$^{15}N_2$ gas experiment.

The results are shown in table 2. The ^{15}N enrichment was found in all parts of the deepwater rice and associated weeds exposed to ^{15}N. Among the parts under water, the leaf sheath had the highest ^{15}N enrichment, followed by aquatic roots, culms, and roots in the soil.

Atom % excess in various parts under water was roughly proportional to specific ARA previously reported[4]. This indicated that ^{15}N found in these parts was the product of N_2-fixation by epiphytic BGA.

Labelled N was also found in the aerial part not exposed to $^{15}N_2$. The ^{15}N abundance in the grain was significantly higher than that in control plant (0.005 ± 0.001 atom % excess). About 40% of the fixed nitrogen was found in the aerial parts, among which leaf blade acted as the sink.

N_2-fixation at the aerial part by the transported $^{15}N_2$ gas during exposure is unlikely, because the aerial part has negligible ARA. It is, therefore, reasonable to consider that ^{15}N found in the portion not exposed to $^{15}N_2$ was transported from nitrogen which was fixed under water.

Eight mg N per plant was fixed during 9 days. This value is higher than the values reported by Ito *et al*[6], Yoshida and Yoneyama[7], and Eskew *et al*[8] by shallow-water rice. ^{15}N abundance found in the submerged portion in this experiment is much higher than that found in the root of shallowater rice which was reported by the above-mentioned authors. High ^{15}N abundance in the acquatic parts of the deepwater rice is, in all likelihood, related to the biomass accumulation of epiphytic BGA.

Previous observations had been that epiphytic BGA preferentially developed on the submerged decaying tissues of the host[4]. The idea that N_2 fixation by epiphytic microorganisms results in the accumulation of nitrogen only in the decaying tissues where epiphytic BGA grow preferentially is not supported by this experiment. A part of the fixed nitrogen was utilized by growing rice. BGA growing on the aquatic root, which has the ability to absorb nutrient from the water[9], may play a role in providing fixed nitrogen to the host plant. The mechanism of nitrogen supply from the fixing BGA is not yet known.

If we extrapolate the observed N_2-fixing activity for 9 days to 100 days, which is assumed as the submerged growth period of deepwater rice, N_2 fixation explains about 15% of the total nitrogen in deep water at maturity (80 mg N over 550 mg N in total biomass of rice).

Because BGA grown in IRRI's deepwater plot grew much less profusely than BGA associated with deepwater rice in the deepwater rice area of Thailand (visual observation by authors), the role of BGA in nitrogen nutrition of deepwater rice field could be much greater than that of BGA found at IRRI.

This paper calls attention to the possibility of an associated relationship between photodependent N_2 fixation with deepwater rice and probably with other aquatic plants.

1. De Datta, S. K., *Principle and practices of rice production*, John Wiley, New York, 1981, p. 243.
2. Roger, P. A., Kulasooriya, S. A., Barraquio, W. L. and Watanabe, I., In *N_2 cycling in South East Asian wet monsoon ecosystem*, R. Wetselaar (ed.) *Aust. Acad. Sci.*, Canberra, 1981, 62.
3. Kulasooriya, S. A., Roger, P. A., Barraquio, W. L. and Watanabe, I., In *N_2 cycling in South East Asian wet monsoon ecosystem*, R. Wetselaar (ed.) *Aust. Acad. Sci.*, Canberra, 1981a, p. 55.
4. Kulasooriya, S. A., Roger, P. A., Barraquio, W. L. and Watanabe, I., *Soil Sci. Plant Nutr.*, 1981b, **27**.
5. Oyama, T. and Kumazawa, K., *J. Soc. Soil Manure, Jpn.*, 1978, **49**, 424.
6. Ito, O., Cabrera, D. C. and Watanabe, I., *Appl. Environ. Microbiol.*, 1980, **39**, 554.
7. Yoshida, T. and Yoneyama, T., *Soil Sci. Plant Nutr.*, 1980, **26**, 551.
8. Eskew, D. L., Eaglesham, R. A. and App, A. A., *Plant Physiol.*, 1981, **68**, 48.
9. Khan, M. R., Ventura, W. and Vergara, B. S., *Proc. Int. Deepwater Workshop, Bangkok*, Thailand, November 1981.

ANNOUNCEMENT

OPTICS 1982 CONFERENCE

Optics 1982 conference is organised by the Optical Group of the Institute of Physics and will be held during 8–10 September 1982 at the University of Edinburgh, England.

The conference follows in the series of biennial meetings – Optics 1976 – York, Optics 1978 – Bath and Optics 1980 – Manchester and as at those meetings the aim will be to cover many aspects of pure and applied optics. It is intended at the conference to mark the centenary of the birth of Max Born. The conference will, as usual, be accompanied by an equipment exhibition.

Further details about the Conference can be had from: The Institute of Physics, 47 Belgrave Square, London SW1X 8QX, UK.