

ON ALKALOIDS FROM *Meconopsis napaulensis* DC.*

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From *Meconopsis napaulensis* DC. protopine, magnoflorine, cryptopine and coptisine were isolated and the presence of allocryptopine, rhoeadine, papaverrubines E, D and two others, a norharmane alkaloid $C_{13}H_{16}N_2O$, corysamine and several non-identified alkaloids was proved. Further a yellow non-basic substance of the composition $C_{23}H_{17}NO_8$ was also isolated.

The *Meconopsis napaulensis* DC. species from *Robustae* PRAIN section is a monocarpic plant growing in high mountain regions of the central and eastern part of the Himalayas. No data on the alkaloids from this species are available in literature so far. In this paper the results are given on the study of the alkaloids from plants cultivated under our climatic conditions. The overground part and the root have a very low content of alkaloids (0.011% and 0.020%, resp.), similarly as observed in other Himalayan monocarpic *Meconopsis* species^{1,2}. From the overground part protopine was isolated as the main alkaloid, while the main alkaloid component in the root was magnoflorine. Otherwise no substantial differences were observed among the alkaloids from the overground part and those from root. Small amounts of cryptopine were isolated from the fraction of tertiary alkaloids in addition to protopine, and the presence of allocryptopine, a small amount of rhoeadine, papaverrubine E (N-demethylrhoeadine), and three phenolic papaverrubines was proved by thin-layer chromatography, of which one was identified as porphyroxine (papaverrubine D). The presence of rhoeadine and papaverrubines — which so far have been found in all species of *Meconopsis* genus investigated² — indicates a biochemical relatedness of this species to the botanically closely related *Papaver* genus. Further, the presence of two additional alkaloids was shown in the fraction of tertiary bases. These two alkaloids have also been found in several other species of the *Meconopsis* genus (see²). One of them, of the composition $C_{13}H_{16}N_2O$, was isolated by us in crystalline form from the *M. rudis* PRAIN species. According to preliminary structural studies² it should be assigned the structure of N-methyltetrahydronorharmane with the methoxy group on the aromatic ring.* Coptisine was isolated from the fraction

* Part LXIII in the series Alkaloids of the *Papaveraceae*; Part LXII: This Journal 41, 2429 (1976).

* See note added in proof.

of quaternary protoberberines in the form of chloride, and in addition to an unidentified alkaloid a trace amount of corysamine was also found. As a further component of the plant an intensively yellow non-basic substance of the composition $C_{23}H_{17}NO_8$ was isolated which is evidently the cause of the yellow coloration of the latex of the root. In the overground part it is present in a negligible amount only.

EXPERIMENTAL

The melting points were determined on a Kofler block and they were not corrected. For thin-layer chromatography silica gel G Merck with gypsum (5 : 1) and the solvent systems cyclohexane-diethylamine 9 : 1 (S_1), cyclohexane-chloroform-diethylamine 7 : 2 : 1 (S_2), ethanol-water-25% ammonia 15 : 9 : 1 (S_3), methanol-water-25% ammonia 15 : 3 : 1 (S_4), 1-propanol-water-85% formic acid 12 : 7 : 1 (S_5) were used, as well as Silufol UV 254 plates (Kavalier) and the system methanol-diethylamine 4 : 1 (S_6). Paper chromatographies were carried out in descending manner on Whatman No 1 paper using the system 1-butanol-acetic acid-water 10 : 1 : 3 (S_7) and ethanol-water 3 : 2 (S_8) for development. Papaverrubines were detected with hydrochloric acid fumes for 20 minutes (formation of purple spots), while the detection of quaternary protoberberines was carried out under UV light. The spots of other alkaloids were detected with potassium iodoplatinate or with Dragendorff's reagent.

Extraction and Isolation of Alkaloids

The plants were cultivated in the Experimental Botanical Garden, Medical Faculty, Brno from seeds obtained from various European botanical gardens, sown in 1966. Only flowering samples, at the stage of flowers and unripe fruits, were harvested gradually over the years 1968 to 1973, at the end of June and the beginning of July. The overground parts and the roots were separated, dried at room temperature and worked up separately, in principle in the same manner (in the text first the yields from the overground part are given, and then the yields from the root). Dry, ground plant material (1080 g of overground parts and 294 g of roots) was extracted with methanol in a Soxhlet extractor. After evaporation of methanol by distillation the extract was treated with 1% acetic acid and filtered. In order to prevent the decomposition of alkaloids sensitive to mineral acids, all operations were carried out with acetic acid (maximum 5%) in the cold. The alkaloid fractions *A*, *B*, *E* and *I* were obtained in the usual manner^{3,4}.

The crude bases of the fraction *A* (0.42 g and 0.16 g, resp.) were separated to fractions *AC* (using the method described in ref.⁵, for example), *AD*₁ and *AD*₂ (see³). The bases from fraction *AC* (50.6 mg and 20.2 mg, resp.) were amorphous and they contained a higher amount of non-alkaloidal substances. Using thin-layer chromatography (in systems S_1 and S_2 , resp.) the presence of protopine (R_F 0.40 and 0.73), cryptopine (R_F 0.21 and 0.68), allocryptopine (R_F 0.25 and 0.63), a small amount of rhoeadine (R_F 0.58 and 0.81), and two further unidentified alkaloids was proved in addition to papaverrubines. Fractions *AD*₁ (42.1 mg or 20.6 mg) when crystallized from ether gave protopine (18.4 mg or 2.6 mg; 0.0017% or 0.0009%, resp.), m.p. 203–204°C from chloroform-methanol, and cryptopine (6.0 mg or 1.6 mg; 0.0006% or 0.0005%, resp.), m.p. 216–217°C from chloroform-methanol. In both instances the identity was confirmed by mixed melting points with authentic samples, R_F values and characteristic colour reactions. In the amorphous residue allocryptopine, alkaloid $C_{13}H_{16}N_2O$ (R_F 0.05 and 0.10; in the root only), and a further alkaloid (R_F 0.11 and 0.20), also found in several other *Mecconopsis* species², were proved by thin-layer chromatography (in S_1 and S_2 , resp.) in addition to both

mentioned alkaloids. The two last unidentified alkaloids gave a characteristic violet spot after detection with potassium iodoplatinate. Fraction AD_2 (30.0 mg or 18.9 mg, resp.) remained amorphous. In addition to a small amount of papaverrubines and a trace of protopine it mainly contained non-alkaloidal substances.

Papaverrubines. Fractions AC and AD_2 when heated with 3.5% hydrochloric acid gave a strongly positive reaction for papaverrubines (purple coloration). Using thin-layer chromatography in S_1 and S_2 the presence of porphyroxine (R_F 0.07 and 0.29, resp.) and an unidentified papaverrubine (R_F 0.13 and 0.41), in addition to a small amount of papaverrubine E (R_F 0.37 and 0.67; in roots only) and another papaverrubine (R_F 0.15 in S_2), was proved in fraction AC on comparison with authentic samples. The same papaverrubines (except for the non-phenolic papaverrubine E) were also detected in fraction AD_2 .

In fraction B (21.4 mg or 7.8 mg, resp.) the presence of coptisine (R_F 0.50, 0.49 and 0.07 in S_6 , S_7 and S_8 , resp.; golden-yellow fluorescence), an unidentified alkaloid (R_F 0.36, 0.55 and 0.17, resp.; golden-yellow fluorescence) and a small amount of corysamine (R_F 0.09, 0.73 and 0.66, resp.; green-yellow fluorescence) was proved. Crystallization of fraction B from dilute hydrochloric acid gave 1.5 mg of a mixture of coptisine chloride and an unidentified alkaloid (from the overground part), or 1.0 mg of chromatographically pure coptisine chloride (from the root).

Fraction E (0.25 g or 0.03 g, resp.) was practically non-alkaloidal. Fraction I from the overground part was also predominantly composed of non-alkaloidal substances. Among the alkaloids only trace amounts of magnoflorine were detected. Fraction I from the root gave on crystallization from methanol 6.5 mg of magnoflorine iodide, and from the residue after conversion to perchlorates 7.8 mg magnoflorine perchlorate were obtained by crystallization from methanol (total yield of magnoflorine calculated as perchlorate, was 0.0048% of the root). Magnoflorine iodide (from methanol) had m.p. 262–263°C, perchlorate (from methanol) had m.p. 280 to 282°C, in both instances undepressed in admixture with authentic specimens, R_F values 0.64 (S_3), 0.54 (S_4) and 0.48 (S_5) are the same as in the case of the authentic sample. In addition to a residue of magnoflorine the presence of two additional alkaloids of R_F values 0.27 and 0.55 (S_3), 0.11 and 0.43 (S_4), and 0.58 and 0.70 (S_5) was proved in the mother liquors.

The yellow non-basic substance of the composition $C_{23}H_{17}NO_8$ (by mass spectrometry, see²) was separated as an insoluble residue from the crude fractions A and B during their dissolution in 1% acetic acid. After crystallization from a large volume of chloroform–methanol it formed small yellow crystals (4.2 mg or 19.0 mg; 0.0004% or 0.0065%, resp.), m.p. 293–295°C, poorly soluble in chloroform, methanol and acetone, even when boiled, insoluble in water, dilute acids and alkali hydroxides.

REFERENCES

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Note added in proof: The mentioned alkaloid $C_{13}H_{16}N_2O$, m.p. $216^{\circ}C$, has now been (see²) identified as 2-methyl-6-methoxy-1,2,3,4-tetrahydro- β -carboline by comparison with a synthetically prepared sample (Shannon P. V. R., Leyshon W. M.: *J. Chem. Soc. (C)* 1971, 2837).