

CHEMICAL EXAMINATION OF PLANT INSECTICIDES

Part IV. *Derris cuneifolia*

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Derris cuneifolia belongs to the section 'Euderris' to which *D. elliptica* and *D. ferruginea* belong. It is a robust climber with showy flowers and occurs in the eastern Himalayas, Nepal, Sikkim and Sylhet. The only earlier report on this species was from the Forest Research Institute, Dehra Dun, wherein it was stated that the roots contained less than 0.1% of rotenone.¹

When the roots were tested directly by the Durham test, they did not give any indication for the presence of rotenoids. Detailed chemical examination was carried out on lines similar to those adopted for the other species of *Derris*.² From the various fractions, only one substance, now named 'cuneifolin', could be isolated. Rotenone was not obtained at any stage.

Cuneifolin is a pale yellow, crystalline substance melting at 180–81° and is only feebly toxic to fish.³ It did not give the rotenoid colour reaction, nor did it give any test for flavones. From a consideration of analytical data and molecular weight, the molecular formula $C_{24}H_{24}O_5$ could be assigned to it. It was exceptional even amongst non-rotenoids isolated from leguminous plants in that it contained no methoxyl groups in spite of the high percentage of oxygen. Regarding the presence of hydroxyl groups it was neither soluble in alkali, nor did it give any ferric chloride colour indicating the absence of phenolic hydroxyl groups. This was supported by the fact that it did not give any methyl ether. However an acetate melting at 83–85° could be obtained, thereby indicating the presence of alcoholic groups. The analytical results agree with the mono-acetate. The substance however gave definite tests for a carbonyl group and yielded a dinitrophenyl-hydrazone. By hydrolysis with zinc and alkali, it formed a degradation product melting at 284° (charring) and exhibiting phenolic properties. Detailed study of this could not be done for lack of material.

EXPERIMENTAL

The roots of *D. cuneifolia* (450 g.) were powdered and extracted twice with ether in the cold. The solvent was completely removed and the residue (7.2 g.) repeatedly treated with petroleum-ether. The object of this treatment was to remove any fatty material present, but on concentrating the petroleum-ether washings, a crystalline solid (A) melting at 175–78° was deposited from it.

The resin left after washing with petroleum-ether was taken in a small amount of ether and set aside. From this a crystalline solid resembling (A) in melting point and other reactions separated and was filtered.

The filtrate was then extracted with 5% aqueous potassium hydroxide and the alkali-solubles were precipitated, taken in methyl alcohol and kept in an ice-chest. But no crystalline component separated from this. The alkali-insoluble ether solution after concentration deposited some more of the solid (A). The remaining portion of the neutral resin was taken in carbon tetrachloride and kept in the ice chest with a view to see whether any crystalline substance would separate. But none separated. Treatment with methyl alcoholic alkali also did not give any fruitful results.

The dried marc left behind after ether extraction was extracted with chloroform. The extract was small in amount. On treatment with ether, it yielded a crystalline component identical with the above (A). The total yield of the substance (A) was 1.0 gram.

Properties of the substance (A) (Cuneifolin)

After repeated crystallisations from acetone, it melted at 180–81°. It was pale yellow in colour and appeared under the microscope as hexagonal plates. The crystals were homogeneous and appeared to belong to one substance. Toxicity experiments were carried out with the substance using fish as test animals. In a concentration of 60 mg. per litre it produced definite toxic symptoms in fish (turning upside down) in 30 mins. In the Durham test it gave an orange colour with nitric acid but no blue or green colour with ammonia. It was soluble neither in alkali, nor in acid and it did not give any colour with ferric chloride. The substance was heated with gallic acid and sulphuric acid but no blue colour was obtained, thereby indicating the absence of a methylenedioxy group. By reduction with magnesium and hydrochloric acid no pink colour was formed. [Found: C, 73.5; H, 6.1; OCH₃, nil; molecular weight (Rast): 400; C₂₄H₂₄O₅ requires C, 73.5; H, 6.1%; molecular weight 392.]

Acetate.—Cuneifolin (0.1 g.) was boiled with acetic anhydride and a drop of pyridine for one hour. The acetate separated out on pouring the mixture into water; it was recrystallised from ethyl acetate and ethyl acetate-petroleum ether mixture. It was obtained as a colourless crystalline powder melting at 85–86°. [Found: C, 72.0; H, 5.8; $C_{24}H_{23}O_4$ (O.CO.CH₃) requires C, 71.9; H, 6.0%.]

The 2:4 di-nitro-phenyl-hydrazone was obtained as a deep orange-red solid. It crystallised from methyl alcohol in the form of rhombohedral plates melting at 226–27°. [Found: C, 62.1; H, 5.0; $C_{24}H_{24}O_4$ [:N.NH.C₆H₃(NO₂)₂] requires C, 62.9; H, 4.9%.]

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SUMMARY

Detailed chemical examination of the roots of *Derris cuneifolia* has been carried out. No rotenone could be obtained but a new crystalline compound could be isolated and is named 'Cuneifolin'. It has the molecular formula $C_{24}H_{24}O_5$ and contains an alcoholic hydroxyl group and a ketonic group.

REFERENCES

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