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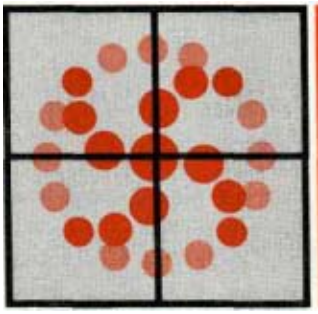

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NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA, A DIVISION OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, A STATUTORY COLLEGE OF THE STATE UNIVERSITY, CORNELL UNIVERSITY, ITHACA

Review of grape and wine toxicity research

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The first report of a systematic investigation of toxic substances present in wine was by Leuch in 1895 (9), in which free sulfite was administered in 40-50 mg doses in wine to 150 Swiss human volunteers. Ten per cent complained of gastric distress, increased salivation, and diarrhea. (Sulfite is used in the manufacture of wines for its bacteria-cidal and fungicidal effects.) Investigations of toxicity of wines from that time have centered around the development of liver cirrhosis caused by etha-nol consumption, pesticide residues from vineyard sprayings, and histamine formation in certain wines. Histamine development has been associated with bacterial production occurring when unsanitary conditions are present during wine making, and not with the species of grape. White wines, in general, seem to contain less histamine than red wines (11).

About 20 years ago, a French physician, J. de Leobardy, attributed liver disorders to drinking wines made from native eastern United States grapes or from hybrid grapes (crosses of French and American varieties). After feeding various wines to hens, rats, guinea pigs, pigs, and goats, with subsequent organ histologic examinations, the only diseased conditions were found in the chickens. Fowl tuberculosis was observed, which de Leobardy and Loubet (8) claimed was coincident to the experiment and not attributable to the wine intake. About this time, Breider, Reuther, and Wolf (4) showed that liver damage was produced in chickens when hybrid wines were fed, and Breider (3) stated falsely that the results from his laboratory agreed with those of the French investigations.

Apparently, because of increased German newspaper publicity at this time regarding "poisonous substances" in hybrid wines, a great deal of published criticism of Breider's work occurred in *Die-Wein-Wissenshaft* (1, 13, 14). Nurnberger, from the Anatomischen Institut der Johannes Gutenberg-Universitat in Mainz (Rhein), concluded that the liver changes of chickens reported by Breider, et al would have occurred without the administration of hybrid wine.

In 1965 Breider, Wolf, and Schmitt (6) published investigations in which wines made from European-American hybrid grapes were fed to nine strains of Leghorn chickens. In seven strains there were: (1) A high incidence of incomplete leg and foot bone development and some spastic conditions in offspring of the treated hens. (2) Significant number of broken eggs, as compared with eggs produced from hens drinking Silvaner (Vinifera) wine, or water.

Breider and Wolf published in 1967 in Der Zuchter, 36: 366-379 an article entitled: "Qualitat und Resistenz V. Uber das Vorkommen vom Bio-statica in der Gattung Vitis und ihren Bastarden." This article claimed that the quality of wines and juices depends on their "biotic" value checked by biological tests. This value, it was claimed, shows a positive correlation with the degree of resistance of the vine to parasites and pathogens. Highly resistant varieties of grapes (hybrids) made into juices or wines were fed to hens and newly hatched

chicks. Chicks produced from these hens, or the hybrid-fed chicks produced from hens not fed the hybrid product, developed malformed legs, feathers, and nervous system aberrations. The substance(s) in these grapes causing these problems is termed "biostatica." Pictures of the crippled animals are shown in this publication.

Because this new and somewhat startling result reported by Breider, et al was receiving considerable publicity and some credence in the United States, the Department of Food Science and Technology of the New York State Agricultural Experiment Station initiated investigations on this problem in 1968. The initial resulting publication (16) showed that wines or juices made from *Vitis labrusca, Vitis vinifera, Vitis riparia,* or a French hybrid, when fed to chicks, produced no significant physiologic or anatomic deviations due to grape species. The major effect in growing chicks drinking wines or juices from any grape is related to the interference with normal water and adequate balanced diet intake. Just prior to this publication, a report from Switzerland (15) showed that in experiments with growing rats and chickens fed either hybrid juices or a Pinot-Noir (Vinifera) juice, none of the animals exhibited any anatomical, pathological, or histological anomalies attributed to a specific treatment. Personal communications with A. Schurch indicate that his laboratory is continuing with longer term breeding studies in rats and chickens fed hybrid juices.

The Geneva Experiment Station also started a reproductive study of Japanese quail fed hybrid or Vinifera grapes in late 1968. This avian species was used principally because of its limited space requirement, very quick maturation (after 40-50 days of age the hens will start egg laying), and its relatively high nutritional requirements for growth and reproduction. Diets containing 50 per cent freeze-dried grapes were fed through two complete generations of quail. The hybrid grape "Siegfried" is included since Breider and Wolf's 1967 report stated that this variety fed to chickens produced malformed offspring. No anomalous specimens were observed in developing embryos, growing quail, adults, or even in the dead unhatched embryos.

Our results were reported at the Annual Meeting of the American Society of Enologists in Coronado, California, June 26, 1970. We have surmised that Breider's experimental chickens developed a variety of chronic and acute nutritional deficiencies due to their poor basal diet. From our data, we have concluded that non-vinifera or hybrid grapes contain no natural toxicants at levels high enough to affect healthy experimental avian species under an adequate plane of nutrition.

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