S. sowerbeii), and "New Zealand, Colenso". Two large distorted specimens ex "Guntawang, N.S.W., Hamilton" and "Mt. Napier, Vic., 1883" were filed by Cooke under *Thelephora radians*. Under *Stereum thozetii* Cooke placed "Gippsland, Vic.". Under *S. obliquum* he filed a collection ex "N.Z., Wairarapa, Dry River, T. Kirk, No. 140".

In literature the specific name is often spelled *S. sowerbeyi*.

spadiceum, Stereum (Pers.) Fr. Of the two collections under this cover from the region "Tasmania, W. Archer" is of *S. lobatum*, "Western Port, F.v.M., June 1853" is an imperfect specimen of *S. rameale*.

sparsum, Corticium Berk. & Br. Under this cover at Kew is a collection ex "N.Z., T. Kirk, No. 318, on dead mahoe bark" which are specimens of the conidial stage of *Nectria otagensis*.

100. SPARSUS, ALEURODISCUS (Berk.) Hoehn. & Litsch., *K. Akad. Wiss., Wien, Sitz.*, 116, 1907: 809.

sparsum, Stereum Berk., *Jour. Linn. Soc.*, 13, 1873: 169.

The type collection, ex "Wangaretta, Vic., Aus.", consisting of eight small and irregular colonies, is the only collection at Kew.

101. SPHAEROSPORUM, CORTICIUM (Maire) Bourd. & Galz., *Hym. Fr.*, 1928: 232.

sphaerosporus, Hypochnus Maire, *Bull. Soc. Myc. Fr.*, 21, 1905: 164.

One collection, ex "Australia, S.53" was filed by Berkeley under *Corticium arachnoideum*.

spiniferum, Stereum Lloyd = Stereum illudens.

spongiosa, Cladoderris Fr. = Cladoderris dendritica.

sprucei, Stereum Berk. & Curt. = Stereum lobatum.

spumeum, Corticium Berk. & Rav. One collection ex "N.Z., Colenso, b.948" so labelled by Cooke but filed by him under *Stereum ochroleucum* is of *Corticium evolvens*.

stereoides, Thelephora Cke. & Mass. = Stereum hispidulum.

stipitatum, Hydnum Fr. Neither collection from the region placed under this cover at Kew is of this species. "Victoria, Dr. Winter, No. 5" possesses gloeocystidia, and "Richmond River, N.S.W." has small obovate spores.

strigosa, Hymenochaete Berk. & Br. = Hymenochaete villosa.

102. SUBCERACEA, MYCOACIA (Wakef.) nov. comb.

subceracea, Acia Wakef., *Trans. Proc. Roy. Soc. S. Aust.*, 1930: 155.

Collections at Kew are the type ex "Mt. Lofty, J. B. Cleland, June 1927", "Mt. Lofty, S. Aus., J. B. Cleland, May 1928", "National Park, S. Aus., J. B. Cleland, Apl. 1924, May 1925" and "N.Z., Colenso, No. 1075" the last filed by Cooke under *Hydnum mucidum*.

103. SUBFASCICULARIA, ODONTIA (Wakef.) nov. comb.

subfascicularia, Acia Wakef., *Trans. Proc. Roy. Soc. S. Aust.*, 1930: 155.

The type is at Kew ex "Mt. Lofty, S. Aus., J. B. Cleland, May 1928, W".

subporiferum, Stereum Berk. in herb. Kew. The name was given in the herbarium to a specimen ex "Chatham Islands, Travers, No. 7" which on examination was found to be a *Peniophora*.

sulfureum, Corticium Fr. Under the cover are two collections from the region, both wrongly named. "Tasmania' is a specimen of *Peniophora filamentosa*, and "b.507" (which is obviously from New Zealand as the label is in Colenso's handwriting) is of *Coniophora arida*.

sulphuratum, Stereum Berk. & Rav. Under this cover, which is labelled *S. sulfuratum* Fr., Cooke placed two Australian collections, ex "Clarendon, S. Aus., Tepper, No. 582" and "Port Phillip, Vic., No. 310". Both are of *Stereum vellereum*.

sulphureum, Stereum Fr. A collection from Australia so named by Cooke, ex "Toowoomba, Q., Hartmann, 1882" consists of three fragments of an *Aleurodiscus*.

104. SULPHURELLA, CORTICIUM Cke. & Mass., *Grev.*, 20, 1891: 35.

The type at Kew is ex "Oakleigh, Vic., Mrs. Martin, No. 925".

105. SURINAMENSE, STEREUM Lev., *Ann. Sci. Nat.*, Ser. III, 2, 1844: 209.

Though the species is common in New Zealand there are no collections from the region in Kew herbarium.

106. TABACINA, HYMENOCHAETE (Sow.) Lev., *Ann. Sci. Nat.*, Ser. III, 5, 1846: 152.

tabacina, Thelephora (Sow.) Fr., *Syst. Myc.*, 1, 1821: 437.

tabacinum, Stereum (Sow.) Fr., *Epicrisis*, 1838: 550.

Only one authentic collection from the region is at Kew, ex "Mamaku, N.Z., W. N. Cheesman, 1914", identified by Miss Wakefield. A second filed under the cover by Cooke, ex "Walcha, New England, N.S.W., Crawford" is of *Hymenochaete villosa.*

107. TABACINA, VELUTICEPS (Cke.) Burt, *Ann. Mo. Bot. Gard.*, 6, 1919: 261.

tabacinus, Aleurodiscus Cke., *Grev.*, 14, 1885: 11.

The type collection is ex "Moona, Walcha, N.S.W., A. R. Crawford, Feb. 1885". A second collection, filed by Cooke under *Hydnum delicatulum*, is ex "Darling Downs, Q., No. 1095".

tabacinum, Hydnum Cke. = Hydnum crinale.

108. TASMANICA, HYMENOCHAETE Mass., *Jour. Linn. Soc.*, 27, 1890: 105.

Though in his description Massee stated that the type collection was from New Zealand, on the sheet the type specimen is labelled "Tasmania, herb. Berkeley" in his handwriting. Other collections under the cover are ex "National Park, Adelaide, S. Aus., W. N. Cheesman, 1914" and "Tasmania, L. Rodway, No. 688".

109. TENUISSIMA, HYMENOCHAETE Berk., *Jour. Linn. Soc.*, 14, 1875: 67.

tenuissimum, Stereum Berk., *Lond. Jour. Bot.*, 6, 1847: 510.

Under the cover are three collections from the region, ex "Tweed River, N.S.W., Camara", "Toowoomba, Q., Hartmann" and "N.Z., Colenso, b.391". The last was placed by Cooke under *H. rhabarbarina* and on the sheet referred by Bresadola to *H. rheicolor.*

tephra, Peniophora (Berk. & Curt.) Cke. Two collections from the region under the cover at Kew, ex "Australia, S.43, S.48" are not of this species but may be of *P. vinosa.*

110. TERRESTRIS, THELEPHORA (Ehrh.) Fr., *Syst. Myc.*, 1, 1821: 431.

laciniata, Thelephora (Pers.) Fr., *Syst. Myc.*, 1, 1821: 431.

Three collections from the region are at Kew, ex "Port Phillip, Vic., 1886", "Sydney, N.S.W., Miss Scott", placed under *Thelephora intybacea* by Cooke, and "Ashburton, N.Z., W. W. Smith, Nov. 1897" which Massee filed under *Thelephora vaga.*

terreum, Corticium Berk., *Fl. N.Z.*, 2, 1855: 184. The type collection, ex "N.Z., Ruamahanga, Colenso, on bark of Knightia excelsa" is a species of *Septobasidium* commonly on living bark of this host.

111. THOZETII, STEREUM Berk., *Jour. Linn. Soc.*, 18, 1881: 385.

The type, ex "Rockhampton, Q." consists of three specimens in good condition. One other collection, ex "Australia, R. Brown", is filed under *S. nitidulum.* Of the other collections placed under the cover "Endeavour River, Q." and "New Guinea, Armit" are of *Stereum elegans*; "Gippsland, Vic." consists of two species, *S. elegans* and *S. sowerbeii*; and "W. Australia, Thos. Muir" is too imperfect to identify.

112. TOTARA, CYPHELLA G. H. Cunn.

Common on living and dead trunks and branches of *Podocarpus totara* in New Zealand, the species is represented at Kew by one collection ex "Buller Valley, T. Kirk, No. 236" filed under *C. cupulaeformis.* A description is being published elsewhere.

113. TRISTRICULA, DUPORTELLA (Berk. & Br.) Reinking, *Philippine Jour. Sci.*, 17, 1920: 364.

tristriculum, Corticium Berk. & Br., *Jour. Linn. Soc.*, 14, 1875: 71.

tristiuscula, Hymenochaete (Berk. & Br.) Mass., *Jour. Linn. Soc.*, 27, 1890: 111.

castanea, *Hymenochaete* Wakef., *Kew Bull. Misc. Inf.*, 1914: 260.
velutina, *Duportella* Pat., *Philippine Jour. Sci.*, 10, 1915: 87.
velutina, *Hymenochaete* (Pat.) Lloyd, *Myc. Notes*, No. 63, 1920: 966.

Australian collections which match the type from Ceylon are "Cape Direction, Q., D. Thomson" and "Toowoomba, Q., Hartmann". The latter was placed by Cooke under the cover of *Hymenochaete insularis*.

udum, Hydnum Fr. One collection placed under the cover by Berkeley, ex "Tasmania, Archer" is not of this species but being sterile cannot be identified.

umbrina, *Hymenochaete* Berk. & Curt. = Peniophora vinosa.

114. UMBRINOALUTACEUM, STEREUM Wakef., in Sarasin & Roux, *Nova Caledonia*, B, 1-L, 2, 1920: 101.

The type was from "Gulf of Prony, New Caledonia, Sarasin, No. 195" and the species listed since it will probably be found in Queensland. It is a species of *Peniophora*, close to *P. papyrina*.

umbrinum, *Stereum* Fr. = Peniophora vinosa, possibly.
umbrinum, *Stereum* Berk. & Curt. = Peniophora vinosa.

115. UNICOLOR, HYMENOCHAETE Berk. & Curt., *Jour. Linn. Soc.*, 10, 1868: 335.

Two collections from the region are at Kew, ex "N.Z., Colenso", placed by Cooke under the cover of *Corticium laeve*.

variicolor, *Stereum* Lloyd = Stereum hirsutum.

vaga, Thelephora Berk., *Fl. N.Z.*, 2, 1855: 182. The type ex "N.Z., Sinclair" is not at Kew. A collection placed under this cover by Massee, ex "N.Z., Ashburton, W. W. Smith" is of the common pine mycorrhizal species *Thelephora terrestris*.

116. VELLEREUM, STEREUM Berk., *Fl. N.Z.*, 2, 1855: 183.

Collections from the region at Kew are the type ex "N.Z., Bay of Islands, J. D. Hooker", "N.Z., Colenso", "Middle Island, N.Z., Dr. Sinclair", "York Bay, Wellington, N.Z., E. J. Butler, July, 1923", "Campbell Island, N.Z., J. B. Mayne, March 1908, No. 6", "Mamaku and Wairoa, N.Z., W. N. Cheesman, 1914", "Wairoa River, Kaipara Harbour, Samuel Mossman, No. 813, 1850" (a mixture of *S. vellereum*, *S. lobatum* and *Polyporus adustus*), "N.Z., Colenso, b.49, b.75, b.255, b.290, b.346, b.392", "Waitaki, N.Z.", "East Taieri, Otago, N.Z., Dr. Lindsay, Nov. 1861" (filed by Berkeley under *S. sericeum*), "V.D.L., herb. Hooker, No. 20" (placed by Berkeley under *S. hirsutum*), "Tasmania, W. Archer" (a mixture of three species, one being *S. vellereum*), "Fitzroy Falls, N.S.W., F. A. Rodway, Nov. 1930", "Swan River, W. Aus., No. 159" (placed by Berkeley under *S. hirsutum*), "Near Melbourne, Vic.", "Port Phillip, Vic., No. 310" and "Clarendon, S. Aus., Tepper, No. 582". The last three were placed by Cooke under *S. sulfuratum*.

117. VELUTINA, PENIOPHORA (DC.) Cke., *Grev.*, 8, 1879: 21.
velutina, *Thelephora* DC., ex Fr., *Elench.*, 1, 1828: 203.
velutina, *Hymenochaete* (DC) Lev., *Ann. Sci. Nat.*, Ser. III, 5, 1846: 152.

The only authentic collection from the region at Kew is ex "N.Z., Rotorua, W. N. Cheesman, 1914", so identified by Miss Wakefield. A second placed under the cover, ex "New Zealand", labelled by Berkeley *Thelephora vaga*, is a *Peniophora* I was unable to identify.

118. VERMICULARIS, PENIOPHORA Wakef., *Kew Bull. Misc. Inf.*, 1915: 371.

The type at Kew, ex "N.Z., Rotorua, W. N. Cheesman, 1914" was collected on petioles of a tree fern.

vespilloneum, *Stereum* Berk. = Stereum prolificans.

119. VILLOSA, CYPHELLA (Pers.) Karst., *Bidr. kann. Finl. Nat. Folk.*, 25, 1876: 325.

Three collections from the region are at Kew, ex "Centennial Park, N.S.W., E. Cheel, No. 21" placed by Massee under *Cyphella australiensis*, "N.Z., T. Kirk, on Antirrhinum stems" and "Melbourne, Vic., No. 376", both filed by Cooke under *C. curreyi*.

120. VILLOSA, HYMENOCHAETE (Lev.) Bres., *Ann. Myc.*, 8, 1910: 588.

villosum, *Stereum* Lev., *Ann. Sci. Nat.*, Ser. III, 2, 1844: 212.
nigricans, *Stereum* Lev., *l.c.*
phaeum, *Stereum* Berk., *Fl. N.Z.*, 2, 1855: 183.
strigosa, *Hymenochaete* Berk. & Br., *Jour. Linn. Soc.*, 14, 1875: 68.
phaea, *Hymenochaete* (Berk.) Cke., *Grev.*, 8, 1880: 146.

Collections listed match part of the type of *Stereum villosum* from Java at Kew. Under *H. villosa* is "Moruya, N.S.W., W. N. Cheesman, 1914"; under *H. phaea* are the type of *Stereum phaeum* ex "Bay of Islands, N.Z., J. D. Hooker", "N.Z., Dr. Sinclair", "N.Z., Colenso", "N.Z., Waimea, No. 338", "Condamine River, Q., F.v.M., 1880", "Mt. Dryander, Q., Shann", "Tweed River, N.S.W., Camara, No. 85"; under *H. rubiginosa*, labelled *H. ferruginea* on the sheet, are "V.D.L., ex Hooker herb.", "V.D.L., Messrs. Gunn & Laurence" and "V.D.L., Hooker herb. No. 19"; under *H. strigosa* is "Brisbane, Q., C. E. Broome". Two collections of *Stereum prolificans*, ex "Daintree River, Q." and "Brisbane, Q., No. 314" are filed under the cover. Under *H. tabacina* Cooke placed a collection of the species ex "Walcha, New England, N.S.W., Crawford".

121. VINOSA, PENIOPHORA (Berk.) Mass., *Jour. Linn. Soc.*, 25, 1889: 145.

vinosa, *Thelephora* Berk., *Hook. Lond. Jour. Bot.*, 4, 1845: 60.
crassa, *Thelephora* Lev., in *Gaud. Voy. Bonite*, Bot. 1, 1846: 190.
? *umbrinum*, *Stereum* Fr., *Pl. Preiss*, 2, 1847: 137.
umbrinum, *Stereum* Berk. & Curt., *Grev.*, 1, 1873: 164.
murinum, *Corticium* Berk. & Br., *Jour. Linn. Soc.*, 14, 1875: 70.
vinosa (*Veluticeps*) *Hymenochaete* Cke., *Grev.*, 8, 1880: 149.
crassa, *Hymenochaete* (Lev.) Berk., ex Cke., *Grev.*, *l.c.*, p. 148.
umbrina, *Hymenochaete* Berk. & Curt., ex Cke., *l.c.*
multispinulosa, *Hymenochaete* Peck, *Bot. Gaz.*, 7, 1882: 54.
scabriseta, *Hymenochaete* Cke., ex Rav., *Fung. Am.*, 1882: 717.
purpurea, *Hymenochaete* Cke. & Morg., *Grev.*, 11, 1883: 107.
intermedia, *Peniophora* Mass., *Jour. Linn. Soc.*, 25, 1889: 143.
kalchbrenneri, *Hymenochaete* Mass., *Jour. Linn. Soc.*, 27, 1890: 116.
murinum, *Coniophora* (Berk. & Br.) Mass, *l.c.*

The following collections from the region are at Kew. Under *Stereum umbrinum* is "Sydney, N.S.W., P. Bochmer"; under *Hymenochaete umbrina* "N.Z., Wairoa, E. A. Hodgson, No. 40"; under *H. purpurea* are "Brisbane, Q., F. Bailey, Aug. 1912", "Brisbane, Q., W. N. Cheesman, 1914", "Norfolk Island, Robinson", and "Melbourne, Vic., F. Reader, No. 22"; under *H. crassa* is "Clarence River, N.S.W., Wilcox". Types of species and synonyms at Kew are, type of *Thelephora vinosa* ex "Swan River, W. Aus., Nos. 160, 172"; of *Hymenochaete kalchbrenneri* "Australia, Kalchbrenner, No. 8" (under the cover were also placed "N.Z., Colenso, b.521, b.570"); of *Corticium murinum* "Berwick, Vic., 1878, F.v.M." (under the cover was also placed. "Victoria, Leuchmann"). Under *Corticium polygonium* Cooke filed "N.Z., Colenso, 1866, b.447"; and Berkeley placed under *Peniophora papyrina* "V.D.L., Gunn, 382 b" and "Wangaretta, Vic.".

122. VIRIDE, CONIOPHORA (Berk.) Sacc., *Syll. Fung.*, 6, 1888: 649.

viride, *Corticium* Berk., *Fl. N.Z.*, 2, 1855: 184.
viride (*Coniophora*) *Corticium* (Berk.) Cke., Grev., 8, 1880: 89.

The only collection at Kew is the type ex "New Zealand, Colenso".

viridis, Thelephora Berk., *Fl. Tas.*, 2, 1860: 258. The type ex "Tasmania, W. Archer, Esq." is now a resupinate fragment of what is probably a *Tomentella*. On the type sheet had been glued part of the type of *Coniophora viride*.

wellingtonii, *Hydnum* Lloyd = Hydnum crocidens.

zealandicum, *Radulum* Berk., in herb. Kew. The type was based on a fragment of *Irpex brevis*, ex "N.Z., Bay of Islands".

123. ZEALANDICUS, ALEURODISCUS (Cke. & Phil.) nov. comb.

zealandica, Cyphella Cke. & Phil., *Grev.*, 8, 1879: 57.

ochraceoflavus, Aleurodiscus Lloyd, *Myc. Notes*, No. 70, 1923: 1228.

The type, ex "N.Z., Winton, Dr. S. Berggren, No. 230" is a species of *Aleurodiscus* not uncommon on twigs of *Leptospermum* spp. in New Zealand, which was later named *A. ochraceoflavus* by Lloyd. Under the cover of the latter at Kew are part of the type ex "York Bay, N.Z., G.H.C." and "York Bay, N.Z., July 1923, E. J. Butler–G.H.C., Nos. 1214, 1221".

124. ZONATUM, HYDNUM (Batsch.) Fr., *Epicrisis*, 1838: 509.

One collection from Australia is at Kew, ex "Melbourne, Vic., Berggren, No. 366".

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INDEX TO VALID SPECIES. (Pages 275-298.)

THE EFFECT OF COLCHICINE ON THE SPINDLE OF ROOT TIP CELLS.

By Mary M. Hindmarsh, Linnean Macleay Fellow in Botany.

(Plate xi; one Text-figure.)

[Read 26th November, 1952.]

Synopsis.

In dividing cells of onion root-tips the spindle can be observed after acid fixation.

0·1% colchicine destroys the spindles in all stages of mitosis and prevents spindle formation in cells beginning division during treatment. The spindle appears to be responsible for organizing the cell division process and all the chromosome abnormalities produced by colchicine can be related to the destruction of the spindle.

Introduction.

Most of the work on cytological effects of colchicine has been carried out using tissue fixed and stained for observing the chromosomes rather than the spindle. The abnormal chromosome arrangements observed in colchicine-treated cells have been explained by postulating an effect on the spindle mechanism, and it is generally agreed that colchicine suppresses spindle formation. Only recently have attempts been made to demonstrate this action of colchicine and in 1951 Gaulden and Carlson, with the phase contrast microscope, examined the effect of colchicine on spindles in living animal cells in culture. They confirmed the earlier deductions that colchicine prevents spindle formation in cells which begin division during treatment, but in addition observed that spindles already formed in metaphase, anaphase and telophase cells were suppressed.

This paper describes the effects of colchicine on the spindle in meristematic plant cells and attempts some discussion of earlier interpretations of the cytological action of colchicine.

Unfortunately the technique employed by Gaulden and Carlson cannot be used for plant cells because of difficulties in obtaining single living plant cells suitable for such experiments. In living animal cells the spindle was identified as a clear area which was not penetrated by mitochondria. After certain types of fixation the spindle can be observed in plant cells and appears to consist of numerous fine fibres. Although these visible fibres are probably the result of acid fixation, they provide a useful indication of the presence of a normal spindle structure. By using plant tissue in which the spindle fibres are clearly visible in untreated cells, as basis of comparison, it should be possible to reconstruct the effects of colchicine on the spindle by examining many cells of a tissue, fixed at known intervals of time after treatment. This was attempted first using paraffin sections of root tips, but this method proved to be slow and tedious and was abandoned. Later it was found that spindles in smears of unstained cells could be observed with the phase contrast microscope after certain types of fixation, and this method was used to study the effect of colchicine on the spindle.

Methods.

Onion bulb roots about 3 cm. long were treated by immersing in 0·1% ($2{\cdot}5 \times 10^{-4}$M) colchicine for periods up to 24 hours at 22°C. Roots were removed and the tips fixed for examination every five minutes during the first hour, then at hourly intervals to 12 hours and at 24 hours. Bulbs were transferred to tap water after various times of treatment up to 24 hours and roots were removed at intervals to determine the cytological changes occurring during recovery. Bulbs with roots in tap water were used as controls.

Roots were fixed in a weak chrom-acetic fixative of: Chromic acid (1%) 25 c.c., acetic acid (1%) 10 c.c., water 65 c.c. After fixing for more than 24 hours, roots were macerated in N.HCl at 60°C. for 10 minutes and squashed in 45% acetic acid. These