

Fruit maturity phenolic content and antioxidant activity of *Eugenia jambolana* lam fruit

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ABSTRACT

Fruits of *Eugenia jambolana* were analysed for total phenolics and antioxidant activity of three successive development stages viz. 1. Mature green 2. Half - ripened and 3. Fully ripened. The total anthocyanin concentrations were higher in fully ripened stage, the total phenolic content was maximum achieved in mature green stage (354 mg L⁻¹). Antioxidant activity also strongly depended on ripening stages, showing completely opposite compared to that of total phenolics. Since total phenolics and antioxidant activity performed nearly “Object and its reflection in the mirror” trend.

Keywords: Fruit; ripening; anthocyanins; TSS; pH; antioxidant

1. INTRODUCTION

Phenolics compounds are secondary metabolites, widely distributed in plants. They are vegetables not only for their major influence on sensory qualities of fruit (colour, flavour, taste) but also for their antioxidant, anticarcinogenic, antimicrobial, antiallergic, antimutagenic and anti-inflammatory properties (Alesiani *et al.*, 2010). The anthocyanins give the colour and other polyphenols such as flavonoids and some non-flavonoids are responsible of antioxidant properties (Gil *et al.*, 2000).

Fruit polyphenol include a wide range of compounds such as hydroxycinnamic acids, flavan- 3 – ols, gallic acid derivatives, flavonols, and therefore it is very important to determine accurately the overall total distribution of phenolic phytochemicals depend on fruit ripeness, cultivar specificities, cultural practices, geographic origin season and postharvest storage conditions (Kim *et al.*, 2001 and Deshmukh *et al.*, 2011).

The *Eugenia jambolana* fruit is a rich source of polyphenols. However, its composition can change depending on the cultivar type, growing region, soil, climate, maturity, storage and processing factors. The main goal of this work is to know the influence of maturity stage on the phenolic content, antioxidant activity and colour of *Eugenia jambolana* fruit (Photo 1).



Photo 1. *Eugenia jambolana* fruit.

2. MATERIALS AND METHODS

The *Eugenia jambolana* fruits were harvested from the experimental Orchards, Faculty of Agriculture, Annamalai University, Tamilnadu, India. The fruits were classified based on their developmental stages viz. 1. Mature green, (Epicarp green) 2. Half ripened, (Epicarp pink) 3. Fully ripened, (Epicarp dark blue). The seed were carefully removed and the flesh were manually extracted. The fruit juices were obtained by squeezing using an extracted machine. Afterward, the juice samples were frozen at -20°C until for further use.

3. COMPOSITIONAL CHANGES

The total titratable acidity (TTA) was determined potentiometrically using 0.1N NaOH to the titration end point of 8.1-8.2 and expressed as percentage of citric acid. The total soluble solids (TSS) were measured at 20°C using a refractometer (Abbe, Germany) and expressed as $^{\circ}\text{Brix}$. The total anthocyanin content (TAC) was determined by bisulfite blanching method (Ribereau – Gayon *et al.*, 2000). The results were expressed as total anthocyanins (mg L^{-1}). The total phenolic content (TP) of *Eugenia jambolana* juice was determined using the Folin -Ciocateau reagent (Singleton and Rossi., 1965). The results were expressed as gallic equivalents (GAE mg L^{-1}). The total antioxidant activity was measured by

ferric reducing antioxidant power assay (FRAP) of (Benzie Strain *et al.*, 1999). Results were expressed as Trolox equivalents (Trolox mmol L⁻¹). The results were analysed by ANNOVA and Duncan test using Statgraphics plus 5.1 software.

4. RESULTS AND DISCUSSION

The *Eugenia jambolana* juice showed an increase in concentration of TSS values (Table 1). The juice pH values of the *Eugenia jambolana* harvested at different maturity stages remained at fairly constant levels. The highest TTA (2.62 %) was observed to mature green stage, this was followed by continuous, but significant decrease in TTA. The decrease in acidity agrees with the increase in sugar concentration. A gradual decreased acidity with an increase in TSS is an inherent process during ripening of The *Eugenia jambolana* which imparts the characteristic flavour (Kulkarni and Aradhya., 2005).

Table 1. Chemical properties and antioxidant activity of *Eugenia jambolana*.

Maturity Stages	TSS °Brix	pH	TTA % citric acid	FRAP Trolox mmol L ⁻¹	TPC GA mg L ⁻¹	TAC Malvidine g L ⁻¹
1. Mature Green (Epicarp - green)	15.2 ±0.4	3.37 ±0.12	2.62 ±0.02	10.91 ±0.51	1272.6 ±38.7	354.11 ±5.99
2. Half – ripened (Epicarp - pink)	15.1 ±0.1	3.29 ±0.01	1.80 ±0.01	7.12 ±0.16	1007.1 ±37.5	484.40 ±5.99
3. Fully ripened (Epicarp - dark blue)	17.1 ±0.3	3.42 ±0.02	1.78 ±0.02	8.76 ±0.76	1660.2 ±19.3	783.49 ±19.98

Values are the means of three replicates

(FRAP) ferric reducing antioxidant power; (TPC) total phenolic content; (TAC) total anthocyanin content.

Statistically significant differences were observed between the three maturity stages in terms of antioxidant activity TP and TAC. (The highest anthocyanins was achieved in fully ripened stage (783 mg L⁻¹) a gradual decrease was observed in mature green stage (354 mg L⁻¹). The highest TP was achieved in mature green fruits (1272 GAE mg L⁻¹) followed by slight, but significant decrease up to half ripened stage.

The antioxidant activity was proportional to the total phenolic content and lower in half ripened stage fruit (7.12; Trolox equivalent mmol L⁻¹). Among others, anthocyanins and phenolic non- flavonoids, either or in combination are responsible for antioxidant activity of *Eugenia jambolana* fruit juices. According to these results the best maturity stage to harvest *Eugenia jambolana*, fruit was the fully ripened stage.

5. CONCLUSION

In conclusion, fruits of cv “*Eugenia jambolana*” were harvested at three successive development stages. It was observed that maturity had a significant effect on total anthocyanins content, total phenolic content and antioxidant content. Fruit anthocyanins and total phenolic content increased with maturity, which indicates that anthocyanins accumulation, and phenolic changes occurred constantly during fruit development. On the other hand, the lack of clear trend in changes of antioxidant capacity during fruit development was also evidenced, nevertheless high correlation between antioxidant capacity and total phenolics was observed.

References

- [1] Alesiani D., Canini A., D’Abrosca B., DellaGreca M., Fiorentino A., Mastellone C., Monaco P., Pacifico S., *Food Chem.* 118 (2010) 199-207.
- [2] Benzie I. F. F., Strain J. J., *Anal. Biochem.* 239 (1999) 70-76.
- [3] Deshmukh S. R., Wadegaonkar V. P., Bhagat R. P., Bhagat R. P., Wadegaonkar P. A., *Plant Omics J.* 4 (2011) 6-13.
- [4] Gil M. I., Tomas-Barberan F., Hess-Pierce B., Holcroft D., Kder A., *J. Agric. Food Chem.* 48 (2000) 4581-4589.
- [5] Kim D. O., Jeong S. W., Lee C. Y., *Food Chem.* 81 (2003) 321-326.
- [6] Kulkarni A. P., Aradhya S. M., *Food Chem.* 93 (2005) 319-324.
- [7] Ribereau – Gayon P., Glories Y., Maujean A., Dubourdieu D. (2000). Hand book of Enology. Volume 2: The chemistry of wine stabilization and treatments. England: John Wile & Sons Ltd. pp. 217-218.
- [8] Singleton V. L., Rossi J. A., *Amer. J. Enol. Vitic.* 16 (1965) 144-158.

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