These data suggested that the compound might be the dihydro-derivative of 9,10-dihydroxy-$\Delta^{6a(10a)}$-tetrahydrocannabinol. Assuming that the stereochemistry at C 6a and C 10a is the same as in the naturally occurring Δ^9-THC, four stereoisomers should be considered.

Synthesis of these isomers showed that (−) (6aR, 9S, 10S, 10aR)-9,10-dihydroxy-hexahydrocannabinol was identical (^{1}HNMR, IR, MS, UV, R_f, [α]) with the isolated compound. The synthesis of **I** was accomplished by epoxidation of (−) (6aR, 10aR)-Δ^9-THC-acetate followed by alkaline hydrolysis and isolation by repeated chromatography of the reaction mixture. This is the first report of the isolation of (−) (6aR, 9S, 10S, 10aR)-9,10-dihydroxy-hexahydrocannabinol from *Cannabis* which we named cannabiripsol.

Due to the stereochemistry of cannabiripsol and other cannabinoids such as Δ^9-THC the 'activity' of cannabiripsol should more nearly mimic that of Δ^9-THC type cannabinoids than that of other dihydroxylated cannabinoids. The pharmacological profile of cannabiripsol is currently being investigated.

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(−)-Maalian-5-ol, a new enantiomeric sesquiterpenoid from the liverwort *Plagiochila ovalifolia*

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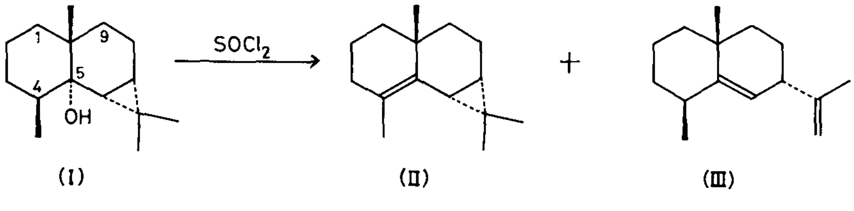
Summary. A new enantiomeric sesquiterpene alcohol named (−)-maalian-5-ol was isolated from the liverwort, and the structure and absolute configuration was determined to be the stereostructure **I** by chemical and spectral evidence.

In the course of our investigation on terpenoids from the liverworts (Hepaticae), which form a unique group in the plant kingdom, several enantiomeric sesquiterpenoids[2] being antipodes to the normal ones from vascular plants were isolated along with several novel carbon skeletal sesquiterpenoids[3]. The present communication deals with the isolation and the structure determination of an additional new enantiomeric sesquiterpene alcohol, named (−)-maalian-5-ol, from the leafy liverwort, *Plagiochila ovalifolia* Mitt. belonging to the Plagiochilaceae in the Jungermannineae.

The liverwort (860 g), collected at Kuju in Kyushu and dried in the shade for a few days, was digested with methanol. The methanol solution, after being concentrated in vacuo, was then extracted with ether and the solvent was distilled out at reduced pressure to afford a viscous matter (10.2 g). Part of the extract (6.8 g) was chromatographed over silica gel with a mixed solvent of chloroform and ether (v/v, 5:1) to isolate the new sesquiterpene alcohol (150 mg) as a major constituent. Spectroscopic evidence showed that the compound, $C_{15}H_{24}O$ (M^+ 222.1990), $[\alpha]_D$ +106° (c 2.5, $CHCl_3$), was a saturated tricyclic sesquiterpene alcohol containing a cyclopropane ring [δ_{CDCl_3} 0.4–0.8 (2H, complex)] together with a tertiary hydroxyl group [ν_{CCl_4} 3625 and 3500 cm^{-1}; no signal between δ 3.0 and 4.5], a secondary methyl [δ 0.93 (3H, d, J=7.5)] and 3 tertiary methyls [δ 1.00, 1.05 and 1.10 (each 3H, s)]. This structure was supported by the off-resonance ^{13}C-NMR spectrum which showed 3 singlets (δ 17.6, 36.4 and 75.0), 3 doublets (δ 20.4, 32.9 and 34.1), 5 triplets (δ 16.9, 21.6, 30.0, 31.0 and 37.0) and 4 quartets (δ 16.5, 16.5, 23.4 and 31.0). The alcohol (120 mg) was dehydrated with $SOCl_2$ in pyridine to yield 2 kinds of hydrocarbons, which were, respectively, isolated as a less polar (40 mg) and a more polar (40 mg) product by means of preparative TLC over silica gel using hexane as a solvent. The spectral properties of the former (**II**), $C_{15}H_{24}$ (M^+ 204); ν_{CCl_4} 1230, 1140, 1070, 973 and 953 cm^{-1}; δ_{CDCl_3} 0.83, 0.99 and 1.09 (each 3H, s), 1.57 (3H, br.s), coincided with those of (−)-β-maaliene reported by Büchi et al.[4], and the latter (**III**), $C_{15}H_{24}$ (M^+ 204); ν_{CCl_4} 3060, 1650, 1210, 985, 955, 900 and 885 cm^{-1}; δ_{CDCl_3} 1.15 (3H, d, J=8.0), 1.14 (3H, s), 4.65 and 4.78 (each 1H, br.s), 5.20 (1H, d, J=4.0), did with those of (+)-selina-5,11-diene[4]. However, the optical rotations of both the sesquiterpene hydrocarbons (**II**, $[\alpha]_D$ +129° and **III**, $[\alpha]_D$ −145°) derived from



(I) (II) (III)

(−)-maalian-5-ol (**I**) gave opposite sign compared with the values ($[\alpha]_D$ −138° and $[\alpha]_D$ +149°) of the known compounds[4].

Accordingly, it was certain that the alcohol consists of the structure and absolute configuration, excluding the tertiary hydroxyl group on C-5, as shown in the stereostructure **I**.

Next, the configuration of the hydroxyl group was elucidated by examination of the solvent effect on ^{1}H-NMR spectra to be trans to both the methyls on C-4 and C-10: when the ^{1}H-NMR spectra of the alcohol (**I**) were measured in $CDCl_3$ and C_5D_5N solutions, the C-4 secondary methyl (Δ 0.04) and the C-10 tertiary methyl (Δ 0.02) exhibited no solvent shift due to vicinal deshielding of the C-5 hydroxyl group[5].

On the basis of the above chemical and spectroscopic evidence, the structure and absolute configuration of the sesquiterpene alcohol, (−)-maalian-5-ol, was determined to be shown by the stereostructure **I**. This may be biosynthesized from trans-farnesyl pyrophosphate via (−)-bicyclogermacrene which has been isolated as a common component in the liverworts[6]. We were interested in such occurrence of the enantiomeric sesquiterpenoids in the liverworts with respect to a chemotaxonomy of the plants and a biogenesis of the compounds.

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Biochemical compartmentation of fish tissues. II. Nonspecific phosphomonoesterases in brain

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Summary. The specific activities of acid and alkaline phosphatases in different regions of the brain of 9 nutritionally important fishes were worked out. The region consisting of pituitary, hypothalamus and thalamus showed the highest acid and alkaline phosphatase activities. Least activities of both the enzymes were found in the cerebellum and medulla oblongata. The piscivorous fishes contain the highest acid and alkaline phosphatase activity followed by cat fishes and major carps. The distributional pattern of these 2 enzymes in 4 regions of the brain of 9 fishes is the same.

Recently, studies in the biochemical aspect of animal tissues has been encouraged for a better insight into biochemical organisation[2-4]. Much attention has been paid in the past to the mammalian brain with regard to key enzymes like glutamate de-carboxylase, choline acetyl, transferase, glucose-6-phosphatase, fructose 1, 6-diphosphatase, important neurotransmitters like catecholamines, energetic substances like adenine-nucleotides, glycogen, glucose, lactate and pyruvate[5-10]. However, the compartmentation of the brain in fishes has to be investigated. It is known that various parts of the brain differ in their biochemical make-up following distinct phylogenetic ages.

Although acid and alkaline phosphatases are widely distributed in animal tissues, they are mainly concerned with the reabsorbtion of glucose molecules in renal tissue, to conduct an active glycolytic mechanism in liver, dephosphorylation of glucoesters in sex organs, active involvement in protein synthesis, association with the secretory activity and absorption of nutrients in digestive system, phosphate cycles and growth[11-13]. However, the functional significance of these phosphatases in various regions of the brain is still to be completely known. If we want to understand fully the complex functions of the brain as a central, controlling, regulating and co-ordinating organ for sensory and memory functions, it is essential to know the levels of the nonspecific phosphomonoesterases in different regions of brain, because of the close relation between brain metabolism and neuronal activity[14].

The functional significance of alkaline phosphatase (orthophosphoric monoester phosphohydrolase EC 3.1.3.1) in brain is supposedly involved in various secretory and transport processes and in blood-brain barrier mechanisms[14]. The acid phosphatase (orthophosphoric monoester phosphohydrolase EC 3.1.3.2) is implied again in the secretary processes and in the intracellular transport mechanisms. Such non-specific phosphomonoesterases are also involved in transphosphorylation[3]. The main aim of the present investigation is to study the differential distribution and functional role of these phosphatases in 4 regions of the brain i.e. cerebrum, cerebellum, the region consisting of pituitary, hypothalamus and thalamus and medulla oblongata of 9 nutritionally and economically important fishes i.e. *Labeo rohita* (Ham), *Cirrihina mrigala* (Ham), *Catla catla* (Ham) (herbivorous and soft fishes), *Channa punctatus* (Bloch), *Channa marulius* (Ham), *Channa striatus* (Bloch) (hard and piscivorous) and *Clarias batrachus* (Linn), *Heteropneustes follilis* Bloch and *Mystus seenghala* (sykes) (hard and carnivorous). This is a first