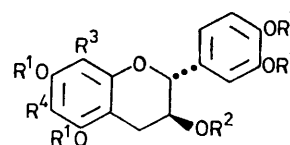


## X-Ray Structure, Conformation, and Absolute Configuration of 8-Bromotetra-*O*-methyl-(+)-catechin

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**Summary** The X-ray structure of 8-bromotetra-*O*-methyl-(+)-catechin confirms the substitution position of the bromine atom and the 2*R*,3*S* absolute configuration of the parent compound (+)-catechin; in the heterocyclic ring both the heteroatom and C-4 are marginally above the mean plane of the adjoining benzene ring, and its conformation is midway between half-chair and sofa arrangements.



- (1)  $R^1 = R^2 = R^3 = R^4 = H$
- (2)  $R^1 = Me, R^2 = R^3 = R^4 = H$
- (3)  $R^1 = Me, R^2 = R^4 = H, R^3 = Br$
- (4)  $R^1 = Me, R^2 = PhCH_2, R^3 = Br, R^4 = H$
- (5)  $R^1 = Me, R^2 = PhCH_2, R^3 = H, R^4 = Br$

BROMINATION of tetra-*O*-methyl-(+)-catechin (**2**) was presumed by Weinges *et al.*<sup>1</sup> to occur at C-8 on the premise that it represents a more reactive nucleophilic centre than C-6 and is sterically less hindered. Weinges<sup>1</sup> used an 8-bromo derivative (**4**) for the synthesis of 4,8-linked biflavonoids *via* the 8-lithio intermediate. Considering that (+)-catechin (**1**) units constitute the 'lower' terminal units of most biflavonoids present in commercially important wattle ('Mimosa')<sup>2</sup> and quebracho<sup>3</sup> extracts, and in other condensed tannins,<sup>4</sup> and that their point of linkage (either 4,6 or 4,8) to the mono- or polyflavonoid residues is still a matter of conjecture, an unambiguous basis is required for their synthesis by similar means from 8- (**4**) and 6-bromo-3-*O*-benzyltetra-*O*-methyl-(+)-catechin (**5**),<sup>5</sup> or for their differentiation through the chemical shifts of residual 6- or 8-protons.<sup>6</sup> Assignments of the relative and absolute configuration of (+)-catechin have hitherto been based on chemical,<sup>7</sup> n.m.r.,<sup>8</sup> and optical rotation data,<sup>7</sup> and attempted definition of the conformation of the heterocyclic ring could draw no distinction between the sofa and half-chair arrangements<sup>8</sup> when in solution.

The 8-bromo derivative (**3**), m.p. 172–174 °C, was prepared by direct bromination of tetra-*O*-methyl-(+)-

catechin (**2**) with 1 mol. equiv. of pyridinium hydrobromide perbromide in 95% ethanol from which it crystallizes. Suitable crystals were formed by crystallization from dibutyl ether at ambient temperatures. The resultant product,  $C_{19}H_{21}BrO_6$  (**3**), was orthorhombic, space group  $P2_12_12_1$ , with  $a = 28.679(20)$ ,  $b = 12.967(10)$ ,  $c = 5.053(10)$  Å,  $D_m = 1.499$ ,  $D_c = 1.503$  g cm<sup>-3</sup>,  $Z = 4$ . Intensities of 1071 independent reflections were measured on a Philips 1100 X-ray diffractometer using graphite-monochromated Mo- $K_\alpha$  ( $\lambda = 0.7017$  Å) radiation. The structure was solved by the heavy atom method using successive Fourier syntheses and refined anisotropically by least squares to a residual  $R$  of 0.046.† Hydrogen atoms were included in the calculation at expected positions, but not refined. The absolute configuration was determined by comparing  $R$ -values for the two enantiomeric structures, at an early stage of the refinement, yielding  $R$ -values of 0.102 and 0.112. The structure corresponding to the higher  $R$ -value may be rejected at high (> 99.9%) significance.<sup>9</sup>

† The atomic co-ordinates for this work are available on request from the Director of the Cambridge Crystallographic Data Centre, University Chemical Laboratory, Lensfield Road, Cambridge CB2 1EW. Any request should be accompanied by the full literature citation for this communication.

