

fact to become the abject slaves of the Poor-Law Commissioners.

I find that I have already trespassed at great length upon your valuable columns, but I have yet much to say; particularly I wish to point out the best, and I believe the only remedy, for the evils under which the profession groans; this, however, I must reserve for another opportunity. In the mean time I remain yours, very respectfully,

J. BEDINGFIELD.

Stowmarket, Suffolk, Aug. 18, 1838.

VEGETABLE CHEMISTRY.

To the Editor of THE LANCET.

SIR:—The following experiments, illustrative of the constituents of gooseberries, at different periods of their growth, have been conducted during the present summer, and if worthy of notice, you will oblige me by inserting them in your valuable Journal. I am, Sir, your obedient servant,

SAMUEL WRIGHT.

Nottingham, Sept. 14th, 1838.

Experiment 1st.—Some unripe gooseberries, collected about the latter end of June, were carefully beaten to a pulp, and then acted upon by successive portions of alcohol, until everything soluble in that menstruum was removed. The several alcoholic solutions, after intermixture, were subjected to slow evaporation. When all the spirit had disappeared there remained a small quantity of sour fluid, tinged green by the colouring matter of the fruit. This liquid was diluted with five times its volume of distilled water, and after standing for some time, was filtered, to separate the colouring matter, which had wholly subsided. The clear fluid was then divided into four equal parts, and examined in the following manner:—

To the first portion was added sulphate of iron, when a dark brown colour immediately resulted, which had every appearance of malate of iron.

The second portion was treated with acetate of lead until it ceased to occasion any turbidity. When the deposition was completed, a little more water was added, and the mixture heated to ebullition. After boiling for two or three minutes the whole of the precipitate was redissolved; it was then filtered, and set aside to cool. In about an hour, the inside of the glass displayed a beautiful arrangement of minute crystals of extreme whiteness. These crystals were collected, dried on bibulous paper, diffused through distilled water, and then decomposed by sulphuric acid. The sulphate of lead was allowed to settle, and the liquid, after filtration, was tested with sulphate of iron, when the characteristic brown colour again resulted.

The third portion was tested with nitrate of silver. On the addition of this salt a darkish precipitate was obtained, soluble in boiling water, out of which it crystallised on cooling in shapeless particles that were nearly black from the reduction of oxide of silver.

The fourth part, by digestion in nitric acid, on a sand bath, and a heat of 130° , was totally converted into oxalic acid.

The residue left by the alcohol, indicating no traces of acidity, was boiled in repeated portions of distilled water, until all the soluble matter was removed. The solutions, after being mixed and concentrated, were suffered to cool, when a small quantity of bitartrate of potass was deposited, and the liquid on examination displayed all the characteristics of gum.

The matter left by the boiling water was small in quantity, soluble in liq. potassæ, and, to all appearance lignin.

Experiment 2nd.—Some gooseberries were gathered before they were fully ripe, having a bright red instead of a deep claret hue, and after due crushing were boiled in repeated portions of strong alcohol. The alcoholic solutions were intermixed, allowed spontaneously to evaporate, and the residual matter redissolved in distilled water. Acetate of lead was then added so long as any precipitate was obtained, by which means all the malic acid was thrown down. The liquid was then filtered, and set aside to evaporate. The produce of evaporation was a thick fluid, of a very sweet taste, and not disposed to crystallise: but after exposure in a vacuum, the microscope discovered an arrangement of shining particles, and I have no doubt that by careful management distinct crystals of sugar might be obtained. At all events, the experiment proves the existence of sugar in the fruit at this period of its ripening, whilst in the immature state not a particle was found. A quantity similar to that used in Experiment 1, was employed to ascertain the proportion of mucilage, and on examination there did not appear to be above half the weight. Another selection was also made, and examined as in Experiment 3, but so small a trace of alcohol was obtained, as scarcely to justify a belief in its independent existence.

Experiment 3rd.—A quantity of gooseberries was collected at the time when they appeared to be fully ripe, and after careful bruising were diluted with half their weight of distilled water, agitated, and then allowed to settle. During this time the vessel containing the fruit was immersed in water cooled down to 46° , so that no change could result from the influence of heat. Without such precaution it is obvious that the experiment would have been faulty. When the husks and denser portions had subsided, the supernatant fluid was care-

fully skimmed off, introduced into a glass vessel with a narrow neck, and then saturated with carbonate of potass. When the saturation was completed, the fluid swimming at the top was removed with a delicate pipette, and dropped upon a bit of camphor placed on a slip of glass under a magnifier. On looking through the microscope a sort of vibratory motion was discovered, the camphor rapidly dissolved, and in a few seconds the spirit had evaporated, leaving a thin lamina of camphor over the whole extent of surface previously traversed by the fluid.

Another quantity of gooseberries of the same age was collected, bruised, and submitted to distillation *in vacuo*. The distilled fluid, after saturation with carbonate of potass, furnished a liquid which dissolved camphor, burnt with a blue flame, and exhibited all the characteristics of alcohol.

These experiments I have many times repeated, and with similar results. I also examined some specimens of gooseberries at this age, to discover their proportion of sugar, and invariably found it very sensibly less than that contained in them a fortnight before. Malic acid was also present, but it was small in quantity.

Experiment 4th.—Some gooseberries that had passed the period of maturity were submitted to very careful analyses, but neither sugar nor alcohol was discovered; acetic acid and mucilage being the predominants.

These experiments appear to justify the following inferences:—1st. In the unripe state, gooseberries consist chiefly of mucilage, lignin, malic acid, and bitartrate of potash. 2nd. When they have nearly arrived at maturity, they contain an abundance of sugar, its presence being attended with a diminution in the quantity of gum, part of this substance having been converted into sugar. 3rd. When they are completely ripe, their components are more numerous than at any other time; sugar and alcohol being additional to the constituents of the unripe berries. 4th. After the period of maturity is past, their composition again becomes simple, the only appreciable matters being lignin, mucilage, and acetic acid.

Now, it will be obvious that some of these constituents are formed by vital, and some by chemical processes. When a gooseberry is first formed, it is by the exudation of a little mucilaginous fluid at the extremity of the stalk, that afterwards attaches it to the tree. Through this fluid, inspissated by warmth and air, delicate fibres ramify in all directions, proceeding from the stalk, their origin, and terminating at the opposite extremity. These fibres interlace, and supported by the mucilage, which serves at once for their matrix and sustenance, at last form a perfect boundary, by which a defence is provided, and from which a consi-

derable secretion is obtained. These fibres are lignin, the bed through which they ramify is gum. These are the only substances of which a rudimental gooseberry consists, and both are the produce of vital action.

In the next stage malic acid is formed, which is also a vegetable secretion; and, whatever may be the origin of the potass, there is no doubt of the tartaric acid being a vegetable product. As the period of maturity arrives sugar is formed. Now, when we remember that the best analyses agree in assigning nearly the same constituents to sugar as to gum, making them isomeric, we require no direct chemical action, but merely a little variation in the functions of vegetable life to render the gummy matter saccharine. A little longer and alcohol is generated. Now, though it is certain that sugar is susceptible of a ready conversion into spirit, it must be remembered that the only chemical means is by fermentation, during which action the intestine movement is great, the heat much augmented, and the escape of gas voluminous; any of which processes would be incompatible with the correct maintenance of vital function, whilst their combined influence would undoubtedly prove its destruction. The great thickness of inspissated mucilage which lines the cortex of a gooseberry, would exclude the atmosphere too completely to allow fermentation to proceed; or, admitting its possibility, such mucilaginous texture, aided by the firm covering of lignin, would never admit the escape of any gas that might be formed, and rupture would consequently always accompany ripening. Besides, as chemical action, which is always attended with disorganisation or decomposition, cannot proceed conjointly with the healthy functions of vegetable life, it follows that the alcohol must be formed by a vital and not by a chemical process.

I am further inclined to this opinion from having been unable to discover the slightest trace of alcohol in gooseberries gathered when sugar only was present, and allowed to stand in the sunshine until those which remained on the tree were distinctly impregnated with spirits, and it has only been by a considerable elevation of temperature that I have ever been able to procure spirit from such berries.

At this period, which is the state of perfect maturity, the proportion of malic acid is small, not one-third of that contained in the immature state; and I am inclined to the opinion, that it is either some change in the composition of the malic acid, or a peculiar combination formed between it and the mucilage, which will at once account for its apparent absence and the colour of the fruits. In the next stage we find different appearances and results. The vessels which carried on the circulation between the parent tree and its dependent berry are now oblite-

rated, vital action ceases in the fruit, and chemical changes supervene. The thick layer of mucilage lining the husk breaks down, and softens into a loose pulp,—the husk becomes thin and permeable, absorbs oxygen, and rapidly decomposes. It requires only a slight alteration in the constituents of the alcohol, and vinegar is formed directly. Thus, 1 eq. of the former, consisting of 4 c. + 6 h. + 20, if added to 4 eq. of oxygen, produces 1 eq. of acetic acid = 4 c. + 3 h. + 30 and 3 eq. of water. This is a change which may be explained by theory, but which is equally substantiated by experiment, for when the alcohol disappears vinegar and water invariably supply its place.

The presence of alcohol in ripe fruit is rather a remarkable circumstance, and I am not aware of its having been described before. But in the mode of investigation which I have adopted (precisely as described in this paper), I do not think that any mistake could arise, or the spirit have been a *product* instead of an *educt*. Had I employed ordinary distillation the alcohol, as long since shown by Gay-Lussac, would have been much more abundant, the greater part of it being formed *during* and not *prior* to the distillation. But by distilling *in vacuo* that inaccuracy is obviated; and by separating the alcohol without any distillation whatever, an additional proof of its existence is furnished.

I think it not improbable that future investigators will detect spirits in most fruits, and I am far from thinking that their flavour does not in some degree depend upon it; at least this idea applies to gooseberries, for when they are sweetest to the taste, the quantity of sugar which they contain is greatly less than when their flavour is not nearly so saccharine. They, however, very readily part with their spirit. Thus, when berries are first collected their flavour is exceedingly full and generous, but if allowed to stand for some time they acquire a dead and insipid taste; there is a sweetness, but the full rich flavour is gone,—the spirit has evaporated, for analysis conducted 48 hours after they have been gathered discovers none. If, again, ripe gooseberries be subjected to heat, they have a strong tendency to become acid, apparently without being previously converted into alcohol; thus, however sweet such fruit may be upon the tree, it becomes insupportably sour by baking. But if a little sugar be first added it prevents acidification, and disposes the formation of a considerable proportion of alcohol. Hence the superiority of fruit pies which are sweetened before cooking, the flavour being dependent not so much upon the sugar as the spirit to which its presence gives rise. The addition of even a trifling quantity of alcohol before baking still fur-

ther improves their flavour, for it encourages the formation of such a quantity of spirit as will sometimes indicate its presence by its effects.

CÆSAREAN SECTION AND EMBRYOTOMY.

To the Editor of THE LANCET.

SIR:—Your Journal of August 11 contains an article by Mr. Hare, recommending Dr. D. Davis's osteotomist as a substitute for the Cæsarean operation. To Mr. Hare's letter you have appended some observations tending to correct misconceptions existing in his mind, relative to the fatality of the operation, and the comparative safety with which Dr. Davis's instrument may be used.

It has never been my lot to witness the Cæsarean section, nor to be able to form an opinion of the proposed substitute, but I have seen an instrument which, judging from the result of the cases in which it has been used, would seem to offer the best prospect of superseding a severe and dangerous operation. The instrument to which I refer is one invented by M. Baudelocque, of Paris, and called by him the cephalotribe. The instrument is a forceps, with a powerful screw, by means of which the blades, after having been securely locked, are brought together with a force which crushes anything resisting their approximation. The blades are introduced in exactly the same manner as those of the forceps, and when they are fixed the handle of the screw is turned, and the child's head crushed. M. Baudelocque proposes his instrument as a substitute for the crochet and perforator, as being free from any chance of injuring the maternal structures, by splintering the bones, or by loosing their hold. In his opinion the Cæsarean operation is now no longer necessary, except when the child is alive, in which case, like the other French accoucheurs, he would not sacrifice the child, but would operate for its extraction. The distance between the blades, when closed, is but twenty lines, so that the instrument can be introduced even in cases of extreme pelvic distortion. I have seen children's heads, even after they have lived a month, crushed with the utmost facility, and thus there can be no doubt as to the power of the instrument to effect what it proposes. I have never seen any splintering whatever of the bones, or laceration of the scalp, and thus we have some guarantee for its safety. M. Baudelocque has used the cephalotribe in seven cases, and MM. Paul Dubois, Barbelle, Aîné, and Rivallié, have employed it in four others. In all these cases the Cæsarean operation had been declared absolutely necessary by men of the highest rank in obstetrics, and in all the use of the instrument saved the life of the