

ART. XXVII.—*On the Coloring Matter of the Privet and its application in the Analysis of Potable Waters*; by Mr. JEROME NICKLÈS.

THE berries of the privet (*Ligustrum vulgare*), which are often employed in Europe to color wines, contain, besides water and ligneous matter, a portion of glucose, a waxy substance and a beautiful crimson coloring matter, which is the principal element. This matter is soluble in water, alcohol and ether; it contains no nitrogen, and is much more stable than many allied substances. When exposed to a sufficient heat it gives a black porous charcoal, but the uncharred portions remain unchanged. It was not altered by boiling for forty-eight hours with distilled water, nor by digestion during six weeks with sulphurous acid. The fixed alkalies and their neutral carbonates turn its color to green, but the red is restored by acids so that it may be employed as a delicate test in place of litmus or the coloring matter of the dahlia. With a solution of acetate of alumina it gives a violet blue liquid, from which by boiling a fine blue lake is precipitated, which is insoluble in acetic acid, but dissolves in tartaric, citric and mineral acids to a red liquid, from which alkalies

throw down again the blue lake. The basic, and even the neutral acetate of lead, yield with the red coloring matter of the privet a blue precipitate, which is soluble in acetic acid. Ammonia readily alters this coloring matter, giving rise to a yellow substance not well defined in its character. From these observations it would appear that the red coloring principle of the berries of the privet is a substance *sui-generis* and distinct from any hitherto known. I therefore propose to designate it by the name of *liguline*.

In order to obtain *liguline* in a state of purity, the filtered juice of the berries was precipitated by neutral acetate of lead, and the well washed lake suspended in a small quantity of water was decomposed by sulphuretted hydrogen. The residue was then thoroughly washed by ether, in which the *liguline* is insoluble.* Being taken up by alcohol, and again treated by acetate of lead, sulphuretted hydrogen and ether, it might be supposed to be pure. I was, however, unable to obtain concordant results in a series of elementary analyses, the carbon of the direct lead compound varying between 21.56 and 23.00 per cent, and the hydrogen from 1.89 to 2.58.

It is probable that the process described by Mr. Glénard for the preparation of *oenoline*, the red coloring matter of wines (*An. de Chim. et de Phys.*, Dec. 1858, p. 368), would be preferable for the extraction of *liguline*. I accordingly applied it, but the berries having been gathered too late in the season, the coloring matter had become so far altered that my trial was unsuccessful, so that the question of the elementary composition of *liguline* remains unsettled.

The following further observations on this coloring matter are not without interest. It is not precipitated by gelatine, which throws down the red coloring matter of wines. With hypochlorite of lime it gives a yellow color and a yellow precipitate. With chlorid of gold, a yellow color and reduction of the metal. With chlorid of platinum, no change in the cold, but a brown color by heat. With chromate of potash a green; with bichromate brown, and with sesquichlorid, and ferroso-ferric sulphate of iron the same color. Chlorine destroys the color of *liguline*. The chlorids of sodium, barium and mercury, the nitrates of baryta, lead, mercury and bismuth, as also the sulphates of starch, soda, lime, zinc, manganese and cadmium are without action on the coloring matter of the privet.

The bicarbonates of lime and of the alkalies (unlike the neutral alkaline carbonates which turn it to green) give a blue color with *liguline*, and the same is true of the chlorids and nitrates of zinc and calcium. The colors thus obtained offer however some

* The author has previously stated that the coloring matter is soluble in ether—there is apparently some error of the copyist.—NOTE OF THE TRANSLATOR.

peculiar differences when seen by transmitted light; in this way the blue produced by a chlorid of zinc and bicarbonate of lime appears red, while it is green with the chlorid of calcium or the nitrate of lime or zinc. The blue color produced by a solution of bicarbonate of potash, on the contrary, offers no variation when thus viewed by transmitted light.

The recent juice of the berries of privet alters readily even when mixed with alcohol; its fine crimson color turns to red, and the liquid then mingled with a solution of bicarbonate of lime gives a gray instead of a blue color, and gives a dirty blue with acetate of lead. This change appears to depend upon the development of ammonia from the transformation of the azotized matter of the juice; when separated from these matters and isolated, on the contrary, liguline may be preserved without change, either in aqueous or alcoholic solution. Its color is then an intense crimson.

Even the strong mineral acids in the cold do not alter liguline, but in the presence of alkalies on the contrary, it is rapidly altered, although the red color can be, to a certain extent, restored by an acid. This alteration is dependent upon the absorption of oxygen, as may be shown by introducing a mixture of liguline and potash ley in a glass tube over mercury, when rapid absorption takes place.

The property of liguline to produce blue with solutions of bicarbonate of lime renders it a delicate reagent for the detection of this salt in potable waters. For this purpose it suffices to let fall a drop of an aqueous or alcoholic solution of liguline into the water, the crimson tint which this communicates to distilled water is replaced by a beautiful blue. In place of the solution we may employ a test paper impregnated with the coloring matter, which is best as prepared from the lead precipitate. We may, however, employ the recent juice of the berries, taking care to redden the paper slightly by exposing it to the vapor of acetic acid before drying.

As a reagent for the detection of bicarbonate of lime in waters, liguline is greatly to be preferred to a tincture of logwood, and the paper prepared with it becomes a valuable reagent for the laboratory as well as for the naturalist in the field. I have found by this reagent that while bicarbonate of lime is indicated in the springs which flow from the jurassic strata, and especially those that supply the city of Nancy, no change of color is produced by a solution of liguline with the waters of other streams which have their source in rocks destitute of calcareous matter.

The observations which I have given above were made for the most part with the fruit of the privet gathered in the autumn of 1856, and I have in fact indicated in a note in the Bulletin of the local Society of Acclimation for the North-West district

(Nancy, 1857, p. 121). I have delayed publication in the hope to render my research more complete by a good elementary analysis, but I am now induced to publish the results already obtained that I may claim the right to continue and complete the investigations, having learned that Mr. Glenard proposes to undertake a similar research.

In conclusion, we may remark that the coloring matter of the privet offers a great analogy with that of the wines of Villefranche isolated and examined by Mr. Glenard; this analogy is shown by their composition and their properties. Its reaction with bicarbonate of lime may render it a valuable reagent in chemical analysis. The fact that it is not precipitated by gelatine, which, as is well known, throws down the red coloring matter of wines, will serve to distinguish the two when associated. It still remains to be decided whether the coloring principle of all red wines is the same, but this is a question foreign to our present subject.