From the seeds and leaves of Thalictrum simplex L. we have isolated the unsaturated nonphenolic base thalcimine. Analyses both of the base itself and of its nitrate indicated the empirical formula \( \text{C}_{13}\text{H}_{21}\text{O}_{4}\text{N} \). Determination of the molecular weight by the methods of Rast and Beckmann showed that the molecular formula is double the empirical formula \([1]\). The elemental analysis of the base after recrystallization from methanol corresponds to the hemihydrate \( \text{C}_{38}\text{H}_{40}\text{O}_{7}\text{N}_{2} \cdot \frac{1}{2}\text{H}_{2}\text{O} \). By the oxidation of thalcimine with potassium permanganate in acetone solution we obtained an acid, which was difficult to purify. Methylation with diazomethane gave a crystalline methyl ester, m.p. 94-95°C (from methanol) which melted without depression in admixture with dimethyl 4-methoxy-3,4'-oxydibenzoate prepared by the oxidation of hernandezine \([2]\). Hence, thalcimine belongs to the series of "bisbenzylisoquinoline" bases. By functional group determination we established the presence of one methylimine and five methoxy groups. Hydroxy, carbonyl, and methylenedioxy groups are absent. The remaining two oxygen atoms have an indifferent ether character. A test for a biphenylenedioxy link was negative (reagent: concentrated sulfuric acid containing traces of concentrated nitric acid) \([3]\). The pyrolysis of thalcimine in melted sulfur led to thiocyanic acid, which indicates the presence of a \( \text{C} = \text{N} \) group \([4]\).

Thalcimine is readily reduced by sodium borohydride and by zinc and sulfuric acid, and also catalytically over platinum, with formation of dihydrothalcimine, which gives a positive reaction for a secondary amino group \([4]\). In thin-layer chromatography (on alumina-gypsum 9:1 in chloroform-methanol 8:2) we obtained the following \( R_f \) values: thalcimine 0.86; dihydrothalcimine 0.76. Hess methylation of dihydrothalcimine gave \( \text{N} - \text{CH}_{3}\) dihydrothalcimine. On the basis of these considerations the formula of thalcimine may be developed as \( \text{C}_{32}\text{H}_{32}\text{O}_{2}(\text{N} - \text{CH}_{3})(\text{N} =)\text{OCH}_{3}\text{H}_{5} \).

The methylation of \( \text{N} - \text{methyl} \) dihydrothalcimine with methyl iodide gave a crystalline methiodide, which, when heated with methanolic potassium hydroxide, gave the corresponding des base. This des base gave a crystalline methiodide. In the second stage of the Hofmann degradation trimethylamine was isolated and a nonnitrogenous substance was formed. On catalytic hydrogenation this absorbed eight atomic proportions of hydrogen, and, after repeated crystallization from alcohol, a substance of m.p. 204-205° was obtained which melted without depression in admixture with the octahydro nonnitrogenous substance from hernandezine \([2]\). The ultraviolet and infrared spectra confirmed their complete identity (Figs. 1 and 2). Hence, thalcimine differs from hernandezine in the presence of a double bond at nitrogen in one of the rings. \( \text{N} - \text{Methyl} \) dihydrothalcimine is not identical to hernandezine, which is due to the presence in the latter of two asymmetric carbon atoms, whereas the reduction of thalcimine leads to the racemization of one of the two possible asymmetric centers.

The question of the position of the double bond was resolved by the cleavage of dihydrothalcimine with sodium in liquid ammonia. From the cleavage products we isolated a phenolic base in the form of its hydrobromide, which after repeated crystallization from alcohol melted at 260-261°. The same hydrobromide was obtained by the cleavage of thalcimine itself with sodium in liquid ammonia. Hence, in thalcimine, as well as the cleavage of ether links, the reduction of the dihydroisoquinoline nucleus occurs. The hydrobromide obtained gave a negative reaction for tertiary nitrogen \([4]\). The determination of the methylimine group by Pregl's method, both in the phenol itself and in its hydrobromide, gave negative results. By Hess methylation of the phenol we obtained its \( \text{N} - \text{methyl} \) derivative. These data indicate that the phenolic base
which we isolated is secondary and was therefore formed from part of the molecule containing the double bond, and also that the cleavage of thalcimine with sodium in liquid ammonia goes with the rupture of two oxygen bridges, whereas the cleavage of hernandezine leads to a bimolecular phenolic base. It is probable that in this case only one ether link was broken [5].

In the cleavage of bisbenzylisoquinoline bases with sodium in liquid ammonia the hydroxy group remains in the unsubstituted nucleus, because the presence of a methoxy group in the ortho position relative to the ether bridge weakens the O–C bond; by the ethylation of the phenol which we isolated with ethyl iodide in presence of sodium ethoxide we obtained the ethiodide of the O-ethyl derivative, which was converted further into the des base. By the oxidation of the latter with permanganate in acetone solution we obtained an acid, which was identified as p-ethoxybenzoic acid. Hence, the dihydroisoquinoline part of the molecule is connected to the unsubstituted benzene ring.

On the basis of these considerations we propose the structure (I) for thalcimine:

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\text{(I)}
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**EXPERIMENTAL**

Extraction of Leaves. 78 kg of air-dry leaves (collected at the blossoming stage in the Susamyr valley, KirgSSR), was moistened with 9% ammonia solution and extracted with ether. The ether extract was treated with 10% H₂SO₄. The acid extract was decomposed with 25% ammonia. Bases were extracted with ether. We obtained 662 g (0.83% on the weight of raw material) of total alkaloids. Treatment of the total alkaloids with methanol gave 290 g of a crystalline base, which was purified by recrystallization from acetone and methanol. The base (I) does not have a sharp melting point: it contracts at 137° and softens at 140-142°; [α]D²⁰ +27.45° (chloroform). Found: C 70.31; H 6.34; N 4.33; 5 (OCH₃) 22.50; N–CH₃ 2.0%; mol. wt.: 657, 658 (Rast method); 654, 632 (Beckmann method). C₃₈H₄₀O₇N₂·½H₂O. Calculated: C 70.65; H 6.39; N 4.33; 5 (OCH₃) 24.0; N–CH₃ 2.38%; mol. wt. 645.7. Thalcimine is readily soluble in ethanol, benzene, ethyl acetate, and chloroform, sparingly soluble in petroleum ether, and insoluble in water and