TABULAR STATEMENT—Continued.

| No. | Name and locality of grapes, and from whom received. | Color, &c. | Juice, per pound. | Specific gravity. | Saccharine, per cent., according to Evans's tables. | Grape sugar, indicated by cupper test. | Absolute alcohol, computed from grape sugar. |
|---|---|---|---|---|---|---|---|
| | | | *fluid ozs.* | | | | |
| 25 | Vitis labrusca, No. 6 of Weber; Hartford, Conn | Purple, medium size | 11 | 1.0380 | 10 | 8.1 | 4.05 |
| 26 | No. 28 of Weber. (See his report.) | Small black, hard, sour | 6½ | 1.0320 | 8 | 5.5 | 2.7 |
| 27 | No. 29 of Weber. (See his report.) | Large red | 10½ | 1.0350 | 9 | 6.16 | 3.8 |
| 28 | No. 30 of Weber. (See his report.) | Large white grapes | 10½ | 1.0360 | 9 | 5.38 | 2.69 |
| 29 | Vitis cordifolia; No. 32 of Weber | Black, medium size | 7 | 1.0470 | 11½ | 7.84 | 3.92 |
| 30 | Vitis labrusca; No. 33 of Weber | Large red grapes | 10 | 1.0510 | 13 | 13.3 | 6.6 |
| 31 | Vitis cordifolia; No. 34 of Weber | Black, medium size | 10 | 1.0540 | 13½ | 10.33 | 5 |
| 32 | Vitis sinuata; No. 35 of Weber | Very small black grapes, in close clusters. | 8 | 1.0610 | 15 | 11.5 | 5.7 |
| 33 | Vitis labrusca; No. 36 of Weber | Dark-red | 10 | 1.0420 | 10½ | 14.3 | 7.15 |
| 34 | Catawba grape, from near Boston, Mass | Pale-red, medium size | 11½ | 1.0630 | 15 | 16.9 | 8.45 |
| 35 | Adelia or Petit Noir, Orange county, N. J.; Patent Office | Small, black | 10¼ | 1.0610 | 14½ | 15.33 | 7.66 |
| 36 | Bartlett Grape, origin Lexington, Mass.; F. Alger, South Boston | Large, pale-red and green | 11½ | 1.0680 | 17 | 12.87 | 6.44 |
| 37 | Clinton, East Cambridge; Mr. Brackett | Dark-purple, medium size | 11 | 1.0880 | 22 | 20.5 | 10.25 |
| 38 | Vitis labrusca, of Conn.; in more favorable year, 1858, sample from E. Paige. | Purple, medium size | 10 | 1.0520 | 13 | 17.8 | 8.9 |

BOSTON, *December* 24, 1859

CHARLES T. JACKSON, M D.



# REPORT ON AMERICAN GRAPES.

## DETERMINATION OF THE PROPORTIONS OF ACIDS IN NATIVE AMERICAN GRAPE WINES MADE FROM THE PURE JUICE OF THE GRAPES.

BY CHARLES T. JACKSON, M. D.

In this examination I employed graduated solution of pure caustic soda, in distilled water, and prepared it so that every degree of the acidimeter corresponded to one tenth of a grain of pure tartaric acid. This test gives results sufficiently exact, though a little of the acid in the wines is malic acid, as I had previously ascertained.

In applying this test, any acetic acid which had formed in the wine during the process of fermentation was first removed by evaporating the wine until it was all volatilized, the acetic acid passing off in vapor, while all the tartaric and malic acid remained. One thousand grains of each of the wines was operated upon in determining their acidity. In the tabular *resumé* the results will be stated in per centages, as the other ingredients have been.

It may be observed that pure grape juice, merely fermented and not diluted with any water, has been the subject of these experiments. In making wines from American grapes, it is customary to add a certain proportion of water and of sugar to the grape juice, to overcome the acids, and to make the wines more agreeable. As the sugar is converted into alcohol, it gradually precipitates a portion of the tartaric acid as bi-tartrate of potassa, or cream of tartar, thus relieving the wine of part of its acidity.

No. 1. The juice of the Henshaw grapes, from Martinsburg, Virginia, yielded, in 1,000 grains, 11.4 of tartaric acid, or 1.14 per cent.

No. 3. The Catawba grape juice, Washington, D. C., yielded, in 1,000 grains, 10 grains of tartaric acid, or 1 per cent.

No. 6. Sweet-water grape, Harding's, tartaric acid in 1,000 grains, 6 grains, or 0.6 per cent.

No. 7. Vitis labrusca, No. 20 of Weber's list, from Concord, Massachusetts, yielded, in 1,000 grains of the fermented juice, 14.2 grains, or 1.42 per cent.

No. 9. Concord seedling, Bull's, Concord Massachusetts, No. 24 of Weber's list, yielded, in 1,000 grains of the fermented juice, 6 grains of tartaric acid, or 0.6 per cent.

No. 11. Sage grape, of Concord, Massachusetts, No. 25 of Weber, yielded, in 1,000 grains of the fermented juice, 11 grains of tartaric acid, or 1.1 per cent.

No. 12. Vitis æstivalis, from Bedford, Massachusetts, No. 21 Weber, yielded 14.6 grains of tartaric acid per 1,000 grains of the wine, or 1.46 per cent.

No. 13. Amber grape, of Dracut, Asa Clements, yielded, in 1,000 grains of the wine, 15 grains of tartaric acid, or 1.5 per cent.

No. 16. Sugar grape, of Plymouth, Massachusetts, yielded, in 1,000 grains of the wine, 14.8 grains of tartaric acid, or 1.48 per cent.

No. 17. Vitis labrusca, Connecticut, No. 10 Weber, yielded, in 1,000 grains of the wine, 7.2 grains of tartaric acid, or 0.72 per cent.

No. 18. White grape, from Connecticut, No. 5 of Weber, yielded, in 1,000 grains, 12 grains of tartaric acid, or 1.2 per cent.

No. 19. Vitis cordifolia, Connecticut, No. 11 Weber, yielded, in 1,000 grains of the wine, 14 grains of tartaric acid, or 1.4 per cent.

No. 20. Vitis cordifolia, No. 8 of Weber's list, yielded, in 1,000 grains of the wine, 13 grains of tartaric acid, or 1.3 per cent.

No. 21. Vitis cordifolia, Connecticut, No. 7 of Weber's list, yielded, in 1,000 grains of the wine, 15 grains of tartaric acid, or 1.5 per cent.

No. 22. Vitis cordifolia, No. 27 of Weber, Connecticut, yielded, per 1,000 grains of the wine, 18 grains of tartaric acid, or 1.8 per cent.

No. 23. Scuppernong grapes, from near Wilmington, North Carolina, yielded, in 1,000 grains of the wine, 17 grains of tartaric acid, or 1.7 per cent.

No. 25. Vitis labrusca, Hartford, Connecticut, No. 6 of Weber, yielded, in 1,000 grains of the wine, 13.8 grains of tartaric acid, or 1.38 per cent.

No. 26. Small black grape, No. 29 of Weber's list, yielded, per 1,000 grains of the wine, 12.4 grains of tartaric acid, or 1.24 per cent.

No. 27. Large red grape, No. 29 of Weber's list, yielded in 1,000 grains of the wine, 9.2 grains of tartaric acid, or 0.92 per cent.

No. 28. Large white grape, No. 30 of Weber's list, yielded per 1,000 grains of the wine, 14 grains of tartaric acid, or 1.4 per cent.

No. 29. Vitis cordifolia, No. 32 of Weber's list, yielded per 1,000 grains of the wine, 12 grains of tartaric acid, or 1.2 per cent.

No. 30. Vitis labrusca, No. 33 of Weber, yielded per 1,000 grains of the wine, 11.8 grains of tartaric acid, or 1.18 per cent.

No. 31. Vitis cordifolia, No 34 of Weber's list, yielded per 1,000 grains of the wine, 14.4 grains of tartaric acid, or 1.44 per cent.

No. 32. Vitis sinuata, No. 35 of Weber, yielded per 1,000 grains of the wine, 20 grains of tartaric acid, or 2 per cent.

No. 33. Vitis labrusca, No. 36 of Weber, yielded per 1,000 grains of the wine, 15 grains of tartaric acid, or 1.5 per cent.

No. 34. Catawba grape, from near Boston, Massachusetts. This wine gave per 1,000 grains of the juice, 14 grains of tartaric acid, or 1.4 per cent.

No. 35. Adelia, or Petit Noir, Orange county, New Jersey, yielded per 1,000 grains of the wine, 8 grains of tartaric acid, or 0.8 per cent.

No. 36. Bartlett grape, South Boston, Massachusetts. The wine of these grapes yielded, per 1,000 grains, 19 grains of tartaric acid, or 1.9 per cent.

No. 37. Clinton grape, East Cambridge, Massachusetts. The wine of this grape yielded, per 1,000 grains, 19 grains of tartaric acid, or 1.9 per cent.

The other wines were used up in other researches, before I was aware that it was desired that I should determine the acidity of the specimens.

It is probable, however, that there are here given a sufficient number of examples of our native grapes, including all the species, to settle the question as to the proportion of acids in them.



It will be remarked that, while the proportion of sugar is not increased in grapes by cultivation, the tartaric acid is diminished in a remarkable manner.

*Tabular statement of proportion of tartaric acid per cent.*

| | Per cent. tartaric acid. | | Per cent. tartaric acid. |
|---|---|---|---|
| Number 1 | 1.14 | Number 23 | 1.7 |
| 3 | 1 | 25 | 1.38 |
| 6 | 0.6 | 26 | 1.24 |
| 7 | 1.42 | 27 | 0.92 |
| 9 | 0.6 | 28 | 1.40 |
| 11 | 1.1 | 29 | 1.20 |
| 12 | 1.46 | 30 | 1.18 |
| 13 | 1.5 | 31 | 1.44 |
| 16 | 1.48 | 32 | 2 |
| 17 | 0.72 | 33 | 1.5 |
| 18 | 1.2 | 34 | 1.4 |
| 19 | 1.4 | 35 | 0.8 |
| 20 | 1.3 | 36 | 1.9 |
| 21 | 1.5 | 37 | 1.9 |
| 22 | 1.8 | | |

## ON THE PRESENCE OF TARTARIC ACID IN THE CULTIVATED GRAPE OF THE UNITED STATES.

BY THOMAS ANTISELL, M. D., PROFESSOR OF CHEMISTRY IN THE MEDICAL DEPARTMENT OF GEORGETOWN COLLEGE, D. C.

The assertion has been frequently made in publications in this country, that the growth of grape-vines for the manufacture of wine is a project of doubtful success, since in the United States the grape does not form tartaric acid in the same large proportion in which it is found to exist in the European plant, its place being supplied by the vegetable acids, which alter the flavor and value of the wine produced.

Inasmuch as the cultivation of the grape is now prosecuted with success in the Ohio valley, and extending over a large section of country, and since the climate and soil of the United States are eminently favorable to the growth and propagation of the vine, as shown by the abundant woody development, it becomes a matter of importance to know whether the juice of the fruit grown in the United States differs in any important particular as regards the nature or amount of acid from that of European grapes.

For the successful manufacture of wine the presence of tartaric acid is all essential; for, by its tendency to unite with the potass, also present in the pulp, and to form the acid tartrate of potass (cream of tartar)—a salt soluble in the pulp of the grape, but not soluble when,

by fermentation, alcohol is formed in the juice, and which is therefore thrown down and separated from the wine forming the "tartar"—depends the superiority and greater healthfulness of true wine over the fermented liquors of other pulpy fruits, whether indigenous or exotic.

In the pulpy fruits used in the manufacture of domestic wines the acids present are chiefly malic and citric, which form with potash salts soluble not only in the fresh juice but also in the fermented wine. They are consequently not thrown down or separated out of the wine as alcoholization goes on in the fermenting vats, and their presence in the wine renders the latter unhealthy, it being liable to become acid in the stomach, and to produce derangement of function in that organ. Hence, the real superiority of the wine of the grape above the fermented juices of other fruits depends not upon fancy, nor an uneducated taste, but upon the production of an alcoholic liquid not containing within it substances injurious to digestion.

Tartaric acid is as essential as sugar in the manufacture of wine; in dry wines the tartar predominates much more than in sweet, in which sugar is the dominant element. This acid diminishes as the fruit approaches ripeness; and it is also diminished in grapes grown where the climate is hot and dry in the season when the fruit is ripening. In the south of Europe, when, in the autumn, the African winds blow northward, when the grape is ripening, those portions of the Mediterranean shores exposed to a hot and dry wind do not produce dry wines, but wines that are always sweet, because the proportion of sugar and tartar are out of relation with each other. Thus the rich, sweet grape of Malaga has but little tartaric acid, and a sweet wine is the result, while the wine of Burgundy has more tartar and less sugar, and produces a more acid wine.

To determine the presence and proportion of tartaric acid, I selected the Catawba grape as that most abundantly grown for wine purposes, and, by the kindness of Mr. Michael Werk, of Greene county, Ohio, who placed at my service several pounds of ripe grapes, and a sample of the tartar produced, I have been enabled to furnish the following results:

Six pounds of grapes, pressed, yielded 56 ounces of a literally clear, colorless juice of specific gravity 1.074. This juice was diluted with an equal amount of distilled water, and the mixed liquid passed through a fine strainer to separate the cellulose and albuminous matters not dissolved; solution of chloride of calcium with ammonia was added so long as a precipitate was produced, allowing the liquor to rest between the additions; the precipitate was then dissolved in hydrochloric acid, and ammonia added. The precipitate was then collected and dried at a gentle heat, and weighed against a tared filter. By this process the malic acid present is avoided, and the precipitate obtained is either wholly tartrate of lime, or, if not containing any racemic acid present in the juice, forming a racemate of lime. As racemic acid is only a modified form of tartaric acid, and as it is not known to act in any way differently in wines from its congener, it was not deemed necessary to separate them in this examination.

The amount of tartrate of lime attained from six pounds of grapes, or from $4\frac{2}{3}$ pints of juice, was $4\frac{32}{100}$ grammes, (nearly 67 grains,) which represents $50\frac{16}{100}$ grains of acid, tartrate of potash, originally existing in the juice.

This would give the quantity of cream of tartar present in each ounce of juice as nearly one grain, admitting the whole of the tartaric acid to be combined with potassa, but as there is always some tartrate of lime present in the juice, the amount of cream of tartar is slightly lessened.

The quantity of sugar determined by Fehling's modification of the copper grape-sugar test was 19.6 per cent.

As the grapes examined had ripened very much in the interval between the gathering and the examination, the above proportion of tartrate of potass is probably somewhat less than existed in the fruit. The presence of that amount shows satisfactorily, however, that tartaric acid is the dominating acid in the Catawba grape, and that is produced abundantly in the latitude of Cincinnati.

The sample of crude tartar forwarded by Mr. Werk yielded, on qualitative analysis, acid tartrate of potass, tartrate of lime, sulphate of potass, sulphate of lime, phosphate ammonia, and magnesia. The two last-mentioned salts were present in but small amount.

Mr. Payen, having stated in his work on distillation that the cellular tissue of the pulp contained "tannin," led to a repeated examination of the juice of the pulp; and in every case where common care was taken that the skins should not be pressed, so that any of its liquids might become mingled with those of the pulp, not a trace of tannic acid could be detected, thus verifying Mulder's statement that this acid is wholly confined to the skins.



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# THE NATIVE GRAPES OF PENNSYLVANIA, NEW JERSEY, NEW YORK, AND NEW ENGLAND.

## THEIR WINE-PRODUCING QUALITIES.

BY JOHN F. WEBER, OF WASHINGTON, D. C.

My examination of native grapes began at Orange and the surrounding country, in New Jersey. Some varieties, which I had noticed several years before, first attracted my attention. I found them still vigorous in their natural growth, and capable of improvement. Following a northern direction, I traversed the greater part of the State of Connecticut, meeting, in the township of Canton, with valuable kinds, free from insects. In western Massachusetts, especially in East Hampton, Northampton, Florence, and Leeds, I observed a few varieties well worthy of attention, exhibiting, with regard to the formation of wood and fruit, all the qualities sought in good wine. Such was also the case south and north of Boston. I selected samples of the matured fruit of all those probably most capable of improvement, and transmitted them to Dr. Jackson, of Boston, for chemical analysis.

The value of grapes, either for wine-making or table use, being de-