

Grape and Apple Pomace Charcoal

Grape and apple processing wastes containing 69–76% moisture were suspended in a solution of sulfuric acid, and the charred intermediates which were easily separated from the aqueous medium

were pyrolyzed at a low temperature to yield charcoals. The major differences between grape and apple charcoals were in acid solubles and in the equilibrium pH of a water suspension.

In industry, ligno-cellulosic matter is converted to activated carbons by prolonged heating at high temperatures in an inert atmosphere, or by the action of dehydrating chemicals and low heat (Fornwalt et al., 1963). These carbons are notable for their physical-chemical properties which may vary, depending on the nature of the starting material, and on the conditions of their preparation (Bartell and Lloyd, 1938; Snoeyink and Weber, 1967).

EXPERIMENTAL SECTION

Moist grape and apple solids (100 g) were agitated in 300 ml of 25–40% sulfuric acid. The solids were allowed to char under the influence of the heat released by the exothermic reaction, with or without additional heat. Upon cooling, the charred solids were washed with water to a supernatant liquid pH of 4–5, then were allowed to settle before separating the phases by decantation. These charred intermediates were dried and slowly heated to 160–200°C until smoking ceased. They were then cooled and ground to a mesh size ≤ 40 . Selected properties of the charcoals produced were determined.

RESULTS AND DISCUSSION

In order to convert the moist substrates to charcoal without first drying them, the solids were carbonized in their aqueous state, using the water present to dilute sulfuric acid to the minimum concentration that would promote charring, with or without additional heating. In each case, the resulting char was less dispersible than the untreated solids, and, consequently, was easily isolated by settling, decantation, and/or filtration. The lower the charring temperature, the more closely did the charred solids resemble lignite. Drying and heating above 160°C resulted in a distinctly carbonaceous appearance. Selected properties of the charcoals are listed in Table I. Generally, grape and apple

pomace would appear to be excellent sources of low-ash carbons. The bulk density values indicate that a considerable amount of pore space would be present. This extensive

Table I. Selected Properties^a of 40-Mesh Charcoal, Carbonized at 200°C

Properties	Apple	Grape
pH	5	9
Bulk density (lb/ft ³)	36	34
Water solubles (%)	0.7	1
Acid solubles (%)	4	15
Ash (%)	2	9

^a Fornwalt et al. (1963).

porosity could be used to advantage in filtration and absorption operations.

LITERATURE CITED

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Bitterness of *Dioscorea cayenensis*

From a particularly bitter-flavored tuber of *Dioscorea cayenensis*, a water-soluble phenolic substance was extracted with ethyl alcohol. After separation on thin layers, this substance was identi-

fied by spectral absorption, by color reactions, and by the fact that an anthocyanidin was released on hydrolysis as a leucoanthocyanidin.

In a previous communication, the occurrence was reported of up to eight related substances from tubers of *Dioscorea bulbifera* L. (Telek et al., 1974), four of which tasted bitter. Solubilities, color reactions, and ultraviolet (uv) absorption spectra showed these to be furanoid norditerpenes. In later studies, these same substances could not be extracted from other species of yams. Even tubers that were strongly bitter did not show traces of furanoid diterpenes.

Recently, while working with varieties of *D. cayenensis*

Lam. (African yellow yam), a popular and widely distributed yam of West Africa, four different strongly bitter cultivars were found. In addition, their flesh was subject to oxidation of polyphenols on exposure to the air. Since studies were in progress on the polyphenolic oxidation of tubers of another species, it was decided to search for oxidizable phenolics in the tubers of these four accessions. During the process, a bitter substance was extracted and partly identified, as presented here. The information on the oxidizable substances is presented elsewhere.