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BRIEF COMMUNICATIONS

SETTLING OF EQUISETUM TELMATEIA EHRH. BY MEANS OF GAMETOPHYTE CULTURE

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One can marvel at why *Equisetum telmateia*, our most decorative horsetail, is not met in parks or gardens. Perhaps it has been tried several times to settle it on a desired place by transplanting rhizomes. MEUSEL et al. (1971), however, write that it is practically impossible to do so, because the rhizomes will rot after transplanting instead of developing new shoots. All attempts made by this author had negative results. Another method, which proved successful, consists of culturing gametophytes and growing the developing sporophytes in flower pots for one year or more, after which they can be transplanted in the open air. This method is briefly described.

Mature spores of *E. telmateia* were collected from a stand in Beek, East of Nijmegen, the Netherlands, in April 1973 and the end of March 1974. Several sowings were carried out on a modified mineral Knop-medium containing 1 per cent agar. This medium, described by LAROCHE (1968) and used by him for the culture of gametophytes of *E. arvense*, contains twice as much $Ca(NO_3)_2$ as Knop-medium and was used at one third of the usual concentration. No micro-elements were added; the water consisted of 50% demineralized water and 50% tap water. After sterilization the agar was poured into petri-dishes in relatively thick layers of 7 mm in order to prevent excessive loss of water potential.

The germination results were very variable. Freshly harvested spores from April 1973 did not germinate at all; even after some time no germination was observed. However, when a sample of the same spores was stored at 4°C for 4 days, approximately two third of the spores germinated within 48 hours at room temperature. When spores cooled for 4 days at 4°C, were warmed for approximately one hour at room temperature and subsequently once more subjected to one night at 4°C the germination reached approximately 75% within 24 hours.

In 1974 several cool nights had preceded the date of collection of the spores and subsequent germination of the different sowings showed less variability. The dishes were placed in a temperature-controlled room at 24°C under continuous light, supplied by fluorescent tubes (Philips TL, M40W/33 RS), with an intensity of 5500–6000 lux at plant level. The gametophytes of *E. telmateia* developed relatively rapidly. After 3 to 4 weeks the young plantlets were transplanted from the agar with tweezers into petri-dishes containing a 7 mm layer

of coarse granular sand, containing little humus, which was over-saturated with the above mentioned Knop-Laroche solution to enable easy planting. The water losses due to evaporation were compensated for by watering occasionally with demineralized water. These dishes containing the plantlets were kept under the same conditions as mentioned above for the agar cultures. The gametophytes of *E. telmateia* appeared to be quite resistant to fungal attack since no such attacks have been observed. Since the gametophytes of this species are monoecious, no further manipulations were required at this high humidity in order to obtain sporophytes, which appeared spontaneously from time to time on the gametophytes. At this stage the gametophytes with their sporophytes were transplanted into pots containing sand, which were placed on saucers continuously kept filled with water. During the first weeks of the development of the sporophytes the cultures were covered with thin polyethene bags. After some time the plants were transferred to larger pots containing soil mixtures with more humus. The first appearing stems of the sporophyte had 3 or 4 ridges, observed at 23 and 12 stems respectively. The *figures 1–4* picture the further development. Two plants at the stage depicted in *fig. 4* were transplanted at the end of June 1974 in the experimental garden, about 40 cm apart, on a soil pervious to water and containing naturally occurring gravel. Immediately after transplanting temporary shading was provided by means of planting some branches with leaves for two weeks, whereafter the plants were adequately settled. The natural ground water level was at a depth of more than 10 meters and therefore the plants had to be watered frequently and abundantly during the dry spells in the summers of 1974 and 1975. The plants developed and propagated themselves successfully, having stems of approximately 2 mm in diameter at the end of 1974. In 1975 the stand had reached an area of about 130 × 275 cm, with stems up to 3 mm in diameter and an average length of approximately 35 cm (*fig. 5*).

Early April 1976 many stems were appearing of which some had a diameter of 5–6 mm, which is close to the average thickness of stems in older natural habitats. In addition also five fertile stems had developed in the center of the stand. Already in May 1975 a short green branched stem had developed bearing a strobilus (*fig. 6*). This phenomenon is not unusual in *E. telmateia*; a great number of variations have been described by PAGE (1972) for the different habitats in Britain.

In July 1974 two other plants at the stage depicted in *fig. 4* had been transferred from the temperature room to a common laboratory room, exposed to the South, and grown in a rectangular plastic container of about 20 l with a tap near the bottom. The soil mixture in this container consisted of leaf mulch, peat, old cow-dung, clay, and humus-rich sand. From time to time the tap at the bottom was opened and the soil drenched with 0.5 to 1 l water. Also under these culture conditions the plants developed successfully (*fig. 7*). Removal of the still living stems from 1975 in the course of January and February 1976 resulted in the development of more than 80, mostly thin, new stems; less than ten stems had a diameter of 4 to 5 mm. It appeared that at

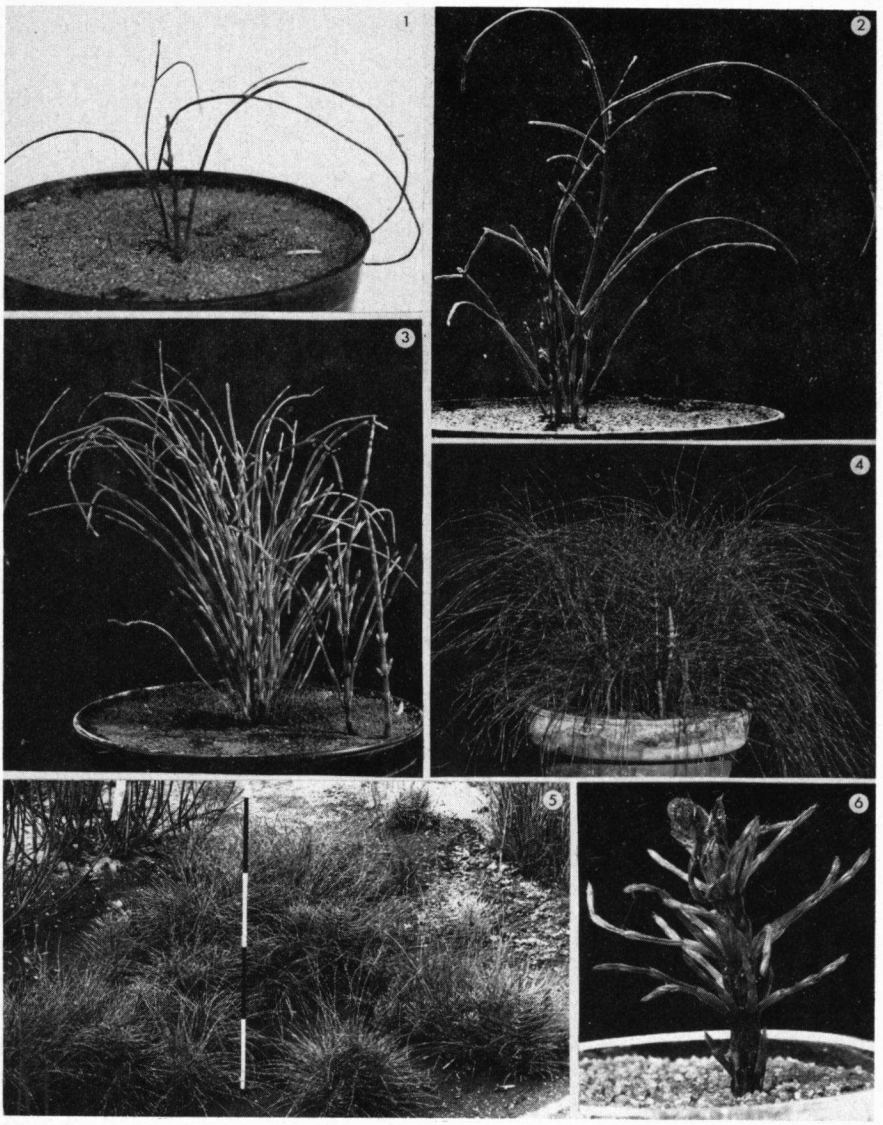

Fig. 1. 7-weeks old sporophyte of *Equisetum telmateia*. × 0.6
Fig. 2. 3-months old sporophyte of *Equisetum telmateia* × 1.1
Fig. 3. $4^1/_2$-months old sporophyte of *Equisetum telmateia*. × 0.5
Fig. 4. 9-months old sporophyte of *Equisetum telmateia*. × 0.16
Fig. 5. Stand of two 15-months old plants of *Equisetum telmateia*. × 0.1
Fig. 6. Cone bearing green stem of *Equisetum telmateia*. × 1.5

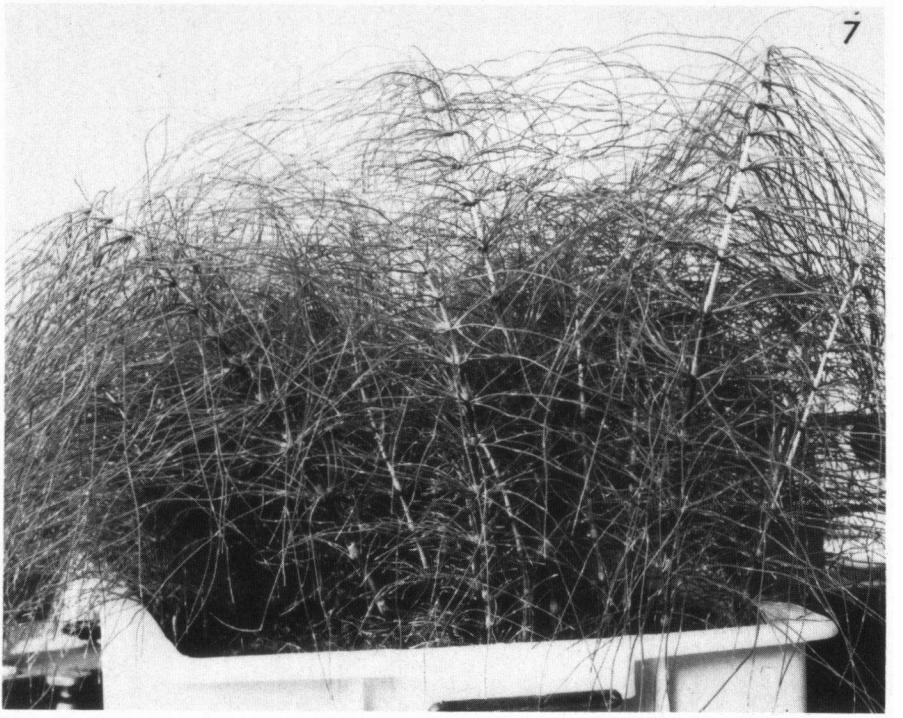

Fig. 7. *Equisetum telmateia* as an indoor plant, about 2 years old. × 0.27

this stage it was also possible to propagate these plants vegetatively by means of splitting. For this purpose the thin stems (2–2.5 mm) with a rooted vertical rhizome-part were cut at a depth of 4 to 5 cm and transplanted into pots and kept under polyethene bags. Very soon new stems developed, in one case even 13 within one month. Without exception all of the twelve splittings made developed successfully. Since they were grown in different soil mixtures it appeared at the same time that the soil composition is not critical for their development.

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REFERENCES

LAROCHE, J. (1968): Contribution à l'étude de l'Equisetum arvense L. I.-Données relatives au comportement du gamétophyte de l'Equisetum arvense L. en cultures stériles et non aseptiques; recherche des conditions optimales de végétation. *Rev. cytol. biol. vég.* **30**: 215–260.

MEUSEL, W., J. LAROCHE & J. HEMMERLING (1971): *Die Schaltelhalme Europas.* Ziemsen, Wittenberg Lutherstadt.

PAGE, C. N. (1972): An interpretation of the morphology and evolution of the cone and shoot of Equisetum. *J. Linn. Soc. London, Bot.* **65**: 359–397.