

# Comparative Study of 14 Cherry Cultivars in Conditions of Low Coastal and Transitional Areas of Albania

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## Abstract

The Sweet cherry (*Prunus avium*) is a well-known fruit species in the Albanian horticultural and commercial market. In Albania, the cultivation of cherries is widespread and well known for its commercial value and family consumption. The most cultivated native cultivars are: Dollmas, Belica-s and Zhitoma, while in the 1980s in the varietal structure were introduced some of the best European varieties such as Burlat, Napoleon, Ferrovia, Katalina, which adapted well and have prevailed the production structure during 20 years. After the 2000s in the Albanian orchards were introduced auto-fertilized cultivars, which were introduced into the planting structure over vegetative rootstocks that are widely spread from the coast to altitudes of 850-900 m above sea level. This new development trend was studied by QTTB Vlora and UBT Tirana researchers, in 2017-2019 in a private farm in Spille, Kavaja. The farm is located at coordinates E 019 ° 28'19.4 "and N 41 ° 05'09.1". The average annual temperatures in this region range from + 14-17 ° C and the precipitation levels are above 600-1200 mm per year. The experimental analysis included 14 North American and European cherry varieties that have predominated in Albania over the last 10 years. Burlat was selected as the reference cultivar due to its climate adaptability and widely use for its commercial values over 50 years in our country.

The results of the study showed that, compared to the standard cultivar, New Star and Grace Star had higher flowering intensity. With regards to the percentage of fruit set, Sweet Heart recorded a percentage of 30.1% followed by Burlat 29.32, Feu 5 28.51, Celeste 24.45, Lapins 22.9, Regina 22.7, Grace Star 17.6, Lala Star 16.68, New Star 16.64, Ferrovia 15.9, Mora di Cazzano 14.08, Black Star 10.08 Schneider 1.77 and Cordia 1.24 %.

Cultivars Celeste, Burlat, Lapins, New Star and Mora di Cazzano resulted in the respective crop yields, 17.01, 15.56, 14.99, 13.7, 13.45 kg /plant, while Schneiders and Cordia performed poorly at 0.73 and 0.7 kg / plant, respectively.

The indicator of resistance to fruit cracking also indicated interesting results. Showing that: Celeste has high sensitivity with 75.32%, New Star, Big Burlat, Mora di Cazzano, Ferrovia, followed by results, 38.69, 38.29, 32.13, 30.23%.

Maturity results appeared to be different. The Burlat variety, usually matures during the first 10 days of May, with a difference of 10-14 days after the Feu 5, Celeste, Grace Star and New Star varieties mature.

Cultivars that recorded average ripening stage were Black Star and Mora di Cazzano (+ 15-20 days), while Lala Star, Cordia, Ferrovia, Sweet Heart and Regina resulted in later ripening, + 20, + 22, +24, respectively +30 and +32 days compared to Burlat. Regina, Cordia, Black Star, Grace Star, 10.7, 10.5, 10.2, 10 gr are rated as cultivars having the biggest berry's weight, followed by Lala Star, New Star, Ferrovia, Schneiders, Celeste, Lapins, Feu 5, Sweet Heart, Burlat, Mora di Cazzano, with weight 9.2, 9.1, 9.0, 8.1, 7.3, 6.6, 6.6 and 6.3 gr respectively.

The analysis of statistical indicators for eligibility, quantitative and qualitative production indicators, considers as the most important varieties: New Star, Lapins, Burlat, Mora di Cazzano, Regina, Lala Star while Schneider and Cordia presented more discrete indicators.

**Keywords:** Sweet cherry, cultivars, auto-fertility, maturity, regionalization.

## 1. Introduction

Albania is a country considered to have a convenient position for the cultivation of a wide range of fruit trees, represented by 35 major and secondary species while the national germplasm includes about 3225 different autochthonous and endemic species [32].

Within this national wealth is also included the cherry plant (*P.Avium*) which is well known by the horticultural market and consumers, also due to the

favorable geographical position and alternative climate conditions of Albania [20].

Due to the adaptability and large number of cultivars spread and cultivated, the cherry fruit in Albania is cultivated from the coastal areas until the subalpine Mediterranean climate area, 850-950 m above sea level [(20)].

The extensive cultivation area with suitable temperatures and soil micro areas has created regionalization and productivity opportunities from

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(Accepted for publication March 27, 2020)

ISSN: 2218-2020, © Agricultural University of Tirana

domestic and foreign cultivars to planting structures in the last 30- 50years.

The most prominent cultivars of the country are Zhitoma, Dollmas and Belica whereas from the 1980s in the varietal structure were introduced cultivars such as Burlat, Burlat C1, Napoleon, Ferrovia, Katalin, etc., which over these last 20 years of the 21st century have adapted well, have high yield and good phytosanitary conditions [7; 12 ; 14].

After the 2000s, in a private or organized manner, the structure of cherry tree planting improved with the introduction of North American auto fertilized cultivars over vegetative rootstocks spreading throughout the country, which gradually replaced the traditional auto-sterile and low yield cultivars [13].

According to data from INSTAT, cherries are ranked third in the structure of planting and realized production, right after apples and plums. Until 2018, there were over 1 141 291 cherry plants cultivated in Albania, of which about 736 660 located in orchards at approximately 2 448 ha. Only in 2018, 42 ha and 36 442 new cherry plants were reported, 18% of which planted in the lower coastal region of Albania [18].

This new development, unnoticed until now by local research institutions, provided a new opportunity for work and research. Initial studies are focused on the low-lying Mediterranean and transitional areas in Albania, while focusing on 14 traditional and young cultivars of Canadian and European origin.

The experiment was conducted at a private collection in Spille, Kavajë in 2017-2019. The farm is located at coordinates E 019 ° 28'19.4 "and N 41 ° 05'09.1". In the selected region the average annual temperatures range from + 14-17 ° C and the level of precipitations is above 600-1200 mm per year [20].

The soil is clay-sandy, with good structure and optimal parameters of organic matter, salt content, limy and nutrients [28].

Burlat was selected as the reference cultivar, with over 50 years climate and market adaptation in our country. The cultivar series includes New Star, Grace Star, Sweet Heart, Burlat, Celeste, Lapins, Regina, Lala Star, Feu 5, Mora di Cazzano, Black Star, Ferrovia, Schneider and Kordia

Being one of the first fruits to mature, in addition to its nutritional values, cherries bring freshness to the consumers and are considered as a consumer-loving fruit. The specific values associated with a high offer at the beginning of the season, made possible in recent years, to target very early and early ripening cultivars

[24] by focusing on areas that accelerate by several days the introduction of the fruit market [19].

Some specific provisions that have promoted the economic cultivation of cherries include the application of agronomic practices that promote fertility[2], usage of bio stimulants for flowering, fruit set, quality improvement [8; 11; 15 ; 25 ; 26], cultivation in surveyed greenhouse conditions, promoting early ripening and crop crack protection, use of crown-restricting vegetative substrates and accelerate product entry [3; 33].

The increase of cherry surfaces, although intriguing, is inevitably influenced by planting restricting factors, as is the case with many areas that do not justify themselves due to the influence of warm climate on flower differentiation [4; 5; 15], difficulties in the process of fruit pollination and fruit set [25 ; 29], but also the lack of knowledge and mistakes made in the selection of planting material, regionalization and inappropriate cultivation agrobiologis [14].

The introduction of self-pollinating cherry cultivars in the Albanian market in recent years, with its distinct biological characteristics, good fruit quality, adaptation of fruit size indicators or its constituents as a result of genetic improvement programs [23 ; 25], reduced growth rootstock [1 ; 3 ; 6 ; 8] and adaptation of modern technologies [1; 2; 8; 10 ; 24], has opened a new perspective for the development of cherry culture in our country. The study and results provided, aim to evaluate the suitability, productivity and quality of the 14 most popular cultivars of the last 20 years which, in combination with traditional cultivars, will be the basis of cherries spread throughout the Albanian territory.

## 2. Material and Method

In order to conduct the study, the study methodology was initially developed and approved by the relevant structures of ATTC Vlora and the Department of Horticulture of UBT Tirana. The study was conducted over three consecutive years, from 2017 to 2019, while the implementation of the experimental part, utilized the collection of a private farm, located in Spille Kavaja, a typical Mediterranean marine climate area.

The farm is located at the coordinates E 019 ° 28'19.4 "and N 41 ° 05'09.1". Fourteen cultivars with approximately 280 plants were studied, enabling the experiment to be set up with two replicates x 10 plants. The planting distances are 4x4 m and Gisela 6, MaxMa and Cab 6 rootstocks are applied [22]. Two cultivar plants were involved in observation, and since winter

pruning, the representative branches were labeled and selected at N-S-E-W positions, preserving them for the three years of the experiment. The crown shape is crouous. Stem height is about 70 cm and three skeletal

branches at 55°-60° angle. The agro-technology applied was the one referred by the farmer while the indicators selected for analysis are vegetative and reproductive [22].

**Table 1. Scheme of placement of the experiment**

No	Cultivar Variant	Row	No. of plants	Selected Plants	Protective area
1	Burlat	1-15	20 (10+ 10)	3 & 8 and 2, 9	16 plants
2	New Star	2-16	20 (10+ 10)	3 & 8 and 2, 9	16 plants
3	Grace Star	3-17	20 (10+ 10)	3 & 8 and 2, 9	16 plants
4	Sweet Heart	4-18	20 (10+ 10)	3 & 8 and 2, 9	16 plants
5	Celeste	5-19	20 (10+ 10)	3 & 8 and 2, 9	16 plants
6	La Pins	6-20	20 (10+ 10)	3 & 8 and 2, 9	16 plants
7	Regina	9-21	20 (10+ 10)	3 & 8 and 2, 9	16 plants
8	Lala Star	8-22	20 (10+ 10)	3 & 8 and 2, 9	16 plants
9	Feu 5	9-23	20 (10+ 10)	3 & 8 and 2, 9	16 plants
10	Mora di Cazzano	10-24	20 (10+ 10)	3 & 8 and 2, 9	16 plants
11	Black Star	11-25	20 (10+ 10)	3 & 8 and 2, 9	16 plants
12	Ferrovio	12-26	20 (10+ 10)	3 & 8 and 2, 9	16 plants
13	Schneider	13-27	20 (10+ 10)	3 & 8 and 2, 9	16 plants
14	Kordia	14-28	20 (10+ 10)	3 & 8 and 2, 9	16 plants
	Total	28 rows	280 plants	56 plants	224 plants

### 2.1 Indicators Observed

- Flowering period (start, full bloom, finish).
- Flowering intensity (scoring from 1-5). It is considered the minimum level when there is at least one flower in the potential flower buds and the flowering of the whole tree.
- Fruit set is measured in percentage by analyzing 250 randomly selected flowers / plants in tagged branches that are monitored until the ripening and harvesting is completed.
- Maturity period, beginning and ending of maturity.
- Production in kg / plant and a sample of 100 fruits / cultivar were estimated where fruit weight, berry size, fruit color were measured.
- Percentage of sugar (° brix) and acidity (grams / liter).
- Evaluating the taste of the fruit.
- Monitoring the cherry market price, calculating the revenue and effectiveness for each cultivar.

- Calculating the productive efficiency as a ration of production / plant with estimated 30 cm stem area measured for the labeled plants.
- Other production parameters were evaluated (3 plants from each cultivar) [23].
- Rainy days during the flowering period, grain growth, ripening and harvesting.
- Fruit cracking for each cultivar.
- Estimations of the rate of infection by *Moniliacinerea*, *cherry lice Myzus cerasi*, *Cherry flies, Rhagoletiscerasi etc.*
- Statistical analysis was performed using Tukey-Kramer HSD, Comparisons for all pairs method, for error level 0.05.

### 3. Results and Discussion

Results from the three years of study, expressed as average values in Table 2, showed that varieties have different flowering times and intensity of flowering, which vary from 3-6 days, indicating that these two estimated parameters, besides the environmental conditions are also caused by genetic inheritance. A comparative analysis of the blossoming period, grouped Burlat, Black Star, Feu 5 and Grace Star as

varieties with an earlier flowering period, while varieties such as Ferrovia and Schneiders have a later flowering period. These results are in accordance with the references published by Italian researchers 1989-1992 [8; 16 ; 23 ; 24 ;25].

Cultivars like Burlat, New Star and Grace Star, recorded the highest flowering intensity while Feu 5 and Celeste had the lowest intensity. Despite flowering intensity, the quantity of fruits after the falling of the

sepals also showed a significant difference between cultivars, which was deepened compared to ripened fruits.

The statistical analysis showed that, the cultivars Cordia and Schneiders had lower percentage of set fruits and ripened fruits (Table 4). While values obtained indicate other determining factors besides genetic related ones that influence the fruit set process [4 ; 8].

**Table 2.** Flowering period and flowering intensity of cultivars

Cultivar	Ripening Period (dates April – June)															Flowering Intensity				
Lapins																1	2	3	4	5
Black Star																1	2	3	4	5
Grace Star																1	2	3	4	5
Regina																1	2	3	4	5
Feu 5																1	2	3	4	5
Celeste																1	2	3	4	5
Ferrovia																1	2	3	4	5
Sweat Heart																1	2	3	4	5
Mora di Cazzano																1	2	3	4	5
New star																1	2	3	4	5
Kordia																1	2	3	4	5
Lala Star																1	2	3	4	5
Burlat																1	2	3	4	5
Schneiders																1	2	3	4	5

Temperatures and humidity are climacteric elements that directly influence the flowering and optimal fruit set in cherries. Low and high temperatures (20-25 °C) before flowering, may cause inhibition of ovary, ovules and pollen, causing miscarriage of flowers and consequently a lower yield [4; 5; 29].

Referring to the three year observation, cultivars with a later flowering period, in conditions of high temperatures and low humidity as well as dry long lasting winds during flowering period, are prone to the fast drying of pollen secretions and pistil stigma causing low productivity [14]. This phenomena has been encountered in varieties such Ferrovia and Schneiders, cultivars that recorded a high number of fruits were unable to mature [22].

Over these three years, were not recorded temperatures below normal values, while fluctuations went from 10-7 °C, with an increasing indicator of 1.5°C above the annual average [17; 20]. This excludes the possibility of damages due to temperatures but there must be involved other internal factors in determining the differences in total yield [22].

With regards to precipitations, this period is not characterized by long period of rainfalls (there were

daily rainfalls from 5 to 10 mm in beginning of April in 2017 and 2019) which didn't stop the bees from carrying out the pollination [22].

Low temperatures during winter have their impact in overcoming the post-leaf fall stage and preparation of sexual organs. Referred in literature, cherries need 400-1500 hours of winter temperatures 5-7°C), in order for buds to start their normal vegetation and productivity activity. According to various researchers, the amplitude of temperatures is well known in case of well known cultivars, but there is still not enough data for all the cherry cultivars that can be cultivated in warm climate conditions [8; 27].

The two varieties originating from countries with colder climate conditions such as Cordia (Czech Republic) and Schneiders (Germany), have recorded the lowest percentages of fruit set (respectively 1,24 and 1.77% Table 4), statistically proven.

The poor results in the case of these cultivars may be considered as consequence of the absence the necessary low temperatures, which might have caused a lack of flowers differentiation, which was not fully completed. In this case, we can argue that the longer flowering period and the presence of flowers until the

beginning of the maturity of the fruits, was caused because these cultivars have not been able to fulfill their needs for temperatures 5-7 °C and have not been able to sprout from winter dormancy at the appropriate time [10].

Cherries are a species known for optimum temperatures of 22-26 degrees during the vegetation period, and 26-28 degrees during the fruit ripening. While high temperatures above 33-35 °C during the ripening and harvesting period of cherries, reduce the quality of the fruits. These temperatures, especially in poorly managed orchards in terms of: nutrition, irrigation and pruning, constitute a critical factor at the time of bud differentiation [5; 7].

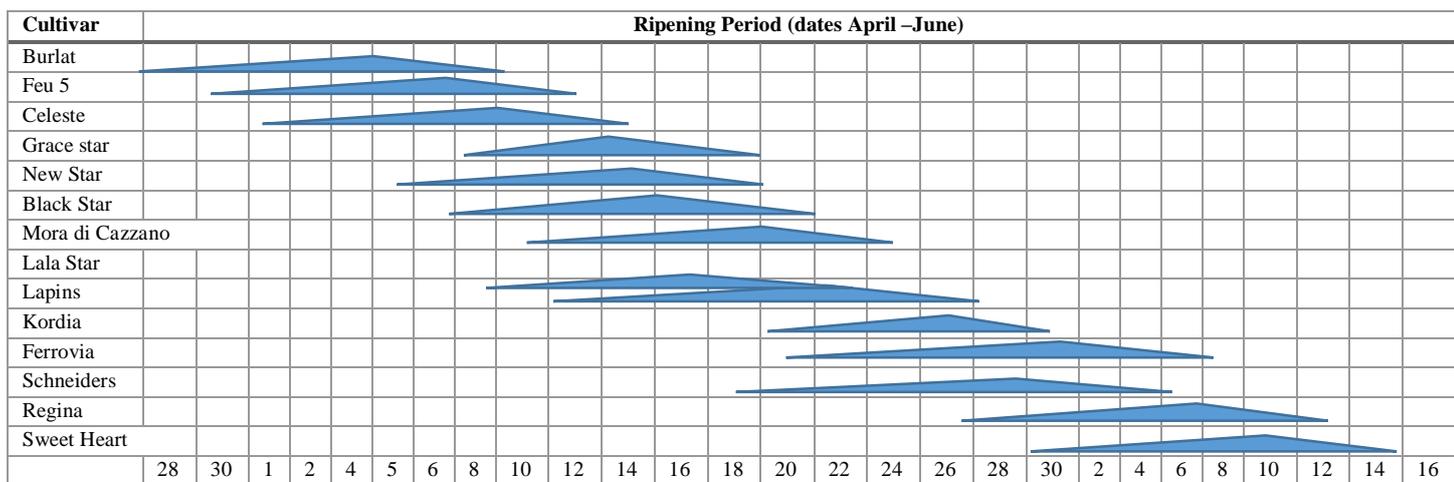
Cherry plants that go through the stress of high temperatures, associated with hydro stress, manifest problems in next year, both in terms of flowering and intensity of fructification, but also in terms of fruit malformation, manifested with formation of double pistils, that are followed with the formation of double

fruits [3; 7; 10]. Almost all the cultivars observed had double fruits, but it was more prominent in the case of Burlat and Ferrovia cultivars.

The maturity period of the cultivars and the analysis of statistical indicators, shows that these cultivars can include a time period of up to five weeks. Burlat was the earliest cultivar to mature, maturing in the first 10 days of May, compared to the cultivars observed. He is followed by Feu 5, Celeste, Grace Star and New Star with a difference of +10-14 days [2].

Black Star and Mora di Cazzano (+15 to +20 days) resulted medium ripening cultivars, while Lala Star, Cordia, Ferrovia, Sweet Heart and Regina resulted in late ripening cultivars, +20, +22, +24, + 30 and +32 days compared to Burlat. The differences observed in the maturing time are similar to the results offered by the literature, although it is noticed a tendency of reducing the period from fruit set to fruit ripening by several days [22; 23; 26; 29; 31].

**Table 3.** Comparative analysis of ripening time for different cultivars



Precociousness is a positive marketing aspect because of high price offers. Are especially appreciated varieties without fruit abnormalities, with a big size of fruits and the ones that have an intensive color and liked taste, which have differed compared to usual selling price not only during the beginning of the maturation but also during the production peak. In contrast, cracked fruits, infected by *Monilinia laxa* and with smaller sized fruits are neither popular nor liked by consumers [12; 14; 22].

Despite substituent cultivars that aim to replace Burlat, this cultivar is preferred for its earlier maturity and total yield that are highly expressed in comparative tests.

According to the results of the statistical analysis Burlat is ranked second in terms of fruit set quantity and yield per plant and has produced slightly reddish colored and tasty fruits. Under the same conditions during the ripening period, manifested fruit cracking stability and was ranked second after Celeste.

Significant differences are observed (Table 4) between varieties for the yield indicators. Celeste resulted to have higher yield (17.01 kg per plant), Burlat 15.56, Lapins 14.9 and New Star 13.7 kg per plant. Mora di Cazzano, Lala Star and Ferrovia result in lower productivity (13.4, 8.6, 8.4 kg per plant), but the results

cannot be proven statistically as the indicators are included in the same statistical group.

The differences were statistically proven for the two cultivars Schneiders and Cordia which resulted with a productivity yield of 0,73 and 0,7 kg per plant, where

results are grouped separately. However for these cultivars statistically there aren't any proven differences in total yield, as proved by the fact that they are included in to the same homogeneous group.

**Table 4.** Average values of data for total yield indicator, cultivars are compared in period 2017-2019, using Tukey-Kramer, level of significance 95%

Cultivar	Crosscut surface of 30 cm above ground	Percentage of fruit set	Mean values of fruit weight (gr)	Yield (kg/plant)	Production Efficiency kg/cm <sup>2</sup>
Burlat	88.48±1.7	29.32±2.86 abc	6.6±1.12 d	15.56± 1.1 ab	0.17abc
Black Star	142.59±6.1	10.08±2.24 bcd	10±1.5 ab	4.63±0.35 e	0.032 de
Celeste	105.69±11.3	24.45±2.15 bcd	8.8±1.11 cd	17.01±1.8 a	0.164abc
Ferrovia	156.01±19.5	15.90±3.16 abc	9.0±1.18 cc	8.48±0.75 c	0.33 a
Feu 5	40.5±8.1	28.51±4.83 bcd	7.3±1.54 e	5.05±0.4 de	0.234 de
Grace Star	145.06±5.9	17.60±2.15 ab	10.2±1.14 a	8.03±1.71 cd	0.055cde
Kordia	77.22±13.4	1.24±1.27 a	10.5±1.29 a	0.7±0.3 f	0.009 e
Lala Star	72.22±13.2	16.68±2.18 a	9.2±1.14bd	8.68±1.6c	0.136abcd
Lapins	197.23±37.4	22.99±6.19 cd	8.1±1.16 d	14.98±1.44 ab	0.083cde
Mora di Cazzano	146.08±17.8	14.08±2.35 bcd	6.3±1.12 f	13.46±1.8b	0.097bcde
New Star	118.84±14.4	16.74±1.95 e	9.1±0.84 c	13.7±1.46 ab	0.119abcde
Regina	48.47±1.7	22.7±4.11 bcd	10.7±1.12 a	7.85±0.87 cde	0.161abc
Schneiders	103.34±5.6	1.77±2.38 a	8.8±0.55 cd	0.73±0.34 f	0.007 e
Sweet Heart	26.89±2.6	30.01±1.51 e	6.6±0.26 ef	5.85±04 cde	0.221 ab

Not in all cases the most productive cultivars have not always had the higher production efficiency. Trees with the higher growth, in general had the lowest production efficiency. For example: Ferrovia, Sweet Heart and Regina with rootstock Gisela, had a high production efficiency (0.33, 0.22 and 0.161) compared to other cultivar, which had a higher yield such as Celeste, Lapins, Moradi Cazzano(0.164, 0.083, 0.097).

In terms of fruits trading quality estimated by the size and weight of the berry, the cultivars under observation showed statistically proved significant differences. In this aspect was verified that most of them had a berry which weighted over 8 grams, with a diameter of over 2,8 cm. The varieties with the biggest weight (and diameter also) as well as a good fruits quality were Regina, Cordia, Black Star, and Grace Star, which despite few differences, the statistical analysis places them within the same homogenous group (10.7, 10.5, 10, 10) grams. Cultivars Sweet Heart, Burlat and Mora di Cazzano, 6.6 e 6.3 gr are grouped separately and among them are not observed statistical differences.

Sugar content and acidity level (Table 5), manifested the different qualities of the cultivars. Lala Star had the highest level (19.2°brix ) while Celeste, Mora di Cazzano e Burlat had the lowest sugar content(14.3,

15.1 and 15.3°brix). Mora di Cazzano, Ferrovia and Burlat also recorded the highest acidity level (13.36, 11.73 and 11.33 g/l), while Regina, Cordia, Celeste which had the lowest acidity level (7.36, 7.8, 8.01 g/l) With regards to the percentage of fruit cracks parameter, the statistical analyses proves significant differences among cultivars (Table 5). In this aspect, Celeste (75.32-a) is considered to have less stability. Burlat (38.29-b) and New Star (38.69-b) are grouped separately and ranked in second position, followed Mora di Cazzano(32.13-bc), Ferrovia (30.23-c). Lapins (15.58-d) and Grace Star (13.67-d), are grouped separately, while Lala Star (11.32-de) is not clearly grouped.

Cultivars Schneiders (4.64-f), Regina (3.61-f), Sweet Heart (2.21-f), Cordia (1.23-f), Black Star (3.06-ff), create another statistical group (f & ff), different from a and b groups, proving a high level of resistance to cracking, higher quality and price in the market.

Fruit cracking is one of the limiting factors of cherry planting in areas with rainfalls during their maturity period, and at the same time it is an important factor providing fungi infections and initiating fruits

malformations. The relation between humid weather and cherry fruits cracking is well known. On the other hand, there are some varieties which are very sensitive while other cultivars, growing in the same conditions, even in presence of long lasting humidity are not observed to go through this phenomena [7; 8; 9; 26].

These differences between cultivars are related to the anatomy, epidermis and cuticle functions of the cherry fruit [16; 26] and our results are also similar with this conclusion.

**Table 5.** Mean values of data about quality yield indicator for varieties compared during period 2017- 2019 (carried out using Tukey-Kramer test, for level of significance 95%)

Cultivar	Percentage of fruits cracked	Diameter of fruit (mm)	Sugar content(°brix)	Total acidity (g/l)
Burlat	38.29±7.25 b	27.5±0.5	15.3±0.65 cde	11.33±1.13 bc
Black Star	3.06±2.97 ff	30.4±0.6	17.3±0.21 b	11.31±1.18 bc
Celeste	75.32±3.38 a	28.6±0.7	14.3± 0.76 e	8.01±0.85 ef
Ferrovia	30.23±5.62 f	28.1±0.17	16.9±0.36 b	11.73±0.85 ab
Feu 5	2.49±2.23 c	27.4±0.51	17.2±0.25 b	9.48±1.95 de
Grace Star	13.67±4.41 d	31.9±0.36	17.5±0.27 b	8.06±0.83 ef
Kordia	1.23±0.26 f	30.1±0.95	17.7±0.61 b	7.80±0.66 ef
Lala Star	11.32±2.35 de	28.9±0.5	19.2±0.32 a	10.33±0.55 bcd
Lapins	15.58±4.96 d	27.5±0.5	16.6±0.22 bc	9.52±0.28 cde
Mora di Cazzano	32.13±5.14 bc	28.1±0.6	15.1±0.51 de	13.36±0.43 a
New Star	38.69±6.71 b	29.1±1.05	16.4±0.62 bcd	8.78±0.65 def
Regina	3.61±3.88 f	32.4±0.4	16.8±0.25 b	7.36±0.32 f
Schneiders	4.6±4.36 ef	28.9±0.95	16.8±0.86 b	11.30±0.13 bc
Sweet Heart	2.21±2.6 f	27.3±1.1	16.9±0.45 b	10.16±0.9 bcd

Celeste, was recorded as the most sensitive cultivar, as in 2019, its fruits were found to be cracked in about 95% of cases. Other cultivars have manifested in general characteristics similar to those described in the literature [9; 16; 26].

In terms of total yield and its quality, a final analyses for the 14 cultivars showed that the best results were recorded for New Star, Lapins, Burlat, Mora di Cazzano, Regina, Ferrovia, Lala Star. The most inappropriate cultivars in this area, turned out to be Schneider and Cordia.

#### 4. Conclusions

Based on statistical analysis, detailed assessment, stability, agro climatic adaptability was concluded that; The most adaptable cultivars for earlier time of production and quality in transitional and coastal warm areas are; Burlat, Lapins, Feu 5, Grace Star and New Star

In terms of quality yield indicators and yield, are appreciated Burlat, Lapins and New Star, Regina, Ferrovia, Lala Star

With regards to plant diseases and pests resistance are recommended Black Star, Grace Star, Mora di Cazzano, New Star, Lala Star. The Celeste cultivar resulted as the most sensitive from fruit cracking. Varieties such as Ferrovia, Sweet Heart, are at risk from infection of cherry fruit fly. At the same time, Cordia turned out to be more sensitive to bacterial infections.

Because of lack of low temperatures, Schneider and Cordia should not be involved in planting structures.

#### Final Conclusions:

In accordance with all the analysis, in order to fulfill the production expectations, a cultivar must have a constant yield and good quality, consistency, color, standard size of fruits, resistance to manipulation, resistance to unfavorable climate conditions, resistance to cracking, diseases, pests. In warm coastal and transitional Albanian areas results that; among the 14 cultivars tested, the statistical analysis of fundamental parameters of quantity and quality, ranks as the most suitable the cultivars; New Star, Lapins, Burlat, Mora di Cazzano, Regina, Lala Star. The least suitable are cultivar Schneider and Cordia.

## 5. Acknowledgments

As institutions, we would like to thank Mr. Kristo Bllama and Mr. Andon Bllama for their support in providing optimal conditions, allowing for the observation of the indicators at the appropriate time and quantity. Thank You!

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