

*Studies on Photoperiodic Responses
of Salvinia natans (IX)*

The Influence of α, α' -dipyridyl on Sporocarp Formation

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The relation between sporocarp formation and Fe in *Salvinia natans* has been suggested from the results obtained by the inhibitory treatments of heavy-metal enzymes (4), and it was concluded that the decrease in the activity of some Fe-enzymes related to the acceleration of the sporocarp formation. On the other hand, the floral initiation of *Pharbitis purpurea* (3) was not inhibited by the culture medium of moderate Fe-deficiency which did not decrease their chlorophyll level during the period of photoperiodic experiment, and that of the plant was rather accelerated.

In the preliminary culture, the procedure used to *P. purpurea* (1) was also applied to *S. natans*. The chlorophyll levels of the latter plants, however, were not uniform among the plants grown under the unusual level of Fe. Therefore, the experiments were planned to suppress the physiological activity of Fe by supplying to the culture solution α, α' -dipyridyl which has been known to form the chelate compounds with Fe^{++} .

Test plants were prepared as described in our previous report (4), and were exposed to 3 cycles of photoperiod consisting of 16 hr dark and 8 hr light periods. During the dark period, α, α' -dipyridyl was dissolved in the culture solution to give the concentration of 10^{-3} , 10^{-4} , 10^{-5} , 10^{-6} , or 10^{-7} M. Four experiments were undergone, 7 plants being used for each experiment. The effects of photoperiodic treatment were measured 15 days after the beginning of the photoperiodic treatment on the percentage of plants which produced sporocarps and the average number of sporocarps per plant. Knop's solution used as culture medium contained 1 mg/l of Fe, but no other heavy metals.

The results obtained are shown in Fig. 1. In the plot of 10^{-3} M, *S. natans* showed neither sporocarp formation nor vegetative growth. In 10^{-4} M, about the same number of sporocarps as in the control were initiated. In 10^{-7} M, however, their number had again a decreasing tendency. Sporocarps were induced on all

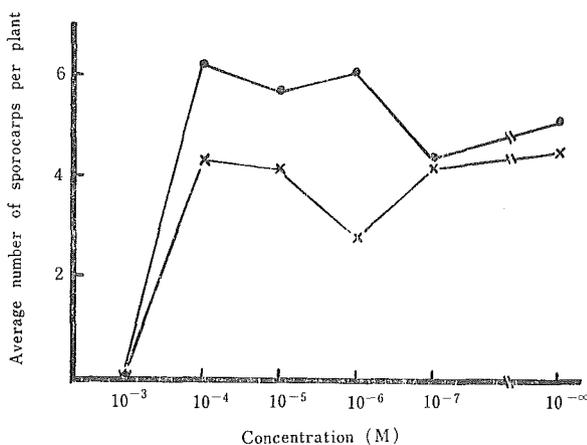


Fig. 1. Relation between the average number of sporocarp per plant and α, α' -dipyridyl concentration. —•—, usual level of Fe (1 mg/l); —×—, excess level of Fe (3.2 mg/l).

plants in all the concentrations tested except 10^{-3} M. The vegetative growth of the plants was inhibited in 10^{-4} and 10^{-5} M, but was normal in 10^{-6} and 10^{-7} M. During the experimental period, their leaves showed no sign of chlorosis in all concentration tested.

In order to minimise as far as possible an effect of remaining α, α' -dipyridyl in the leaves following the photoperiodic treatment, some of the plants were supplied with an excess of Fe (3.2 mg/l) after the photoperiodic treatment. The supply of Fe in excess generally showed a smaller number of sporocarps per plant than that of the plants given continuously the usual level of Fe after the photoperiodic treatment, and, especially, its decrease was remarkable when the plants had been given 10^{-6} M α, α' -dipyridyl. When its concentration was less than 10^{-7} M, however, such effect of Fe was not found. The vegetative elongation of test plants was more vigorous in the excess of Fe than in the usual one. The growth of sporocarps, however, was inhibited by the excess Fe, and many abnormal sporocarps of partial deficiency or under-development were formed.

From the facts that α, α' -dipyridyl of 10^{-3} M inhibited entirely both the vegetative growth and the sporocarp formation of *S. natans*, but at 10^{-4} M, it merely inhibited the vegetative growth, it may be suggested that the moderate deficiency of Fe having a physiological activity may accelerate the sporocarp initiation. These facts show that the moderate Fe deficiency may be beneficial for the photoperiodic stimulus formation or the sporocarp initiation. However, the sporocarp development appears to require the usual level of Fe (4). With these facts, the data on the excess supply of Fe obtained here may be resulted from

some processes prior to the development or from some poisonous effects of Fe during the development. SETH et al. (2), however, has reported that Fe-EDDHA (Fe-salt of ethylenediamine-di-*o*-hydroxyphenylacetic acid) induced flowering in *Wollfia microscopia* even under a continuous light, and that Fe uptake was stimulated several-fold in the medium containing Fe-EDDHA. It remains to be known whether these inconsistencies with our results are caused by the difference of materials or by the kind of the chelate reagents.

References

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