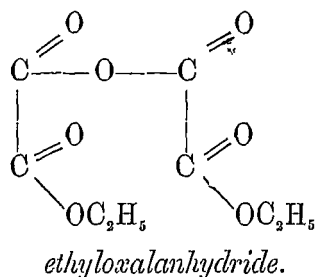


Citation:

Itallie, L. van, *Thalictrum aquilegifolium*, a hydrogen cyanide-yielding plant, in:
KNAW, Proceedings, 8 I, 1905, Amsterdam, 1905, pp. 337-339

Dr. MOL allowed ethyloxalylchloride to act with the usual precautions on the potassium salt of acid ethyloxalate covered with ether and obtained a colourless liquid which distilled at 85°—90° under a pressure of less than 1 millimetre, solidified on cooling and then melted at 4°. The results of the elementary analysis and of the determination of the molecular weight agree with what is required by the desired anhydride



as does the decomposition by water. On being heated at the ordinary pressure it is decomposed with evolution of gas.

Dr. MOL obtained this substance in a still simpler manner by acting with oxychloride of phosphorus on an excess of potassium ethyl oxalate. The investigation is being continued with other dibasic acids.

Chemistry. — "*Thalictrum aquilegifolium*, a hydrogen cyanide-yielding plant." By Dr. L. VAN ITALIE. (Communicated by Prof. P. VAN ROMBURGH).

The communications from GUIGNARD (Compt. rend. de l'Acad. des Sciences du 24 Juillet 1905) as to the presence of a hydrogen cyanide-yielding glucoside in the leaves of *Sambucus nigra* L. and other varieties of elder have induced me to continue the experiments previously made in the same direction. I have been able to confirm the observations of GUIGNARD in every particular notwithstanding the figures which I found for the HCN-content are lower than those stated by him. This may, probably, be explained by the fact that I did not test the elder leaves until the beginning of September whilst GUIGNARD made his experiments in June.

From 100 grams of fresh leaves of *Sambucus nigra* I obtained 8,3 milligrs. and from 100 grams of *Sambucus nigra* var. *laciniata* 7,7 milligrs. of HCN. No HCN was obtained from 100 grams of *Sambucus Ebulus*.

The ornamental plant *Thalictrum aquilegifolium* (which appears to

grow wild in the environs of Nijmegen) appears, however, to be comparatively rich in HCN-yielding material.

If the leaves of this Ranunculaceus are crushed and digested with water for 12 hours at 30°—36° a hydrogen cyanide-containing distillate will be obtained on distillation.

The distillate from 100 grams of fresh leaves collected on Sept. 11 in the botanical garden of the Veterinary School yielded 248,8 milligrs. of AgCN = 50,2 milligrs. of HCN = 0,05 per cent. A volumetric experiment which showed 53 milligrs. of HCN confirmed this result.

A third experiment made with leaves, kindly forwarded to me from the Botanical Gardens at Groningen, gave 0,06 per cent of HCN in the distillate obtained from the same quantity of leaves.

I failed to obtain any HCN from the root of the plant and 142 grams of the fresh stem only yielded 4,4 milligrs. of HCN.

The leaves of *Thalictrum aquilegifolium* are therefore, comparatively rich in HCN-yielding material

No HCN-containing distillate could be obtained from *Thalictrum flavum*, *Thalictrum minus* and *Thalictrum glaucum*.

Hydrogen cyanide could not be detected in the leaves in the free state. When fresh leaves were immersed in hot alcohol no HCN could be detected in the alcoholic distillate.

The hydrogen cyanide is formed during the digestion and is, therefore, most probably liberated from a glucoside by the action of an enzyme.

This enzyme is probably closely related to emulsin. I have obtained it, in an impure condition, by extracting the fresh, crushed leaves with water, and adding to the filtrate a large amount of alcohol. The precipitate so obtained was carefully dried; it very readily resolved amygdalin.

The glucoside present in *Thalictrum aquilegifolium* is not identical with amygdalin but is probably so with phaseolunatin isolated from *Phaseolus lunatus* by DUNSTAN and HENRY (Proc. Royal Soc. LXXII, 482, 1903), because in the hydrogen cyanide-containing distillate acetone can be detected, but no benzaldehyde. The presence of the former was shown from the iodoform-reaction with ammonia and tincture of iodine and the solubility of freshly precipitated mercuric oxide in the distillate.

Owing to the small quantity of leaves at my disposal it was useless to attempt the isolation of the glucoside in the pure state. I intend doing so next year, and also to watch the development of the glucoside in the plant.

I may, however, state provisionally that this glucoside is either insoluble or at most very slightly soluble in cold alcohol. When the leaves, after being dried in an airbath at 80°, and then powdered, were extracted with cold alcohol, no HCN and acetone could be obtained by enzyme-action from the alcoholic residue.

When the extracted powder after being dried was mixed with water, and then brought in contact with the enzyme, the aqueous distillate showed abundant evidence of the presence of HCN and acetone.

Utrecht, September 25, 1905.

Chemistry. — Prof. P. VAN ROMBURGH presents a communication:
“On the action of ammonia and amines on formic esters of glycols and glycerol” (II).

As the action of ammonia and amines on allyl formate (Proc. June 24 '05) had yielded such good results to me, I have also included in my research other formic esters, and I now communicate, briefly, the results obtained with the formates of some polyhydric alcohols.

If gaseous ammonia is allowed to act on the diformate of glycol it is first absorbed slowly with evolution of heat. If, when the action is over, the liquid is distilled, nothing passes over at the boiling point of the diformate (174°), but the temperature rises at once to the boiling point of glycol, and then gradually to that of formamide. A complete separation of the two substances, whose boiling point only differs about 20°, does not succeed with small quantities, and although it has been proved that the reaction takes place readily and almost quantitatively, formamide cannot be obtained pure in this way.

One gram of the diformate when mixed with 2 grams of dipropylamine gave a slow rise from 18° to 42°. The liquid being distilled the formate again seemed to have disappeared, and a fraction could be obtained at the boiling point of the glycol, and another at that of dipropylformamide.

With 1.8 gram of benzylamine, 1 gram of glycol diformate gave a slow rise from 18° to 80°. On distillation, the formate seemed to have disappeared and the glycol being distilled off, nearly the theoretical amount of benzylformamide was left in a pure condition.

If gaseous ammonia is allowed to act on the diformate of propanediol (1. 2), which I prepared by heating this glycol with formic acid, phenomena are noticed analogous to those in the case of glycol