4th EUFRIN Plum and Prune WG meeting Jelgava, Latvia on September 5th - 7th, 2018.

Influence of traditional Drying on Polyphenols and Antioxidant Activity of Skopelos'Plums

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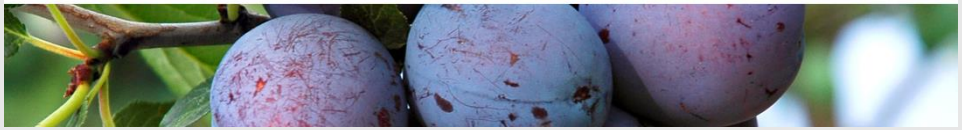


Introduction

Many studies have been carrying out on antioxidant activity in various of plant origin foods, especially in legumes grains, vegetables and fruits. Fruits are more interesting because they can be consumed on various occasions fresh firstly and other processed forms as juice, dried, powder. Among the fruits tree the plums have a nutritious and healthy protection profile of their content, as low calorie, high fiber content and antioxidant activity. Their contain includes carbohydrates, mainly sugars as glucose and fructose, organic acids, e.g. citric and malic acids, as well as fibers (pectins), tannins and aromatic substances. These substances give the nutritive value and the taste of plums *(Ertekina, et al, 2006)*. Plums are also rich in bioactive compounds or phytochemicals, such as vitamins (A, C and E), anthocyanins and other phenolic compounds, characterized by relatively high antioxidant activity, higher than oranges, apples or strawberries. Plums are a good source of natural antioxidants and may provide health advantages to consumers; plum extracts exhibited a strong antiradical activity in vitro, essentially attributed to their phenolic compounds (*Rupasinghe, Jayasankar, & Lay, 2006)*. It is known that antioxidant capacity(*Tabart 2009*) of fruits and vegetables is influenced by different factors, such as ripening date, postharvest conditions, storage (time and conditions), various processing technology (*Bureau, Renard, Reich, Ginies, & Audergon, 2009; Deshmukh, Wadegaonkar, Bhagat, & Wadegaonkar, 2011; Valero et all 2010)*.In present work was estimated the possible losses of vitamin C total phenolics and antioxidant capacity of processed plums according to following drying methods by growers.

Skopelitiko (Agen)

SKOPELOS' PLUMS

Avgoulato

ksinomavro

Material and methods

Plant material-sampling

Fresh plums as control samples

Mature and fresh plums ready for drying were received from growers and were led to the lab for vitamin C, total phenolics, and antioxidant activity determination.

Processed plums samples

Samples from processed plums of three varieties *Stanley, Ksinomauro*, and *Skopelitiko* were collected at the two steps of traditional drying. The first one was at the end of Sun Drying Processing (S.D.P.) and the last one at the end of Oven Drying Processing (O.D.P.) As samples were used 100 fruits for every one of the above work mentioned cases. The work was repeated in two successive periods of cultivation.

Measurements

Vitamin C content was determined by titration following the *AOAC protocol (Lee Sk and Kader A. A.2000;Tabart et al 2011).* and using the following formula : Vitamin C content (mg/100g DM) =Titre x VE x V1 x 100 x 100 /V2 x S x 1000 x Y

Where VE = vitamin C equivalent of 1 ml of DCPIP (mg/ml)
V1 = total extract volume (ml)
V2 = titrated extract volume (ml)
S = sample weight
Y = sample dry matter (%)

- Total phenolics were determined according to the Folin–Ciocalteu method described by *Kevers et al. (2007).* Gallic acid (GA) was used as standard (0–50 mg/l), and the results were expressed as mg equivalent gallic acid (GAE) per 100 g of sample weight.
- Antioxidant activity was also determined by scavenging of the radical 2, 2-diphenyl-1-picryhydrazyl (DPPH_) as described by *Tadolini, Juliano, Piu, Franconi, and Cabrini (2000).* Trolox was used as standard and the antioxidant capacity was expressed as µmole Trolox equivalent (TE)per 100 g of fresh weight.

TRADITIONAL OVEN

RESULTS

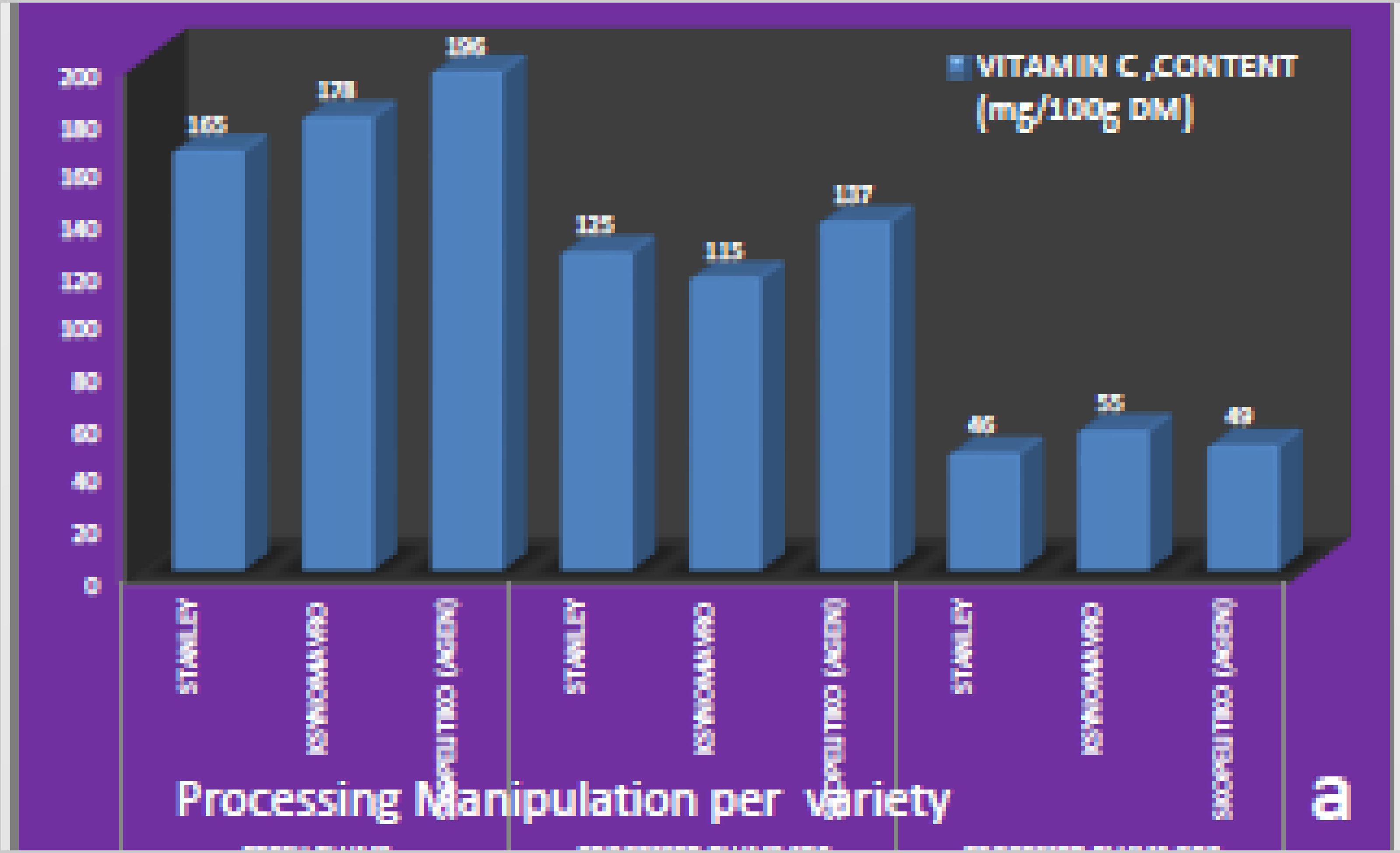
Results are summarized in tables 1&2 and Figures a,b,c

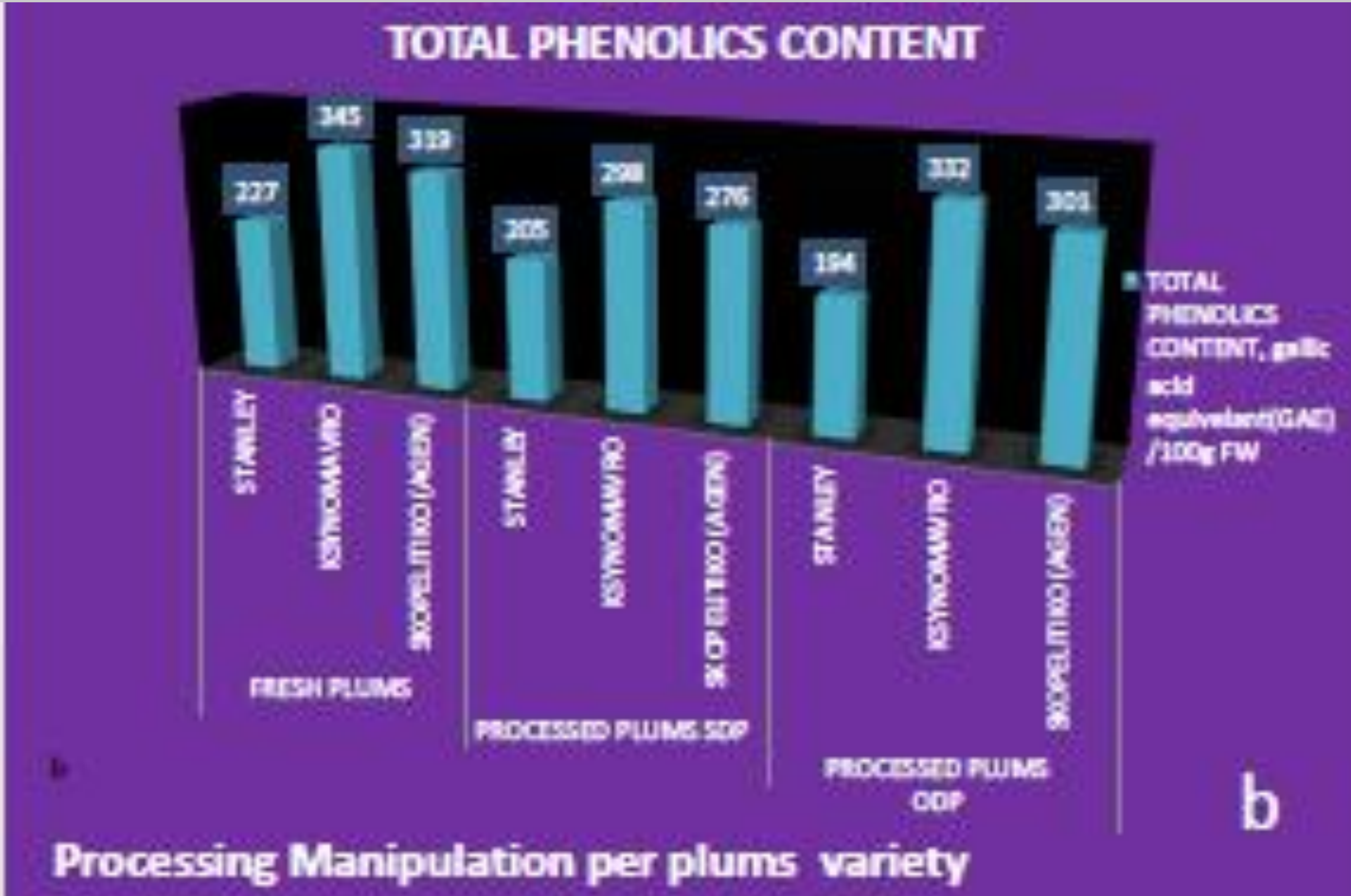
Table 1. Total phenolics, vitamin C measurements on whole fruits (plum pulp and peel) and their antioxidant activity estimation at first treatment of Sun Drying Processing (S.D.P.).

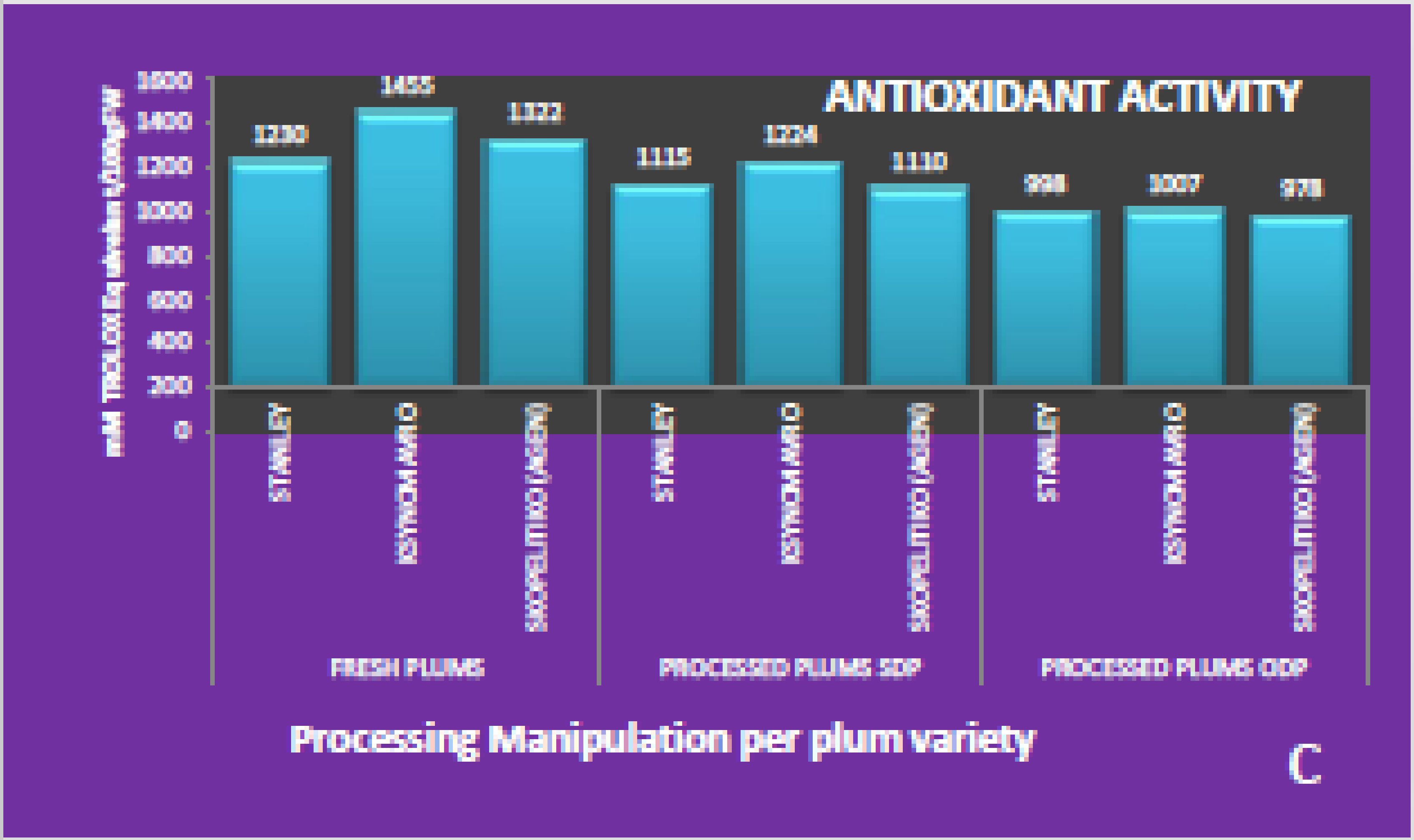
Variety	Treatment	Total Phenolic gallic acid (GAE)/ 100 g FW	Vitamin C content (mg/100g DM)	Antioxidant Activity µmole Trolox equivalent (TE)/ 100 g FW
Stanley	Fresh	227	165	1230
	Treatment SDP	205	125	1115
Ksinomavro	Fresh	345	178	1455
	Treatment SDP	298	115	1224
Sopelitiko (Agen)	Fresh	319	196	1322
	Treatment SDP	276	137	1110

Table 2. Total phenolics, vitamin C measurements on whole fruits (plum pulp and peel) and their antioxidant activity estimation at second treatment of Oven Drying Processing (O.D.P.).

Variety	Treatment	Total Phenolic gallic acid (GAE) / 100 g FW	Vitamin C content (mg/100g DM)	Antioxidant Activity μmole Trolox equivalent (TE) / 100 g FW
Stanley	Fresh	227	165	1230
	Treatment ODP			
Ksinomavro	Fresh	345	178	1455
	Treatment ODP			
Sopelitiko (Agen)	Fresh	319	196	1322
	Treatment ODP			


VITAMIN C ,CONTENT (mg/100g DM)
200
180
160
140
120
100
80
60
40
20
0
165
178
196
125
115
137
46
55
49
Processing Manipulation per variety
a


TOTAL PHENOLICS CONTENT
227
345
319
205
298
276
194
332
301
STANLEY
STANLEY
STANLEY
FRESH PLUMS
PROCESSED PLUMS SDP
PROCESSED PLUMS ODP
TOTAL PHENOLICS CONTENT, gallic acid equivalent(GAE) /100g FW
b
Processing Manipulation per plums variety


ANTIOXIDANT ACTIVITY
1455
1322
1115
1224
1110
1007
978
0
200
400
600
800
1000
1200
1400
1600
FRESH PLUMS
PROCESSED PLUMS SDP
PROCESSED PLUMS ODP
Processing Manipulation per plum variety
C

Discussion and Conclusions

This study investigated the suitability of the followed processing by growers in Skopelos' plums production. The vitamin C presented significant losses due to Sun and Oven drying. The Sun Drying Processing caused losses in a percentage from 25%(Stanley) to 36,5%(Skopelitico). The Oven Processing Drying caused more serious losses from 70%(Ksynomavro) to 75%(Scopelitico).In contrary with vitamin C losses the total phenolics content and the antioxidant activity of processed material of three studied varieties did not give significant fluctuations. It has been referred in several studies that the thermal processing could be retention the antioxidant activity in many cases. That could be explained because some phytochemical compounds(anthocyanins, flavones, iso-flavones, phenols, etc.) convert from one form/type to others keeping by this way the total phenolics content in a high level. This suggests more that the form/type of phenolic compounds could be different in fresh and dried plums. It needs more investigation on phenolics content aiming to be answered what does happen under thermal processing and the converting procedure among and between phytochemicals compounds. Referring to vitamin losses it is a topic that the growers have to find a solution aiming to fortificate the final product with added ascorbic acid mainly in steric form.

Thank you for your attention

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