bacteriophage action, excess lysine, and deprival of diaminopimelic acid, together with the recent work of Eddy and Williamson[4] on the development of irregularly shaped outgrowths on yeast protoplasts under the action of digestive juices, seem to be similar phenomena. In the experiments now to be described, I accept as a working hypothesis that vesicles and arbuscles are primarily a manifestation of fungitoxic factors, though an element of adaptation to nutritional requirements undoubtedly enters into their morphology.

A technique was developed which permitted germination and early growth of the fungus on a normal medium but favoured rapid accumulation of metabolic products around the hyphæ and partial anærobic conditions. A double-dish method was used, the outer dish containing the medium, while the inner dish had a base of nylon fabric, superimposed upon which was the aerial part of the fungus colony. The apertures between the nylon threads permitted immediate access to about 4 per cent of the surface of the medium. These conditions in themselves were sufficient to produce vesicles within the more complex organic media, which, within a few days, contained clusters of hyphæ with swellings at the tips, the vesicles differing in shape and size according to the organism being grown and the nature of the medium. Vesicles were rare in mineral salts/sucrose medium, but were numerous and multiple in malt agar to which 'Vegemite' (autolysed yeast) was added. By lifting out the inner dish with its superimposed colony, thus breaking off the hyphæ passing through the fabric base, the outer dish containing the medium could be examined, and anti-fungal or other compounds inserted, or the *p*H or moisture content changed. The basal hyphæ remaining within the medium could be distinguished from the new growth which occurred when the inner dish was replaced. Replacement of the established colony on a medium rendered toxic by metabolic products, especially of certain other fungi, by low concentrations of fungicidal compounds, or by a physiologically unbalanced nutrition, led to arbuscular development on the new growth of assimilatory hyphæ, and to coralloid masses of plectenchyma when water was removed from the medium. The proliferated hyphæ spread in far more complicated patterns than those figured by Stamps[1], and were usually mixed with coils, loops and swollen outgrowths.

Organisms used in the experiments represented strains with varying tolerance to the toxic additives in the medium, and ranged from *Aspergillus niger*, through the cellulolytic species *Memnoniella echinata*, *Myrothecium verrucaria* and *Botrytis cinerea*, to *Penicillium rugulosum*, which is parasitic on fungi and was found to be extremely resistant to fungal metabolic products. It was not easy to obtain arbuscles on *P. rugulosum*. Interesting results followed when one species was transferred to the medium from which another had been removed. The successful biotroph was found to leave a medium relatively atoxic but to be tolerant to metabolites; but the necrotroph excreted products which caused changes both in the vegetative and reproductive structures of its own or other species. Tolerance of certain strains of fungi to fungitoxic substances was correlated with lessened arbuscular development.

I believe this work is linked with the general problem of haustorial organs formed by parasitic fungi inside host plants, and suggest that the technique may be of value to plant pathologists interested in exploring host and parasite interactions.

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G. A. Atkins

Australian Defence Scientific Service,
Defence Standards Laboratories,
Department of Supply,
Maribyrnong, Victoria.

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Hybrids of *Tilapia nilotica* × *T. galilea*

In a recent communication, C. F. Hickling reports on hybrids between Malayan *Tilapia mossambica* stock and an East African one. It may be of interest, therefore, to record our observations, which indicate that hybridization among this genus might be more common than it is generally believed.

In summer 1958 a small mud pond at the Fish Culture Research Station, Dor, was stocked with several *Tilapia nilotica* males and *T. galilea* females. When this pond was drained, about 70 small *Tilapia* fry were discovered among the weeds. These fry were believed to be the hybrids of the two species of *Tilapia* stocked.

In order to ascertain this, we stocked again in the spring of 1959 two mud ponds and several concrete tanks with carefully sexed males of *T. nilotica* and females of *T. galilea* and vice versa.

In May and June courtship of males and females of these species, and also nest building in the mud ponds were observed. In the middle of June, small fry, the offsprings of *T. nilotica* (male) and *T. galilea* (female) were seen in one of the concrete ponds.

Only further work in this direction will show the importance of the *Tilapia* hybrids for fish culture.

A. Yashouv
J. Chervinsky

Fish Culture Research Station,
Dor, Israel.
July 7.

ENTOMOLOGY

Contents of Cystine-Cysteine, Glutathione and Total Free Sulphydryl in Arsenic-resistant and sensitive Strains of the Blue Tick, *Boophilus decoloratus*

The affinity of arsenicals for sulphydryl groups was first suggested by Ehrlich as being responsible for the toxic action of these poisons, and the work by Voegtlin[1] and his associates later demonstrated that the trypanocidal action of arsenicals was reversed as well as prevented by the administration of reduced glutathione, cysteine and related sulphydryl compounds.

In insects, Fink[2] and Forgash[3] have shown that significant drops in reduced glutathione levels occur after injection of arsenious oxide. In addition, the latter found that glutathione, when injected into the cockroach, protected it against the toxic effects of arsenic. Harington[4] has shown that the levels of free sulphydryl and reduced glutathione in arsenic-resistant larval strains of the blue tick, *B. decoloratus* are considerably depressed following treatment of the larvæ with varying concentrations of arsenious oxide.