SMOKE CURING AND AFLATOXIN CONTAMINATION OF COCONUT KERNEL PRODUCTS IN SRI LANKA

By

MADAMAGE CHULA PRIYADARSHANI RODRIGO

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ABSTRACT

The main observation of this study was that the protective effect of smoke on copra from contamination by the carcinogenic aflatoxin is not due to presence of polycyclic aromatic hydrocarbons (PAH) in Sri Lanka, but the acidic or phenolic components.

The overall dimensions of the commercial copra kilns showed a wide range of variations compared to the 'Improved Standard Ceylon Copra Kiln' at Coconut Research Institute (CRI) indicating that the specifications recommended in the CRI leaflet have not been followed in construction of most of the commercial copra kilns. The practice of using increased number of rows of shells combined with reduced height of the drying chamber and increased width probably contributed to fast drying and low quality of copra due to high heat.

Most of kilns used coconut shells as the fuel. A few kilns used charcoal. Charcoal does not give a high flame but maintained a lower temperature throughout the burning period making the drying process more uniform. Incorporation of sulphur dust to fuel source is also becoming popular. The use of charcoal provided distinctly better quality copra and the use of sulphur dust gives white copra which could fetch better prices in foreign markets. The copra kernels tested for sulphur dioxide did not contain more than 80 ppm of residual sulphur.

Production of PAH during smoke curing varied with the type of fuel used. Coconut husks produced the highest concentration of PAH while coconut shells gave the least. This variation may probably be due to the differences in the organic material between husks and shells used as fuel. Generation of PAH was also observed during the oil expelling process using a 'baby expeller'.

The mean aflatoxin concentration (43 ± 94.7 μg/kg) observed in commercial copra, oil and poonac samples were comparable to the concentrations (50 μg/kg) reported by Samarajeewa and Arseculeratne (1975). Mean concentrations of light, heavy, benzo(a)pyrene and total PAH in copra samples were 105, 12, 8 and 118 μg/kg respectively. Of the total PAH indicated that, most were light PAH (90%) which are not carcinogenic. No relationship was observed among moisture, aflatoxin B_1 and PAH in copra collected from the field. All the correlation coefficients were negative and almost zero.

Under experimental conditions, fungal growth on desiccated coconut (used as a uniform substrate) decreased with increased time of smoking. Inhibition of the fungal growth in desiccated coconut did not show a relationship with PAH deposited during smoking.

Laboratory experiments carried out incorporating the commercial food flavouring, Zesti® liquid smoke, as well as coconut shell smoke liquid (produced by absorbing smoke from coconut shell into water) in to growth media showed that both preparations inhibit fungal growth and aflatoxin production by *Aspergillus parasiticus*. Both Zesti® liquid smoke and coconut shell smoke liquid did not contain PAH. Experiments with desiccated coconut as growth media indicated that PAH is not responsible in suppressing fungal growth in coconuts.

On examining the constituents in the Zesti® liquid smoke by partitioning between polar and non-polar solvents, the constituent inhibitory to aflatoxin production was found to be a polar fragment. The experiments also showed that the inhibitory effect is not associated with low pH caused by smoke or the Zesti® liquid smoke, but due to anions of acids or the phenolic constituents that are deposited during smoke curing.