

Quality deterioration in commercial virgin coconut oil due to photooxidation and autooxidation

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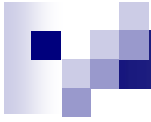
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Introduction

- VCO and perceived health benefits
- Commercially available
 - Transparent bottles only
 - Secondary Packing (paper carton)
- Production method
 - Dedicated VCO processor
 - Collection of finished product
- Consumer's complaint
 - Objectionable odor
 - Wide variation in keeping quality



Objectives

- To determine the keeping quality of commercial virgin coconut oil (VCO) marketed by retailers around Yogyakarta
- To identify its probable cause of its quality deterioration.



Materials and Methods

- 18 brand of VCO products were obtained from the local retailers.
- Five packages, having the same volume, were selected from each brand.
- All samples were placed in styrofoam boxes with lid and were kept out from light and stored at refrigerated temperature prior to further analyses.
- A freshly prepared VCO packed in plastic bottles with or without light protection were obtained from local VCO producer and used as a reference.
- 12 trained panelists were employed to perform sensory evaluation on odor and taste using a difference test method.



Materials and Methods (Continued)

- Chemical analyses were performed on
 - Free fatty acid (FFA), moisture, peroxide values (PV), tocopherol, carotenoids, and total phenolics content.
- Fatty acids composition of the VCO products were measured using GC equipped with FID detector.
- In order to observe the effect of photooxidation on the keeping quality
 - a freshly prepared VCO was placed in a transparent serum bottle with rubber caps and exposed to fluorescent lights at approximately 4000 lux for up to 6 hours at room temperature.
- Peroxide values of the samples were measured at 1 hour interval.



Results and Discussion

- 5 out of 8 commercial VCO product packed in transparent plastic bottles were found to have PV 1.2 - 9.1 meq/kg oil,
- 4 out of 7 of those products packed with secondary paper box have PV 1.1 - 4.9 meq/kg oil.
- Three flavored VCO products have PV 1.6 - 5.9 meq/kg oil,
- PV of reference VCO was 0.14 meq/kg oil.



Results and Discussion (Cont'd)

- 3 out of 8 product packed in transparent plastic bottles have FFA content ranges from 1.1 to 3.1 %,
- All (8) of the products packed with secondary paper box have FFA content of less than 1.0 %.
- FFA content of reference VCO was 0.16%.



Results and Discussion (Cont'd)

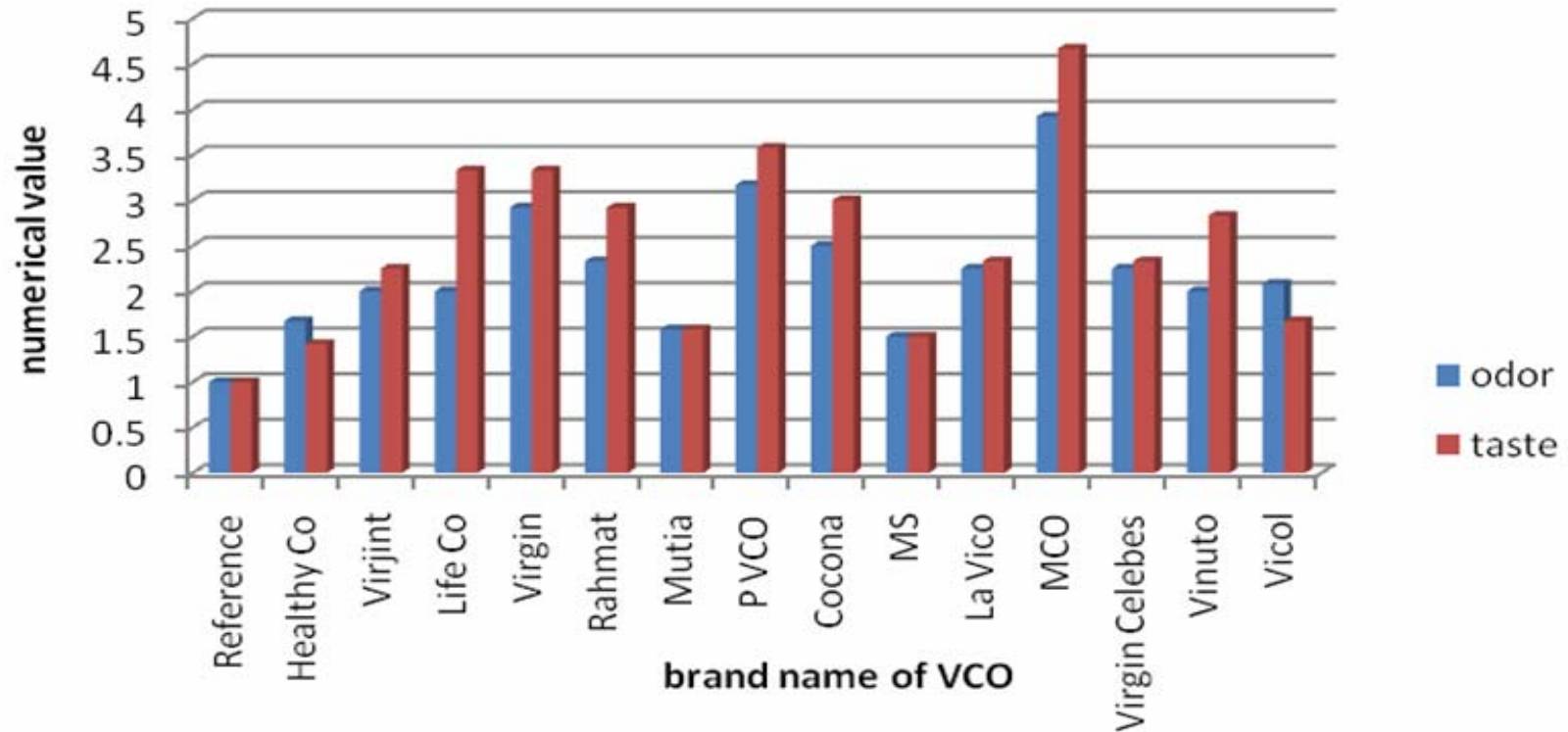
- All of the VCO products contained tocopherol at level ranges from 404 - 460 ppm, while its carotenoid content of 32.4 - 43.4 ug/100g.
- Objectionable odor and taste were clearly detected by panelists on samples having PV of higher than 1.0 meq/kg oil.
- There was a significant positive correlation between PV and the presence of objectionable taste and rancid odor.



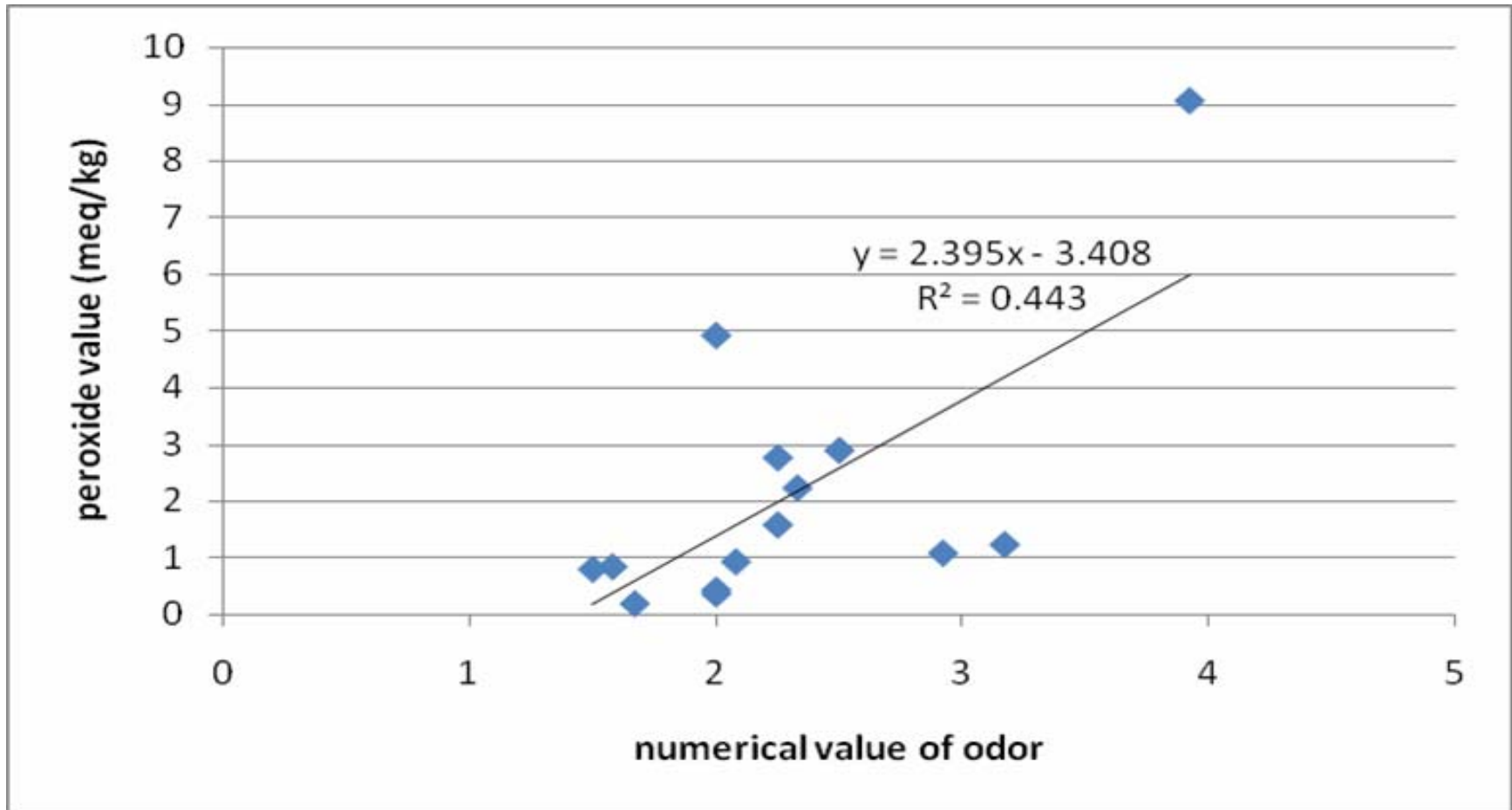
Results and Discussion (Cont'd)

- More than 90% of the VCO consisted of saturated fatty acids, but it still contains
 - oleic acid (6.5%) and
 - linoleic acid (1.5%)
- It could undergo lipid peroxidation with the presence of oxygen and/or light.
- It only takes only 2 hours of light exposure (4000 lux) for the freshly prepared VCO to have PV of 1.0 meq/kg oil.

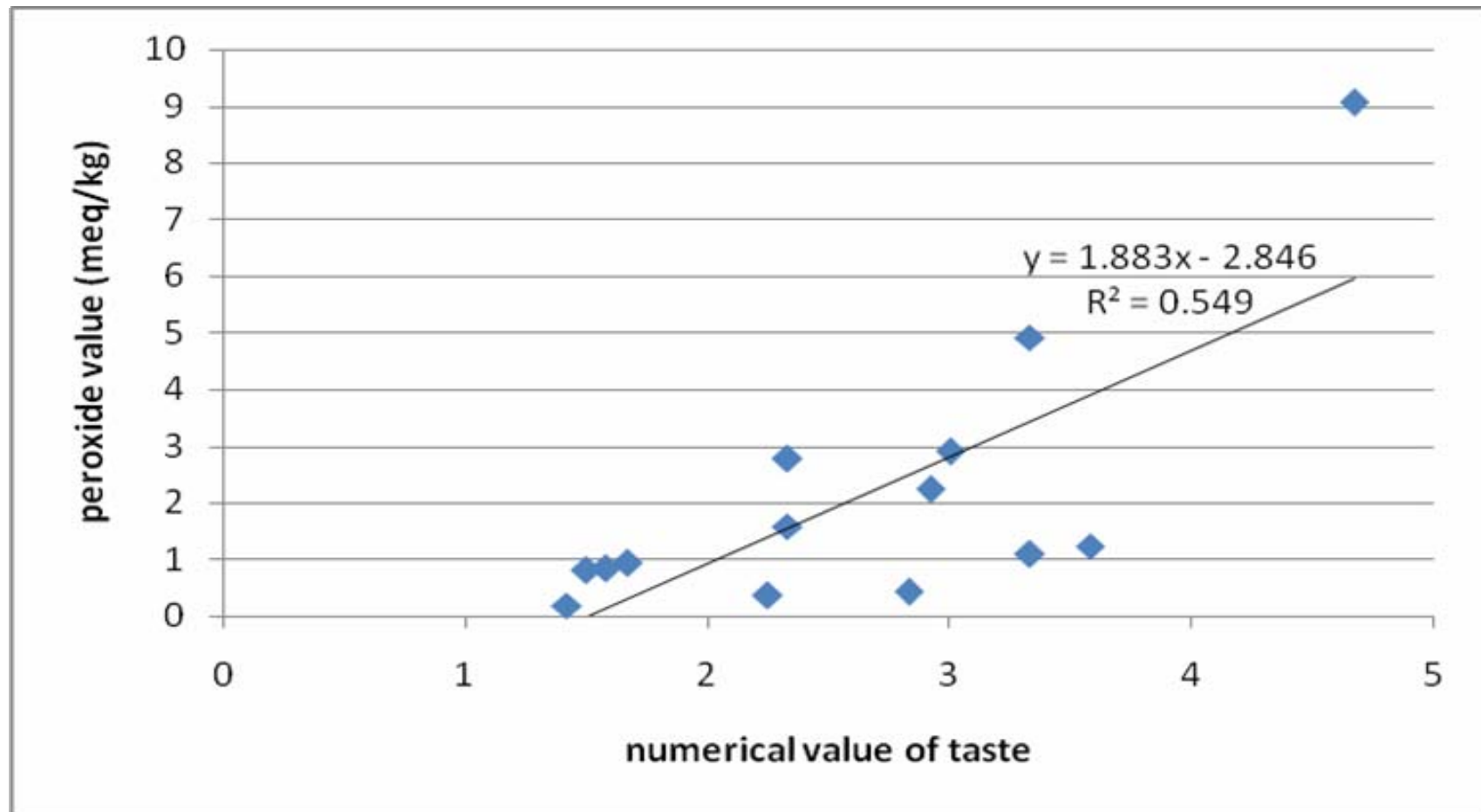
Odor and taste scores of freshly prepared and commercial VCO



Correlation between peroxide values and odor scores of VCO



Correlation between peroxide values and taste scores of VCO





Conclusions

- This study confirmed that approximately 67% of the commercial VCO products in Yogyakarta suffered from quality deterioration in term of presence of objectionable taste and rancid odor.
- The VCO product packed without protection to light suffered most severely from photooxidation.
- It is therefore very crucial to minimize light exposure during VCO production.
- Once the VCO undergoes brief photooxidation, subsequent protection using light barrier packaging material will not effectively inhibit lipid autooxidation reaction during storage.



Acknowledgement

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