrigation. Herbicide fallow was kept in rows. Grass in the alleys between rows was mowed. Fungicide and pesticide treatments were minimized to an essential treatment against fungal diseases and pests.

The collection orchard of village Jighaura is located in the Eastern part of Georgia, 610 m above sea level. The zone characterized by warm climate, moderately humid air, cold winter and hot summer is appropriate for cultivation of stone fruits. The average yearly temperature is 10.8 ^{0}C, the absolute minimum temperature is -17.8 ^{0}C.

July and August are hottest months. The average temperature in this period is +22 ^{0}C. The absolute maximal temperature in this period is +39 ^{0}C. The average temperature in the coldest month (January) is -1.1 ^{0}C. In the average increase of the transition air temperature above +5^0 C begins since 16th March, and decreasing of temperature (below +5 ^{0}C) begins from 21st November.

The duration of vegetation period is 245 days on an average. The late spring frosts may be caused once in 10-15 years till 20th May. The sum of active temperatures is 3870 ^{0}C. The annual precipitation is 591 mm.

The soil was alluvial Calcaric Fluvisols according to World Reference Base of Soil. Calcareous soils characterized by very low organic matter content (less than 2% in humic horizon), which tend to decrease with depth. The soil is highly carbonated causing alkalinity of soil (pH in water extract is above 8 in though whole soil profile). The soil has high stoniness index, which sometime starts from the surface. Texture content is loamy, with good infiltration rate which together with high stone content eliminates a risk of water logging, but at the same reduces water holding capacity of soil and increases the need of irrigation during agricultural production to avoid considerable yield losses from annual and perennial crops during draughts. The studied alluvial soils are poor in plant available nutrient pool. The content macronutrients, such as nitrogen, phosphorus and potassium low or very low and it is necessary to use organic and mineral fertilizers on a regular basis

Results and Discussion

Phenological study

Two years (2014-2015) observations on the progress of phenophases allow to draw a conclusion that calendar periods of phenological phases depend on biological features of a cultivar, location of collection and ambient conditions (Krska,2000).

Table 1. Phenological stages of plum cultivars (average 2014-2015)

№	Cultivar	Beginning of bud swelling		First blossoming		Full blossoming		End of blossoming		Time of maturity (date)	
		2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
1	Amers	18.03	11.03	17.04	10.04	22.04	18.04	26.04	22.04	02-06.08	10-16.08
2	Bluefree	20.03	14.03	18.04	11.04	22.04	15.04	24.04	21.04	15-20.08	24-27.08
3	Chanchuri	28.03	22.03	30.04	23.04	03.05	25.04	06.05	30.04	24-31.08	01-07.09
4	Empresss	24.03	18.03	22.04	16.04	26.04	22.04	30.04	26.04	28.08-04.09	08-16.09
5	Prezident	22.03	15.03	21.04	13.04	24.04	18.04	28.04	23.04	08-14.09	13-19.09
6	Stanley	23.03	18.03	25.04	18.04	29.04	21.04	02.05	27.04	04-11.09	11-16.09
7	Shavi qliavi	20.03	15.03	22.04	16.04	25.04	29.04	28.04	23.04	20-26.08	30.08-07.09
8.	Tophit	27.03	20.03	24.04	18.04	27.04	21.04	30.04	26.04	18-25.09	23-30.09

The results of two years (2014-2015) observations on calendar periods of phenolocal stages are given in the Table 1. According to Table 1, the beginning of bud swelling was especially accorded during third and fourth weeks of March. The differences in beginning of bud swelling between the years of studies were noticed. Namely, in 2015, bud swelling was noticed 6– 8 days earlier in comparison with 2014.

Time of blossoming and ripening

The calendar periods of blossoming for one and the same cultivar were very variable according to years; it is explained by the difference of climatic conditions (Vitanova et al., 1998; Minev and Stoyanova, 2012). The most favorable climatic conditions for blossoming were in 2014. All plum cultivars first blossoming began in mid-April in 2014 and continues 7-13 days. Namely, in 2015, first blossoming began 2 – 8 days earlier than in 2014. The First blossoming ranged from 17-30 April, 2014 and from 10-23 April, 2015. Full blossoming was registered on 22 April -03 May 2014, and 15–29 April, 2015, and the End blossoming in 2014 and 2015 was from 26 April -06 May and 21-30 April, respectively. The earliest blossoming dates were characteristic of cv. Bluefree, and the latest of cv. Stanley. First blossoming was on 10 April, and the end blossoming on 30 April in 2015, whereas in 2014 it was on 17 April, 02 May respectively. On average, full and end of blossoming occurred 3-4 and 10-12 days, respectively, after the first blossoming date.

Bluefree had the shortest blossoming period (7days), while Amers had the longest blossoming period (13 days). Beside cultivars, most of authors reported, that season (year) importantly influenced blossoming date (Garcia-Montiel et al., 2010). In addition, climatic conditions can affect fruit set with negative effects of both low and high temperatures (Milatović et al., 2014).

The cultivars ware divided according to the blossoming time: Early (Amers, Bluefree), medium (Stanley, President, Empress) and late (Chanchuri, Tophit) blossoming time cultivars. There was a 12-day difference between early and late blossoming time cultivars.

As for maturity period, there were differences among plum cultivars, too. Amers was the earliest ripening cultivar (02-15 August), and President, Stanley, Tophitwere the latest (8-22 September). The plum cultivars could be divided into two groups according to the ripening period- early and late ripening period. Early ripening period cultivar was Amers. Late ripening period cultivars were President, Stanley, Tophit. Comparing the years of studies, it can be concluded that the differences in the time ripening period for the same cultivar were not big (4 – 6 days). These results are in agreement with those of Ganji Moghaddam at al. (2011) who reported similar results for plum cultivars. The sequence of fruit ripening in the evaluated cultivars mostly agrees with published results Blažek and Pištěková (2009). Some slight discrepancy in this respect could be explained by influence of different climatic conditions, the rootstock used or differences in fruit set.

Yields and yield efficiency

The agrotechnical background for all cultivars was the same. Therefore the difference between cultivars according to growth parameters is explained by the biological peculiarities of cultivars.

Table 2 shows the yield (in kg) per one tree of each cultivar according to years (2014-2015) and the average yield for two years.

Table 2. Yields per tree and yield efficiency of plum cultivars (average 2014-2015)

№	Cultivar	Yield per tree (kg)			Crown Volume (m^3)	Trunk cross-sectional area (cm^2)	Yield efficiency	
		2014	2015	average			Kg/m^3	Kg/m^2
1	Amers	54.8±1.24d	68.0±1.71c	61.4±1.63d	28.5±0.07c	21.2±0.32d	2.3±0.04c	3.1±0.02c
2	Bluefreee	64.8±1.18c	75.0±1.50	70.0±1.44c	20.8±0.08a	15.6±0.24a	3.3±0.05b	4.5±0.02a
3	Chanchuri	70.0±2.06	82.5±1.64b	76.2±1.24c	26.8±0.09b	19.4±0.16c	2.8±0.01d	3.8±0.02
4	Empresss	90.0±1.36a	106.2±1.82a	98.1±1.82a	25.2±0.08b	20.2±0.18	3.9±0.12a	4.8±0.01a
5	President	86.7±1.22a	94.5±0.96a	90.5±0.56a	26.0±0.01	19.6±0.22c	3.5±0.14b	4.6±0.00a
6	Stanley	80.4±1.18b	96.5±0.70a	88.4±0.45b	21.2±0.06a	16.6±014b	4.2±0.01a	5.3±0.00a
7	Shaviqliavi	52.0±1.52d	67.8±0.38c	60.0±0.38d	24.0±0.01b	17.3±0.30b	2.5±0.16d	3.4±0.04c
8	Tophit	60.2±2.22c	72.5±0.22b	66.4±0.40d	19.7±0.01a	14.5±0.12a	3.1±0.12b	4.2±.0.01b

cultivar means in the same column followed by the same letter are not significantly different according to the LSD test ($P = 0.05$). (mean ± SE).

As primary research has shown, average fruit yield differed among plum cultivars. The severe summer drought of 2015, when rainfall in June and July was very low, Stanley, President and Empresss produced higher fruit yields, while Blufre, Tophitand Amersproduced produced lower ones (20-30 kg for tree). Out of the researched cultivars, the cultivars Empresss Presiden and Stanley are the most productive - the average yield per tree for them is 98,1; 90,5 and 88,4 kg, respectively. The highest-yield year was 2015 (106,2- 67,8 kg), the lowest yield year - 2014 (90,0- 52,0 kg).

The average yield on the projection of 1 m^2 crown and on the volume of 1 cm^3 crown was counted. According to the data, the highest returns were noted in 2015, for trees of cultivars Empresss (106.2 kg) and President (94.5kg), whereas the least productive were in 2014, of Shaviqliavi (52.0 kg) and Amers (54.8kg) cultivars. The highest value of yield efficiency was on Stenley cultivar (4.2 $kg/m^3$5.3 kg/m^2) whilst the lowest ones were recorded on Amers (28.5 $kg/m^3$21.2 kg/m^2).

Mean yields and yield efficiency in this trial were on similar with Blažek and Pištěková (2009). The results are also supported by Ganji Moghaddam (2011). The differences between our results and those of the above authors could be explained by differences in the tree shape and size and in the pruning regimes.

Fruit and stone weight and its dimensions

During evaluation of plum cultivars both quantity and quality of yield are important. The best cultivar has characteristics of high yield and good commercial properties. The commercial parameters of the fruit are mass, size, form, coloring, consuming qualities. The commercial properties of fruit, besides peculiarities of a cultivar, depend on soil and climatic factors and complexity of agro technical measures (Ertekin, 2006).

Our zone of research (Shida Kartli) by its climatic conditions is one of the best for planting plum cultivars, therefore the biological properties, manifested by the introduced cultivars determine their further propagation with the commercial purpose.

With the purpose of estimation of fruit quality, the mechanical characteristics of fruit (mass, dimensions and size of drupel) have been studied.

The weight of fruit is one of the most important pomological characteristics because the fruits are mainly used for fresh consumption. As the Table 3 shows the big mass of fruit is characteristic for the cultivars: Empress, Prezident, Stenley, Shaviqliavi, Topiti while the Chanchuri cultivar has a relatively small fruit. The biggest fruits were recorded in the case of Empress, having an average fruit weight of 58.4 g. The next in sequence were Prezident 52.6 g, Stenley 50.4g, Shaviqliavi46.5 g and Tophit 42.4 g. On the other hand, the smallest fruit weights belonged to Chanchuri averaging only 26.2 g.

Table A.3. Fruit traits of plum cultivars (average 2014-2015)

№	Cultivar	Fruit weight [g]	Stone weight [g]	Stone to fruit ratio [%]	Dimension of the fruit			Fruit shape	Adherence of stone to flesh
					Height	Width	Thickness		
1	Amers	40.5±0.28b	1.5±0.11d	3.7±0.21c	4.4±0.06b	4.2±0.02a	4.8±0.11a	0.96±0.02d	Free
2	Bluefree	38.0±0.42c	1.8±0.15c	4.7±0.40b	4.7±0.06a	3.9±0.03b	3.5±0.12b	1.4±0.04c	Free
3	Chanchuri	26.2±0.24d	1.4±0.11d	5.3±0.36	3.0±0.11c	2.3±0.04c	2.0±0.14d	1.9±0.03a	Medium
4	Empresss	58.4±0.18a	2.1±0.18a	3.5±0.22c	5.1±0.08a	4.2±0.04a	3.8±0.12b	1.6±0.11b	Medium
5	Prezident	52.6±0.24a	2.4±0.26a	4.5±0.18b	4.8±0.10a	3.7±0.12b	3.6±0.04b	1.7±0.22b	Medium
6	Stanley	50.4±0.31a	2.3±0.14a	4.5±0.21b	4.6±0.09a	3.7±0.11	3.5±0.04b	1.6±0.3a	Free
7	Shaviqliavi	46.5±0.12b	2.6±0.24a	5.6±0.16a	3.5±0.06	2.7±0.02c	2.1±0.15d	2.5±0.2a	Free
8	Tophit	42.4±0.16b	2.0±0.24b	4.6±0.20b	4.4±0.08b	3.7±0.06b	3.0±0.02c	1.7±022b	Free

Cultivar means (mean ± SE) in the same column followed by the same letter are not significantly different according to the LSD test (P =0.05).

Average fruit value dimensions were in correlation with the weight of fruit. In all researched cultivars, it was observed that width was larger than length. On the basis of fruit dimensions, fruit shape factor was calculated. That value was the lowest in Amers cultivar (0.96), and highest in Shaviqliavi cultivar (2.5).

Stone weight also showed considerable variation among cultivars, from 0.9 to 3.1 g. Adherence of stone to flesh ranged from medium (President), weak (Empresss) to free (Amers, Stenley, Shaviqliavi).

The lowest weight of stone weights was recorded in Chanchuri (0.9 g) whereas cultivar Stenley (2,3g); Prezident (2,4g); Empresss (3,1g); had heavier stones. A great majority of evaluated cultivars were stone-free.

The lowest share of stone in total weight of the fruit was in Empress Cultivar (3.5), and highest in Saviqliavi cultivar (5.6). Plums with lower stone weight have better value, as well as those having lower share of stone in total weight of the fruit. Our results are in an accordance with Hartmann, Fische (2003); Nenadović, Mratinić et al. (2007),

Chemical composition of plum cultivars

The results for chemical composition of plum cultivars are presented in the Table 4. The quality of fruit is determined mainly by the chemical composition of pulp. In this research, chemical analysis of the plum was carried out – total soluble dry substance, total sugars and titrable acidity were also determined.

Main factor of fruit quality is the content of soluble solids. It depends on many factors, and mostly on the cultivar, rootstock and stages of fruit ripeness. In the present study, total soluble solids (TSS) ranged between 10.28% (Chanchuri) to 1423% (Tophit).

Table A. 4. Chemical composition of plum cultivars (average, 2014-2015)

№	Cultivar	Soluble solids (%)	Total sugars (%)	Inverted sugars (%)	Total acids (%)
1	Amers	11.70±0.12c	9.54±0.22d	7.22±0.10a	1.62±0.00d
2	Bluefree	11.52±0.26c	10.11±0.18c	6.21±0.12c	1.48±0.02d
3	Chanchuri	10.28±0.11d	9.64±0.12	6.00±0.12c	0.54±0.01a
4	Empress	12.81±0.10b	11.81±0.11b	7.28±0.22a	1.27±0.02c
5	Prezident	12.64±0.18b	11.52±0.18b	6.24±0.24b	1.11±0.00a
6	Stanley	13.78±0.20a	12.32±0.22a	6.43±0.41b	0.43±0.00a
7	Shaviqliavi	12.41±0.14b	10.67±0.14c	5.81±0.18d	0.73±0.02b
8	Tophit	14.23±0.12a	12.24±0.11a	7.22±0.18a	0.81±0.01b

Cultivar means (mean ± SE) in the same column followed by the same letter are not significantly different according to the LSD test (P = 0.05).

By analyzing the content of sugar types in the fruit we made a conclusion that inverted sugars are dominant, and sucrose is present in smaller amounts. The content of total sugars ranged from Stanley (12.32%) -Chanchuri. (9.64 %), mean SSC ranged between 10.2 and 14.2°Brix. Fruits of the Topfit have the highest SSC, followed by Stenley, the lowest SSC was detected in Chanchuri (10.2). According to Surányi (2006) late-maturing cultivars are generally characterized by higher dry matter content and lower acid content. The present results for Tophit was similar to those published by Gadze et al. (2011) and Jacob (1998).

The content of acids ranged from 0.43% (cv. Stenley) to 1.62% (cv. Amers). A similar situation was found for the acid content with the Blažek et al. (2005).

In terms of the soluble solids the highest values were found for Topit, Stanley and Prezident and Empress this ratio is one of the best indicators of fruit flavour. It was stated by Vangdal and Flatland (2007) that a dry matter content in excess of 12.5% and a soluble solids: titratable acidity ratio of over 10 is required if the fruit is planned to be suitable for eating (Molnár et.al 2016).

Kader (1999) and Molnár et.al (2016) concluded that the titratable acidity should be below 0.8% and the soluble solids content above 12%, which means that the lowest acceptable sugar/acid ratio is over 15. All the cultivars investigated in the present work had soluble solids: titratable acidity ratio of over 15 and a soluble solids content exceeding 12.5%.

The differences between our results and results of other authors, who studied these cultivars, can be explained by the influence of different rootstock, soil and climate conditions.

Conclusions

Having studied some biological and agricultural properties of plum (*Prunus domestica L.*) cultivars grafted on rootstock Ishtarain, we have drawn the following conclusions:

- Flowering begins in the second part of April, and it lasts for 10 – 13 days (8.3 days on average). The cultivar Amers begins flowering as the earliest (10.04) and the cultivar Chanchuri most lately (23.04) in 2015 year.
- Fruit ripening extended from early August to September. Average time of maturity was from 02.08. (Amers) to 30.09. (Tophit).
- The time of maturity of the researched cultivars was from 02.08. (Amers) to 30.09. (Tophit). Comparing the years of studies, it can be concluded, that the differences in the time of maturity for the same cultivars were not big (6 – 8 days).
- . The average fruit yield in this trial for Empress, President and Stanley cultivars was 88.4- 98.1 kg per tree
- The weight and size of fruit are the most important indicators of plum fruit quality. All studied cultivars could be classified like plums with large (except for Chanchuri) fruit size. The weight of fruit ranged from 58.4 g (Empress) to 26.2g (Chanchuri).
- The Tophit, Empresss, Prezident cultivars contain the biggest contents of soluble dry substance – respectively 14,23%, 12,81%, 12,64%.
- The contents of total sugars in the cultivars varied from 12.32% (Stenley) to 9.64% (Chanchuri).
- Taking everything into account, the best features among studied cultivars were found in President, Tophit (for fresh fruit), Stanley and Empresss (for dried Fruit) cultivars and their planting is recommended in the similar soil and climatic conditions of Georgia. The results of this study confirmed that at present the

economic situation of the country's plum production is well profitable. The study indicates the importance of the selection of the cultivars that are favored by the consumer and that generate high yields. Wider ripening periods and high quality products are also important. However, in order to make a final conclusion about these cultivars, the study has to be continued.

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