

This Week's Citation Classic™

CC/NUMBER 49
DECEMBER 3, 1984

Mosse B. Advances in the study of vesicular-arbuscular mycorrhiza.

Annu. Rev. Phytopathol. 11:171-96, 1973.

[Department of Soil Microbiology, Rothamstead Experimental Station, Harpenden, Hertfordshire, England]

This review gave a comprehensive account of the information then available on occurrence, structure, and function of vesicular-arbuscular mycorrhiza. It discussed techniques used in their study, the probable source and mechanism of increased phosphorus uptake, and differential effects of the different endophytes. [The SCJ® indicates that this paper has been cited in over 295 publications since 1973.]

Barbara Mosse

11, The Close

Harpenden, Hertfordshire AL5 3NB
England

May 16, 1984

"When I first became interested in vesicular-arbuscular mycorrhiza (VAM), their study was greatly neglected. During the 1940s and 1950s, only three other people in the whole world worked on these mutualistic root:fungus associations, although earlier surveys clearly testified to their widespread occurrence in most land plants, including many important crops. The unpopularity of the subject was such that, after I completed my thesis on the mycorrhiza of temperate fruit plants, an eminent Oxford professor strongly advised me to change my field of study. A subject involving 'thamniscophagy' (the digestion of little bushes) and the even worse term 'thamniscophysalidophagy' was, he maintained; not only an uncomfortable concept, but could hardly expect serious consideration from a self-respecting scientist.

"The real difficulty lay, and still lies, in the inability to grow the causal fungi without a living host plant. Nevertheless, we found ways of isolating, sterilizing, and germinating the large soil-borne spores; of producing the typical VAM infections in axenically grown plants; and of identifying and multiplying the different causal fungi. This gave great impetus to studies showing the ef-

fect of such infections on plant growth and particularly phosphorus uptake. Fascinated by the spectacular responses to inoculation that could easily be demonstrated in a range of mycorrhiza-dependent plants, many new researchers entered this field. This frequently quoted review article probably provided them with a convenient summary of the state of the art at that time of rapid expansion. Much of the work discussed in this review has since been consolidated and elaborated. We now know that endophyte species can differ in their effects on plant growth, and that field inoculation can improve yields and increase nodulation and symbiotic nitrogen fixation in legumes, thus assisting their establishment in pastures. Also, mycorrhiza can affect soil aggregation, plant-water relations, hormonal balances, partitioning and use of photosynthate, and susceptibility to root pathogens.¹

"Today, we may be within sight of a further significant advance: the application of this research to practical problems of crop production and improvement.^{2,3} Better utilization of applied phosphorus fertilizer and improved growth of seedlings in fumigated nurseries are immediate objectives. More speculative is the possibility of using these fungi with their wide host range for genetic manipulation in order to introduce new properties into plant roots. Symbiotic nitrogen fixation has been discussed, but mobilization of unavailable soil phosphates, already a feature of some soil bacteria, may be a more realistic objective. Such developments depend on finding a way to culture these fungi. Using roots transformed by *Agrobacterium rhizogenes*, which gives them a much increased growth potential, Mugnier (private communication) has produced vigorous mycorrhizal infection and external mycelia in a two-compartment system with easy access. With such material, fundamental studies of fungal metabolism become possible and may eventually lead to axenic culture."

1. Mosse B. *Vesicular-arbuscular mycorrhiza research for tropical agriculture*. Honolulu, HI: Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii, 1981. 82 p. Research Bulletin 194.
2. Hayman D S. Practical aspects of vesicular-arbuscular mycorrhiza. (Rao N S S, ed.) *Advances in agricultural microbiology*. New Delhi, India: Oxford and IBH Publishing Co., 1982. p. 325-73.
3. Menge J A. Utilization of vesicular-arbuscular mycorrhizal fungi in agriculture. *Can. J. Bot.* 61:1015-24, 1983.