

DETERMINATION OF SOME CHEMICAL PROPERTIES OF 'SWEET ANN' AND 'KABARLA' STRAWBERRY CULTIVARS IN HIGHLAND CLIMATE

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Abstract

This study was conducted to determine of some chemical properties of 'Sweet Ann' and 'Kabarla' strawberry cultivars in highland climate. This research was carried out in Isparta region with highland climate conditions. Both varieties of strawberry cultivars used in the research are neutral day plants. Due to the rich polyphenol content of the berries, the positive effects on human health have begun to be explored in recent years. Especially high anthocyanin contents are important. It is well known that the strawberries are rich in polyphenol compounds. In this research, two different production methods were applied, open field and cover cultivation. The total phenolic, total anthocyanin and ascorbic acid content were determined. Total phenolic of 'Sweet Ann' strawberry cultivar varied between 620.44mg GAE 100 g⁻¹ FW to 786.64 mg GAE 100 g⁻¹ FW. Total anthocyanin of 'Sweet Ann' strawberry cultivar and ascorbic acid ranged between 58.15 µg/g to 98.88 µg/g and 76.42 mg/100 g to 94.39 mg/100 g respectively. Total phenolic of 'Kabarla' strawberry cultivar varied between 448.01 mg GAE 100 g⁻¹ FW to 1050.48 mg GAE 100 g⁻¹ FW. Also total anthocyanin of 'Kabarla' strawberry cultivar ranged between 47.16 µg/g to 74.44 µg/g. Ascorbic acid content was determined by 125.09 mg/100 g to 134.81 mg/100 g in 'Kabarla' strawberry cultivar. Highest value of total anthocyanin and ascorbic acid were obtained from open field cultivation for both varieties.

Key words: anthocyanin, ascorbic acid, phenols.

INTRODUCTION

Having a very important place in human nutrition, strawberry is a rich source of phenolic, anthocyanin and C vitamin. Thanks to the antioxidant substances it contains, this fruit is also beneficial for health. It has been reported by many researchers that the strawberries have the high antioxidant activity. (Cordenunsi et al., 2002; Wang et al., 1996, Cordenunsi et al., 2005). It is important to consume fresh in order to make more use of high antioxidant activity. Because the strawberry is a product that cannot be stored for a long time after being harvested, it will decay immediately. In order to make more use of phenolic substances, vitamin C and anthocyanins found in strawberries, it is necessary to give importance to fresh consumption. Because of the short shelf life, fresh consumption is very important (Cordenunsi et al., 2005). Phenolic substances, vitamin C and anthocyanins, which are very important in terms of health, are affected by

environmental factors, harvest maturity, storage conditions as well as by genetic characteristics (Pradas et al., 2015). Hence, this study was conducted to see the effects of two different production methods (open field cultivation and under cover cultivation) on the level of total phenolic, total anthocyanin and ascorbic acid content.

MATERIALS AND METHODS

In this study, "Kabarla" and "Sweet Ann" strawberry varieties were used as plant material. Both are neutral day varieties.

"Kabarla" variety has bears large, hard, sweet fruits with bright red color. It's fruits bearing starts slightly later than the other day variety and it keeps bearing for a long period of time. It bears fruit throughout the summer in highland regions (Anonymous, 2017).

"Sweet Ann" cultivar fruit bears in uplands and passageway regions throughout the summer. It has large, hard, oval and conical shaped bright red colored fruits (Anonymous, 2017). The variety is characterized by vigorous plants

which produce high yields of large to very large. It has sweet fruit with an excellent flavor. And well-shaped, long and conical fruits (Bagdasarian, 2012)

In this research, two different production methods were applied that, open field cultivation and under cover cultivation. Fruits were harvested at the same maturity stage in both varieties. Total phenolic, vitamin-c and anthocyanin were analyzed in fruit samples.

Total phenolic were determined by using the Folin–Ciocalteu reagent according to the method of Singleton and Rossi (1965). Results were explicated as mg GAE 100 g⁻¹ FW.

Total anthocyanin was determined by pH differential spectroscopic method (Cheng and Breen, 1991).

Vitamin C was determined spectrophotometrically at 525 nm according to the procedure of Hodges et al. (2001).

The trial was run in triplicate and statistical analysis was done by using the Minitab 17 software package version (Minitab 17 Statistical Software 2010). Differences between means were analyzed by ANOVA test and Tukey test was applied ($P < 0.05$).

RESULTS AND DISCUSSIONS

The total phenolic, anthocyanin and ascorbic acid contents were determined in the "Kabarla" and "Sweet Ann" cultivars grown by two different production methods (Table 1). As you can see from Table 1, the differences between the methods of growing in both varieties in terms of vitamin C are statistically significant. Vitamin C content in "Sweet Ann" cultivars varied from 76.42 to 94.39 mg/100g. Vitamin C content of the "Kabarla" variety was determined between 125.09 mg/100g and 134.81 mg/100g. The "Kabarla" variety has higher vitamin C content in both growing methods than the "Sweet Ann" cultivar. On the other hand, vitamin C content in under cover cultivation is higher than open field cultivation for both varieties.

The amounts of vitamin C in strawberry fruits were reported by Asami et al. (2003), Van de Velde et al. (2013) and Tonutare et al. (2009) as 27.1-32.6 mg/100g, 39.9-44.5 mg/100g and 44-60 mg/100g respectively. Our results are well above these values. And Polat et al. (2016)

reported as 94.10-118.87 mg/100g in strawberry fruits. The findings we obtained are consistent with these values.

The total amount of anthocyanin in the "Sweet Ann" variety was found to be 98.88 µg/g in open field and 58.15 µg/g in under cover. In the "Kabarla" varieties, the total anthocyanin content ranged from 47.16 (under cover) to 74.44 µg/g (open field) (Table 1).

In terms of total anthocyanin, the "Sweet Ann" variety has higher values than the "Kabarla" variety. However, total anthocyanin content of open-grown "Kabarla" fruits is higher than "Sweeten" fruits grown under cover (Table 1).

Table 1. Some chemical characteristics of "Sweet Ann" and "Kabarla" cultivars

Cultivar	Growing Methods	Vitamin-C (mg/100g)	Total Anthocyanin (µg/g)	Total Phenolic (mg/100 g FW)
Sweet Ann	Open field	76.42±0.03* b	98.88±0.05* a	786.64±0.52* a
	Under cover	94.39±0.07a	58.15±0.23b	620.44±0.13b
Mean		85.41 B	78.52 A	703.54 B
Kabarla	Open field	125.09±0.03 b	74.44±0.05a	1050.48±0.02 a
	Under cover	134.81±0.02 a	47.16±0.04b	448.01±0.52b
Mean		129.95 a	60.80 B	749.25 A

*The differences between the numbers shown in the same column with different letters are statistically significant ($P < 0.01$)

Polat et al. (2016) are reported that the total amount of anthocyanin as 37.41-105.58 µg/g in fresh strawberry fruits. The data we obtain in our study is in consistent with these values. However, our data are lower than those reported by some other researchers. For example, in a study conducted by Tonutare et al. (2014), the total anthocyanin content was determined as 27.79-60.05 mg/100g in strawberries. In similar researches, Rekika et al. (2005), Zheng et al. (2007) and Wang and Lin (2000) reported that the total amounts of anthocyanin in strawberries are 190.5-841.26 µg/g, 20.07 mg/100g and 38.9 g/100g, respectively. Gill et al. (1997) noticed the total amount of anthocyanin as 113.7-153.5 µg/g. We think that as mentioned by Voca et al. (2014), the reason of the our findings lower than some of the values reported in the literature, harvesting at different maturity stages is affect the total amount of anthocyanin. As can be seen in Table 1, in terms of the total phenolic contents, open-grown "Kabarla" fruits showed higher values than the "Sweet Ann" variety. The highest total phenolic value was found in open-grown "Kabarla" fruit (1050.48

mg GAE 100g-1 FW). However, both "Sweet Ann" fruits grown in open field (786.64 mg GAE 100g-1 FW) and under cover (620.44 mg GAE 100g-1 FW) have higher total phenolic content than "Kabarla" fruits grown under cover (448.01 mg GAE 100g-1 FW).

The total amounts of phenolic of strawberry cultivars have reported as 308 to 353 mg/100 g FW by Cordenunsi et al. (2005). Our datas are higher than these values in terms of total phenolic. Polat et al. (2016) reports that, the total phenolic content between 474.97 mg GAE 100g-1 FW and 896.85 mg GAE 100g-1 FW. The findings we obtained in our study are consistent with these values.

CONCLUSIONS

Strawberry fruits have an important place in daily diet nowadays with its rich phenolic substance, anthocyanin and vitamin C content. Some chemical contents of "Kabarla" and "Sweet Ann" varieties have been determined in our research carried out in highland climate conditions. In our research, we tried to reveal the effects of open field cultivation and under cover cultivation on this rich content.

According to the results obtained, we can recommend under cover cultivation to producers and researchers in terms of vitamin C for both varieties. For higher total anthocyanin and total phenolic level, we are recommended the open field cultivation to each two cultivars in highland climate condition.

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