

## EVALUATION OF PAPRIKA QUALITY OBTAINED FROM 'TAP DE CORTÍ', A MAJORCAN RED PEPPER LANDRACE

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**Abstract:** 'Tap de cortí' red pepper is a landrace variety from Majorca Island in risk of genetic erosion used for paprika elaboration. The final quality of this dehydrated red pepper processed by different methods was evaluated. Oven drying presented the lowest ASTA value and R/Y ratio, meanwhile craft drying obtained higher results. Seedless samples in oven drying treatment exhibited lower chroma and higher hue colour parameter. No significant differences in non-enzymatic browning were detected. Samples with seeds increased the antioxidant capacity of red pepper powder. Paprika from 'Tap de cortí' landrace could achieve a high quality of the final product.

**Keywords:** Tap de cortí, red pepper landrace, quality, colour, antioxidant capacity.

### INTRODUCTION

Red pepper (*Capsicum annuum* L.) or paprika has been used since ancient times as a colorant either to enhance or modify colour (Simal *et al.*, 2005). Beside its use as condiment, Majorcan's food industry is an important consumer of this spice. It is used for the production of the traditional sausage 'sobrassada' because of its contribution on the product preservation and organoleptical attributes.

'Tap de cortí' is a landrace from Majorca Island in risk of genetic erosion. The use of this red pepper variety in "sobrassada" products would guarantee the minimum growing area necessary for the 'Tap de cortí' survival.

There is a growing interest in spreading the use of this variety as a spice; however, the information about the final quality and processing conditions is scarce.

The quality of paprika in trade is evaluated using colour intensity and non-enzymatic browning as main criteria. The colour of paprika is mainly originated from carotenoids formed in the fruit during ripening (Topuz *et al.*, 2009). Pepper fruits contain not only carotenoids as natural antioxidants but also others like ascorbic acid, present in relative high amounts, which could play a positive role to ensure stability of the final product (Garau *et al.*, 2005).

The aim of this study was to evaluate the final quality of paprika obtained from a landrace red pepper 'Tap de cortí' processed under different drying methods. The addition or refuse of red pepper seeds into paprika quality was also studied.

### MATERIALS AND METHODS

#### *Plant material*

'Tap de cortí' landraces were planted into 0.4 x 0.6 m length in a traditional farm during May. Harvesting was carried out between August and September at full red stage and stored under fresh and dark conditions. Samples were selected visually by colour and freshness, and with no sign of mechanical or pests damages. A sample was randomly selected in order to carry out the quality evaluation of 'Tap de cortí' red peppers.

#### *Processing of paprika powders*

Red peppers were divided into three groups for different drying conditions.

Oven drying (OD): red pepper drying was carried out in an oven at 55 °C without air renewal.

Craft drying (TD): paprika was obtained by drying in a tray with a biomass domestic convective drier controlled at a wide range of temperature between 35 and 45 °C.

Industrial drying (ID): an industrial air-flow drier was used to obtain paprika. Air drying flowed at 50 °C by forced convection.

On dried samples, the peduncle was separated from the fruit. OD were subdivided in two groups, including seeds (OD-A) and seedless (OD-B). All samples were ground and sieved at 450 µm in order to obtain paprika.

#### Quality parameters

Quality evaluation was checked in all samples after a storage period about 180 days. Moisture content was determined by drying at 60 °C. Water activity was measured at 25 °C with a water activity meter (LabMaster-aw, Novasina AG., Switzerland).

The ASTA (American Spice Trade Association) color value was determined according to the AOAC International method (2002), based on pigment extraction and espectrofotometric measure at 460 nm. In the same way, the extract prepared for the ASTA determination was used to determine the red/yellow pigment ratio (R/Y) by measuring absorbance at 470 nm for red pigments and at 455 nm for yellow pigments. Non-enzymatic browning was measured as described Lee *et al.* (1991).

Colour was determined as reflected colour according to the CIELab\* coordinates ( $L^*$ ,  $a^*$  and  $b^*$ ) by using a CM-5 spectrocoulometer at 10° and D65 (Konica Minolta, Japan). The hue angle ( $h^\circ$ ) and chroma ( $C$ ) values derived from the colour parameters.

The antioxidant capacity was conducted in a Rancimat 743 Instrument (Metrohm AG., Switzerland). The air flow rate and temperature were 20 L/h and 110 °C, respectively. The oxidation took place on sunflower oil, to which a 100 g/L paprika concentration was added. Thus, the protection factor (PF) for each sample was calculated by dividing its induction period by that corresponding to the sunflower oil as described Garau *et al.* (2005). Statistical analysis was performed on pooled data by using the *Statgraphics* software package.

## RESULTS AND DISCUSSION

Table 1 shows the mean values and standard errors of moisture content and water activity of red pepper dehydrated under different conditions. Depending on the drying method, there were significantly differences on those parameters, being TD the paprika with higher values of both variables.

Table 1. Moisture and water activity of ‘Tap de corti’ paprika for the different treatments.

	Moisture (kg/kg dm)	Water activity
OD-A	2.35±0.12 <sub>a</sub>	0.28±0.01 <sub>a</sub>
OD-B	3.44±0.35 <sub>b</sub>	0.37±0.02 <sub>ab</sub>
TD	5.91±0.19 <sub>c</sub>	0.41±0.00 <sub>c</sub>
ID	3.37±0.14 <sub>b</sub>	0.32±0.00 <sub>b</sub>

The ASTA extractable colour results reflected in figure 1 showed significant differences between the processing conditions. The ASTA values for ‘Tap de corti’ paprika ranged from 129±21 (TD samples) to 83±4 (OD-A). Thus, ‘Tap de corti’ could attain a high ASTA value after 180 days of storage, similar to those obtained by García *et al.* (2007) in Bola-type red peppers and to those presented by Simal *et al.* (2005) in ‘Tap de corti’ red peppers when samples were dried between 50 and 75 °C. Craft drying (TD) attained the highest ASTA value meanwhile OD-A powders the lowest. With respect to the seeds addition, the ASTA values for OD-A were lower than OD-B powders due to the presence of seeds, which dilution effect leads to a loss in colour as obtained in a similar study García *et al.* (2007).

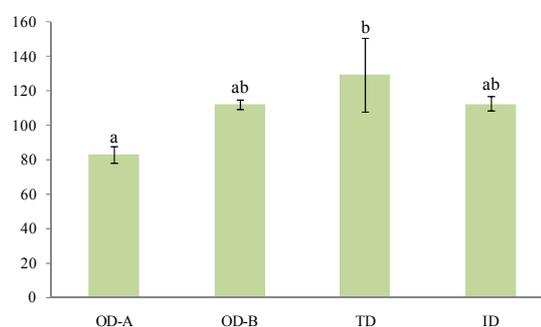


Figure 1. Effect of processing treatment on the ASTA values in ‘Tap de corti’ paprika. Letters indicate differences among samples ( $p < 0.05$ ).

The extractable colour of paprika was also compared with extractable red/yellow pigments ratio (R/Y). The drying methods had a significant effect on the R/Y values, ranging between 1.004 and 1.019 in OD-A and TD, respectively. OD samples showed a significant loss on red colour, probably because of the largest drying period compared with convective drying. Carvajal *et al.* (1997) and Topuz *et al.* (2009) reported similar R/Y values in paprika of 0.978-1.012 and 0.978-1.108, respectively.

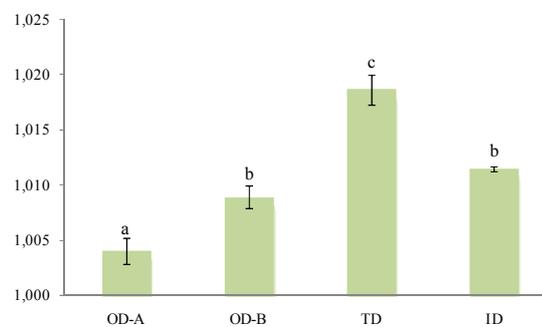


Figure 2. Effect of processing treatment on the R/Y ratio values in ‘Tap de corti’ paprika. Letters indicate differences among samples ( $p < 0.05$ ).

Table 2 presents the non-enzymatic browning (NEB) exhibited for ‘Tap de cortí’. Results ranged between 0.17 and 0.19, depending on the drying treatments applied. These values are slightly higher to those presented by Topuz *et al.* (2009) in traditional drying with ‘Anaheim’ and ‘Jalapeno’ paprika after 90 days of storage. Those differences are probably related to the drying conditions but also to the sugar and amino acid concentration of the different paprika varieties, which are responsible to the Maillards reactions (Topuz *et al.*, 2009). It can also be observed that, although no significant differences were found, industrial drying (ID) led to an important formation of brown products, and OD-A samples, which included seeds, achieved the lowest. This could be explained by two factors; when the seed is added, its oil content covers the particles with a thin film that preserves it in front of the oxidation promoters (light, heat and oxygen) and the other factor, is the presence of tocopherols, which curb the action of any hydroperoxides formed (Pérez-Gálvez *et al.*, 1999).

The values of reflected colour parameters are presented in table 2, as means with standard errors. Both the drying method and the addition of seeds showed a significant influence over  $L^*$ ,  $a^*$  and  $b^*$  values.  $L^*$  was strongly affected by the treatment, being OD-B samples those with higher luminosity. However, when  $C$  was calculated, only OD-B samples decreased significantly in comparison with the others treatments. More pronounced were differences detected in  $h^\circ$  values, being TD those with lower results of  $42.77 \pm 0.2$  and OD-B, those with higher values of  $45.83 \pm 0.4$ .

Table 2. Chromatic coordinates ( $L^*$ ,  $a^*$ ,  $b^*$ ),  $C$ ,  $h^\circ$  and NEB values for the different paprika samples.

	OD-A	OD-B	TD	ID
$L^*$	36.54±0.58 <sub>ab</sub>	38.26±1.03 <sub>b</sub>	35.99±0.28 <sub>a</sub>	37.49±0.4 <sub>ab</sub>
$a^*$	35.99±0.3 <sub>b</sub>	27.2±0.6 <sub>a</sub>	37.49±0.16 <sub>c</sub>	37.26±0.48 <sub>bc</sub>
$b^*$	36.62±0.58 <sub>b</sub>	28.05±1.0 <sub>a</sub>	34.69±0.36 <sub>b</sub>	36.30±1.46 <sub>b</sub>
$C$	51.35±0.61 <sub>b</sub>	39.08±1.24 <sub>a</sub>	51.08±0.36 <sub>b</sub>	52.04±1.35 <sub>b</sub>
$h^\circ$	45.49±0.26 <sub>bc</sub>	45.83±0.4 <sub>c</sub>	42.77±0.2 <sub>a</sub>	44.14±0.82 <sub>ab</sub>
NEB	0.17±0.00 <sub>a</sub>	0.17±0.01 <sub>a</sub>	0.18±0.004 <sub>a</sub>	0.19±0.003 <sub>a</sub>

Letters indicate differences among samples ( $p < 0.05$ ).

The obtained results of the antioxidant capacity are reported in table 3. All samples presented a protection factor value (PF) higher than 1, which indicates the antioxidant capacity of the ‘Tap de cortí’ paprika. Seedless samples (OD-B) presented significantly lower results than pepper powders including seeds (OD-A). This behavior probably answers the presence of the tocopherols in red pepper seeds.

Table 3. Induction time and PF of ‘Tap de cortí’ paprika dehydrated under different methods.

	Induction time (h)	PF
OD-A	7.5±0.4	1.66±0.10 <sub>b</sub>
OD-B	6.2±0.1	1.37±0.13 <sub>a</sub>
TD	6.9±0.03	1.53±0.03 <sub>ab</sub>
ID	7.5±0.03	1.67±0.03 <sub>b</sub>
Control	4.5±0.001	-

Letters indicate differences among samples ( $p < 0.05$ ).

## CONCLUSIONS

‘Tap de cortí’ paprika achieved a high quality of the final product when ASTA value, R/Y, NEB, color attributes and antioxidant capacity were evaluated. Processing affected significantly quality of the end product, therefore drying conditions should be carefully considered in order to improve paprika quality. The addition of seeds into paprika increased antioxidant capacity.

## ACKNOWLEDGEMENTS

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