

Chocolate Studied

Chocolate aroma involves more than 300 chemical compounds, says Dr. Phillip G. Keeney, professor of food science at The Pennsylvania State University. Dr. Keeney and associates are experimenting with certain of these compounds involved in processes converting raw cocoa beans into a finished product. The studies are concentrated on the aroma and taste components of chocolate flavor.

When shipped into this country, cocoa beans do not have the typical flavor of chocolate, he said recently in "Science in Agriculture," the quarterly magazine of the Agricultural Experiment Station at Penn State. Flavor is developed in the chocolate factory, primarily by roasting. By blending different types of beans, and by manipulating manufacturing processes, desired and sometimes unique flavor properties are developed.

Chemical substances are altered in roasting the beans. A complicated series of reactions follow, yielding the aroma and taste of chocolate. Chemical compounds involved in these transformations are called "flavor precursors." Precursor formation depends very much upon processes used in the tropics where the cocoa beans are grown to prepare the beans for market.

Fermentation is the most important process given the

beans in the tropics, Dr. Keeney stated. Basically, the beans are taken from the pods and are allowed to ferment 3 to 7 days in piles on the ground, in bins, sweat boxes, or trays. Mucilaginous pulp alcohol, which is oxidized to acid by bacteria.

Acid, combined with heat generated by fermentation, kills the beans and inhibits

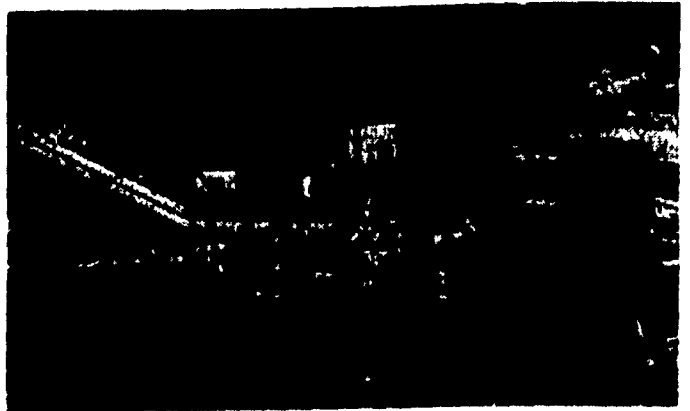
germination. Bean death results in cellular changes, causing enzymatic reactions and precursor formation. Research by Dr. Keeney and associates has contributed to a basic understanding of chemical changes during fermentation.

An example of subtle chemical differences, discovered through research, concerns specific sugars and their influence on the formation of flavor precursors. During fermentation the sucrose or common table sugar is

consumed and the end products, glucose and fructose, are involved in fermentive reactions. Although present in cocoa beans in low concentrations, these sugars - through their reactions with protein degradation fragments - are key components in the formation of many important aroma compounds.

Rotation

In the Northern Hemisphere the rotation of the earth is counter-clockwise. Rotation goes like the hands of the clock below the equator.



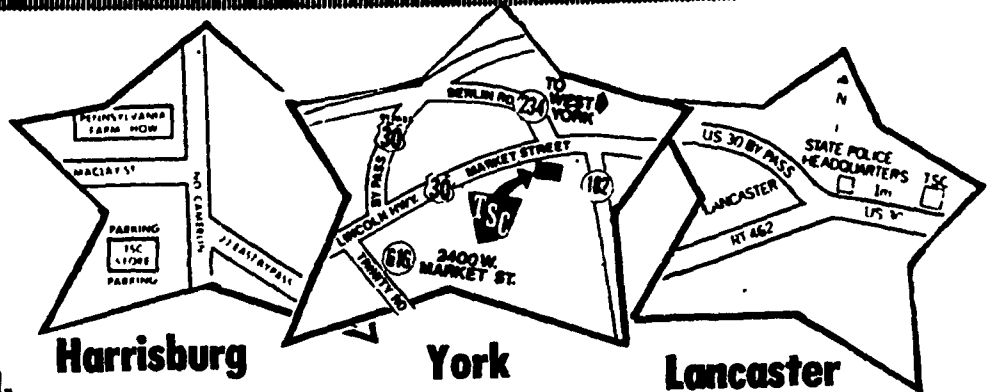
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