

Detection and determination of furfural in crude palm oil.

ABSTRACT

In the palm oil mill, fresh fruit bunch (FFB) undergoes various thermal and mechanical treatments to produce the crude palm oil (CPO). FFB consists of many fruits attached to the spikelets that are spirally arranged on the main bunch stalk. Each fruit is made up of a nut enveloped by the fleshy mesocarp, which is reinforced by strands of fibers running from the base towards the fruit tip. A ripe fruit mesocarp contains oil-rich cellulosic cells. These cells are bound together by hemicellulose. Whilst cellulose is very stable, the hemicellulose is easily hydrolyzed. This hydrolysis occurs during sterilization of the FFB when it is exposed to temperatures of 140-145°C and pressure of 40-45 pound per square inch (psi) or 275.8-310.3 kPa for 1-1½ hours. This condition aims at and ensures the detachment of fruits from the bunch. The in-depth chemical changes that occur in the FFB during sterilization are not fully understood and continuously being investigated. Xyloses form one of the products of hydrolysis, and furfural is another product that results from the dehydration of pentose formed also upon the hydrolysis of hemicellulose. Presence of furfural was tested in six extracted samples, namely CPO, mill-pressed crude, condensate oil, sludge oil, sterilized FFB oil and unsterilized FFB oil, using aniline acetate colorimetric method, thin-layer chromatography (TLC) and UV-visible spectrophotometry. The color formation was compared to that of standard furfural. Furfural was detected in CPO, crude, condensate oil, sludge oil and sterilized FFB oil, while it was undetected in the unsterilized FFB. The amount of furfural was quantified in CPO, condensate oil and sludge oil using high-performance liquid chromatography (HPLC).

Keyword: Crude palm oil; Hemicellulose; Xylose; Furfural.