

Cultivar and accessions of fig (*Ficus carica* L.) for breba production selected within the autochthonous germplasm of Calabria (South Italy)

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Abstract

During 2019 ripening time and quality characteristics of brebas from 40 autochthonous fig accessions from Calabria were determined for the selection of superior genotypes to create a new commercial orchards for breba production. A total of 56 morphological and qualitative characteristics were evaluated. To compare overall performance of each accessions studied, an evaluation scale was developed based on weighting fruit characteristics considering both local and global consumer preferences. The results relating to ripening time of the 40 accessions studied showed that it is possible to have a market offer period of 40 days both for accessions that produce fruits with yellow or green skin and for those that produce fruits with purple or black skin. The weighted analysis of the fruit characteristics allowed the best accessions to be identified for each ripening time and type of skin color. This study allowed us to select from the Calabrian fig germplasm the most interesting and appropriate range of varieties for the breba production according to the market needs taking into account the ripening time and the color of the fruit.

Keywords: *Ficus carica*, breba production, fruit quality, varietal selection

INTRODUCTION

In recent years, consumer demand for fresh figs has increased significantly. This increasing trend of demand is to be found in the beneficial properties of this fruit for human health. Figs are rich in sugars and minerals (Chessa, 1997; Crisosto et al., 2011), but free of sodium, fat and cholesterol (Vinson, 1999; Crisosto et al., 2010; Veberic et al., 2008; Veberic and Mikulic-Petkovsek, 2016). Furthermore, they are sources of fibers, important proteins, vitamins, amino acids and antioxidants (Solomon et al., 2006) that can help protect human health from various human diseases (Slavin, 2006; Dueñas et al., 2008; Oliveira et al., 2010; Çaliskan and Polat, 2011; Trad et al., 2014). In Italy the fig industry has ancient tradition and assumes economic importance in South Italy, particularly in three regions: Campania, Puglia and Calabria. In this last region large part of fig industry is based on the cultivar “Dottato”, which is able to produce partenocarpic fruits usually processed as dried fig (Mafrica et al., 2015). The increasing demand on the local, national and European markets of fresh fruit, has made economically sound the sector of the fig market. Among the types of fresh figs, the greatest attention of consumers and consequently the most interesting prospects for farmers to make a profit seem to be towards the brebas. Although the production of brebas appears to be less demanding in terms of climate characteristics, the development of a profitable fresh fig industry is very difficult. The development of the breba industry depends on the

availability of cultivars producing high crop and top quality fruits (Flaishman et al., 2008), the use of proper horticultural techniques and appropriate postharvest techniques would help to preserve and prolong the life of the fruit, promoting access to new markets (Crisosto et al., 2011; Villalobos et al., 2014). In the last years, several cultivar and accessions from Calabria (South of Italy) are looking promising due to the high quality brebas suitable for fresh consumption. The objective of this study was to evaluate the morphological and qualitative characteristics of brebas, sampled from trees of cultivar/accessions of the Calabrian fig germplasm.

MATERIAL AND METHODS

During 2019 the brebas of forty autochthonous fig cultivar/accessions (Costa et al., 2015) were evaluated. Brebas were harvested from adult trees in perfect health grown in commercial and experimental orchards located at an altitude between 80 and 200 m above sea level. Brebas were harvested at the commercial ripening stage, when the fruits began to show the characteristic colour of the variety and the use of slight finger pressure on these fruits was possible. From each fig cultivar, 30 fruit were randomly selected from the fig trees. Harvested fruit were immediately transferred to ice boxes and then stored at 0°C. The fruit were then evaluated for pomological properties. There were 3 replicates each consisting of 10 fruit. To discriminate the cultivars of figs studied was carried out using fig descriptors (IPGRI and CIHEAM 2003) with an additional 20 new characteristics. A total of 56 morphological and qualitative characteristics were evaluated, 26 of which were subjective and 30 of which were objective traits. To compare overall performance of each genotype studied, an evaluation scale was developed based on weighting fruit characteristics considering both local and global consumer preferences (Table 1).

RESULTS AND DISCUSSIONS

Considering the different consumer preference with regard to skin color of fruits and consequently to a possible diversification of market supply, the 40 accessions studied were divided into 2 groups on the basis of this characteristic: accessions with light skin (yellow or green) and dark skin (purple or black). The results of the ripening time showed substantial differences between the accessions. In both groups (light-skinned and dark-skinned) there are early and late-ripening brebas. Overall, the accessions studied allow us to have a very extensive brebas harvest calendar: from the beginning of the second decade of June to the end of the second decade of July (Figure 1 and 2). This aspect is very important in commercial terms as it allows to guarantee a market offer of at least 40 days.

The fruit weight, which notoriously represented a very important character for fresh consumption in figs, varied between a minimum value of 23.4 g and a maximum value of 127.7 g. There were no substantial differences between the accessions of the 2 groups. In both groups the average value of fruit weight was around 68 g. Similarly to weight, the fruit shape, defined by the ratio between width and length, is another very important requirement for markets of fresh fruit, as it conditions packaging and transportation (Pereira et al., 2017b). The most suitable fruit shape is considered to be the globose (Condit, 1941). Most of the accessions studied had an acceptable fruit shape. Although only 18% of the accessions had a typically globose shape (with a width/length ratio between 0.9 and 1.1) in many of the remaining accessions the fruits tended to be globose (with fruit index values between 0.7 and 0.9). The vast majority (over 90% of cases) of accessions produced brebas with necks. The

presence of a neck in figs is a very important element as it facilitates picking the fruit from the tree, and is thus associated with easier harvesting (Trad et al., 2012). However, an excessively long neck can negatively affect the packaging and transportation. Overall the fruits with dark skin had longer necks than those with a light skin. On average, the accessions with a light skin had less ostiole width than those with a dark skin. Only in two accessions (one with a white skin and one with a black skin) ostiole width was greater than 5 mm. The presence of a large number of accessions with fruits characterized by narrow or very narrow ostiole is a very important element for market aspects. In fact, the varieties with very large ostioles (> 5mm) are not popular for the fresh fig market as they represent an entry point for microorganisms that can damage the fruit after harvesting (Crisosto et al., 2011; Trad et al., 2012). The presence of skin cracks was very limited both in the light-skinned and in the dark-skinned accessions. The absence of skin cracks is a very important requirement for the marketing of fresh figs. In fact, the presence of skin cracks is undesirable because it can be an entry point for mushrooms and also cause a loss of moisture that could reduce post-harvest life and thus shorten the commercialisation period (Kong et al., 2013). The degree of skin peeling was also good. In over 90% of accessions the peeling is particularly easy or of medium difficulty. The easy skin peeling is an important character for consumer acceptance because consumers tend to peel the figs before eating (Crisosto et al., 2010). With regard to the color of the pulp, in the accessions with light skin the colors white and amber prevail, while in the white dark skin ones the pink and red colors are more frequent. Generally fresh figs with pink and red flesh color are preferred by consumers (Çaliskan and Polat, 2012). The total soluble solids (TSS) content varied between 10.5 and 20.7 in light-skinned accessions and between 15.1 and 23.5 in dark-skinned ones. On average, dark-skinned accessions had a higher TSS content than those with a light skin. On the other hand, these latter accessions have, on average, the highest levels of acidity (TA). TSS and TA are both related to fruit ripening and influence shelf life and are therefore important parameters for fruit marketing; fruits with higher TSS and lower TA content are the most sensitive to physical damage and, consequently, their duration is reduced (Pereira et al., 2017b). The results of the weighted characterization are shown in figures 3 and 4. The weighted analysis made it possible to establish the best accessions for the 2 types of fruit (with light or dark skin) and for each of the 4 decades that make up the harvest calendar. With regard to accessions with light-skinned fruits, "Bifera bianca CS 150", Bifera bianca CS 139", "Unifera bianca CS 166" and "Signorella CS 229" were the genotypes that showed a great potential for breba production due to good quality fruit traits. With regard to the accessions with dark-skinned fruits, the best genotypes were "Bifera nera CS 103", "Bifera nera CS 144", "Bifera nera CS 119" and "Citruslara CS 31". With regard to the latter group of accessions, despite "Bifera nera CS 103" and "Bifera nera CS 144" have not scored particularly high scores (penalized essentially by the very low weight) the peculiarity of ripening quite early (second and third decade of June) or in any case in a period in which the other black skin accessions have no ripe fruit makes these accessions particularly interesting in commercial terms.

CONCLUSIONS

The results of this study showed that within the germplasm calabrian fig germplasm there are accessions capable of producing good quality brebas and with different ripening time. The knowledge learned will allow fruit growers to be able to choose the most interesting

and appropriate range of varieties based on market needs taking into account the ripening season and fruit colour.

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Figure 2 - Ripening time of the brebas from autochthonous fig accessions from Calabria producing fruits with purple or black skin.

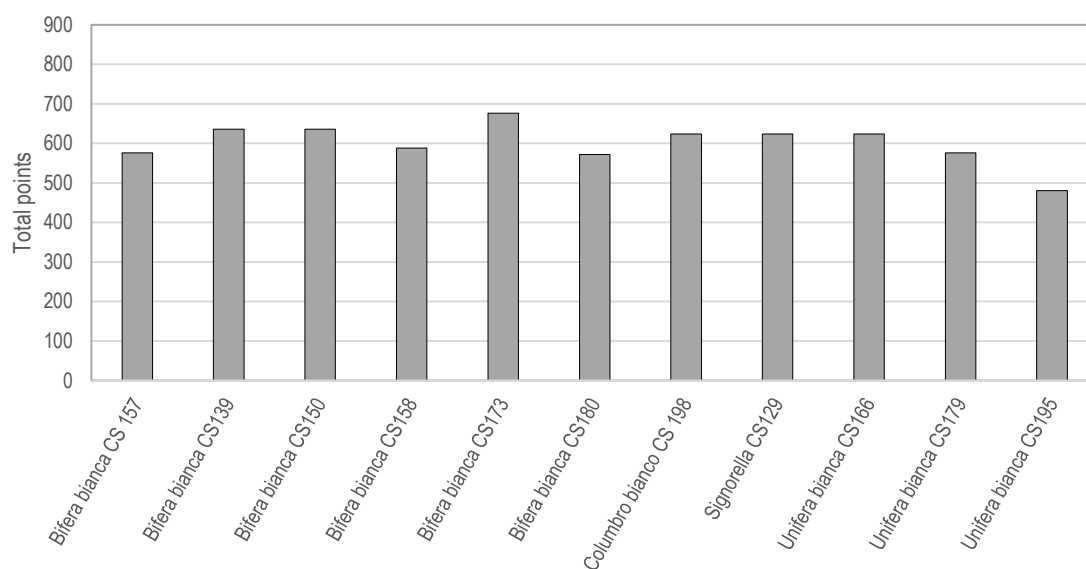
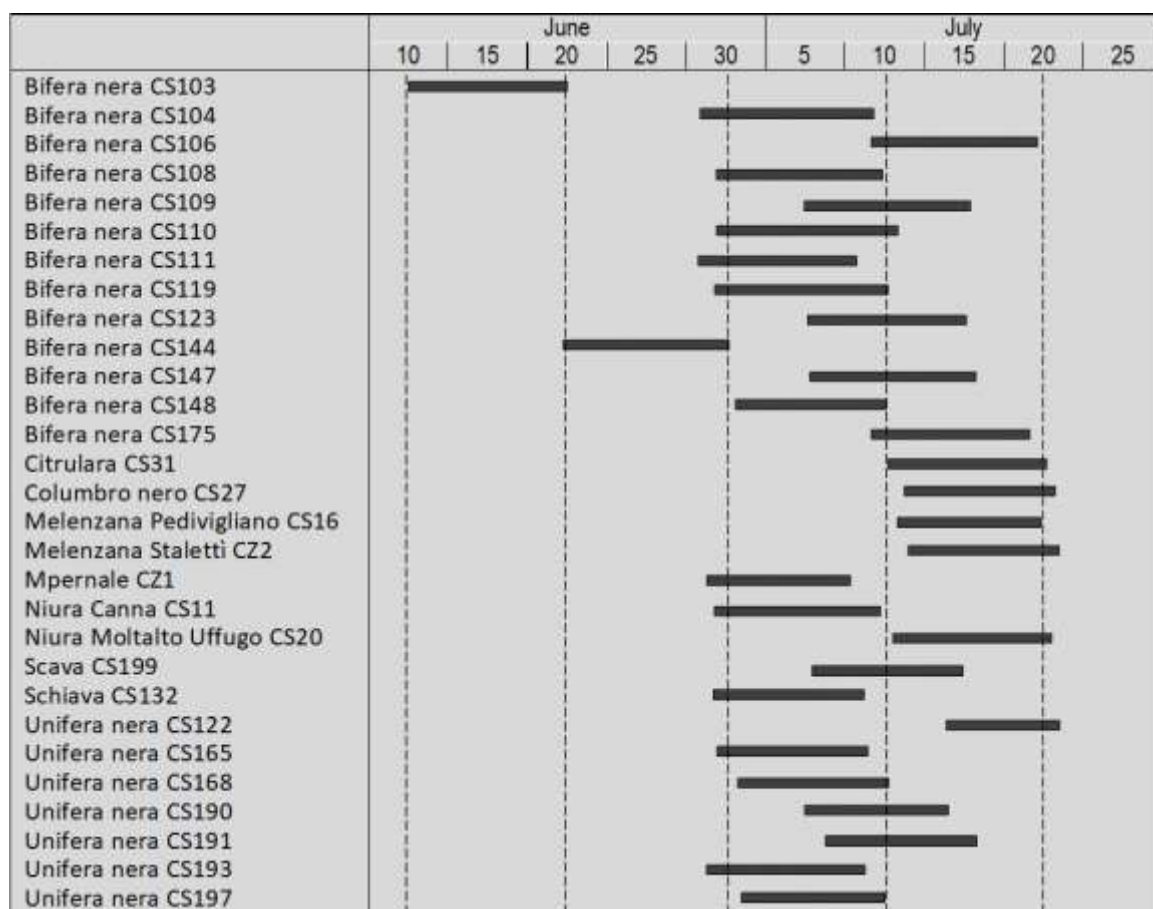


Figure 3 - Results of weighted characterization of autochthonous fig accessions from Calabria producing fruits with yellow or green skin.

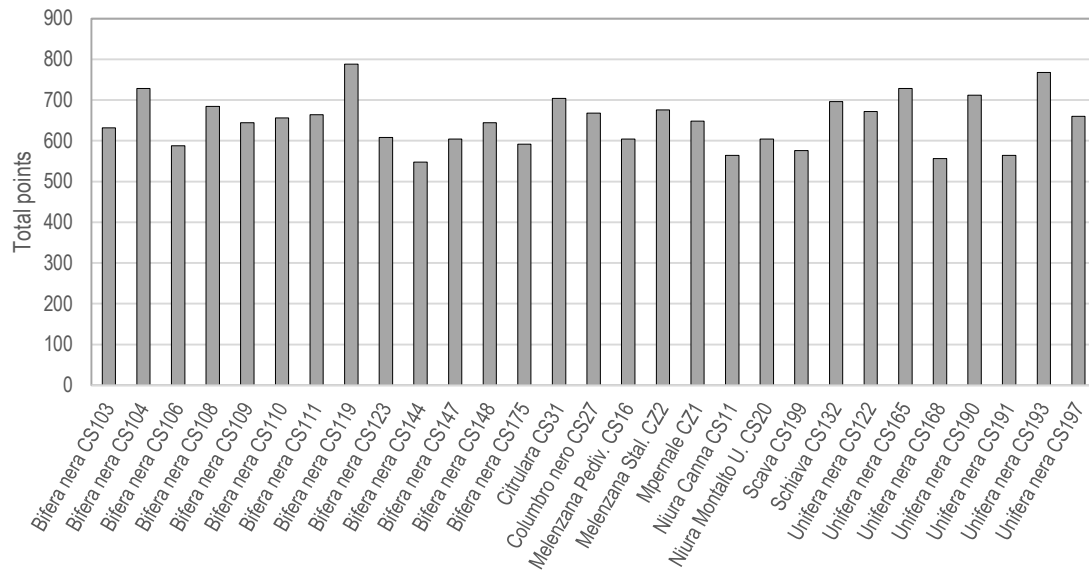


Figure 4 - Results of weighted characterization of autochthonous fig accessions from Calabria producing fruits with purple or black skin.