augmentation of thrombolytic activity and thus accelerated vascular clearing.

Further investigation of the phenomenon may make available more detailed knowledge of the mechanism of plasminogen activation.

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BIOLOGY

Caulerpicin, a Toxic Constituent of *Caulerpa*

IT has long been known that the marine green alga *Caulerpa* has a peppery taste. Yet varieties of this species are used as a salad delicacy in the Philippines and lack it. We have attempted to discover the nature of the flavour-giving substance, having in mind its recognition for chemotaxonomic purposes. One of us (G. A.-S.) was able to obtain from ether extracts adsorbed on and then eluted from alumina crystalline material which melts at 95° C. We have named this material "caulerpicin". Mass spectrometry indicates that caulerpicin has a molecular weight of 649 with a possible formula of $C_{43}H_{87}O_2N$ and properties unlike those of any other compound of which we are aware. The infra-red spectrum indicates that caulerpicin may be a long-chain saturated hydroxy amide. So far it has been found in several *Caulerpa* species or varieties in different concentrations; as much as 600 mg have been isolated from 1,500 g dry weight of one variety of *Caulerpa racemosa* (Forsskal) J. Agardh.

Different people respond differently to caulerpicin. Some merely obtain a mild anaesthetizing sensation which is not immediate but is delayed for a minute or two. Others also obtain a numbness of the tongue or lips. In one subject exposed to the substance at various times truly toxic symptoms have become stronger and stronger following each contact. Almost immediately on chewing the raw dried *Caulerpa* material, the subject felt a numbness at the tip of the tongue. This has developed to a point at which the reaction is one of numbness of the extremities coupled with a cold sensation in the feet and fingers, rapid and difficult breathing, slight depression and, finally, loss of balance requiring the subject to lie down. The symptoms wear off, depending on the dosage, in a few hours to a day. Coupled with these reactions to the impure and pure substance, the same subject has developed a sensitivity to oysters and crabs and eating them produces the same symptoms.

The toxic effects are somewhat similar to those reported[1] for ciguatera fish poisoning in the Tropical Pacific. According to Banner's investigations ciguatera poisoning is caused most frequently by eating the red snapper (*Lutjanus bohar* Forsskal) which in turn feeds on herbivorous acanthurids such as *Acanthurus triostegus* Linnaeus. Dawson *et al.*[2] reported that *Caulerpa serrulata* (Forsskal) J. Agardh was found in the alimentary tracts of reef fishes from Palmyra Island in the Central Pacific. One of these, *Arothron hispidus* Linnaeus, was found to be poisonous; another, *Acanthurus triostegus*, is often poisonous.

In so far as we have been able to determine from Banner and Helfrich[3] and from questioning, ciguatera is unknown in the Philippines, although it is widespread in the Tropical Pacific. However, it is possible that the toxic response to shellfish on the part of our subject in the Philippines was due to substances such as caulerpicin being passed to the human food organisms, oysters and crabs, through a detritus food chain rather than through the herbivore fish to carnivorous fish food chain. We do not believe the effects of caulerpicin which we observed to be identical to those of ciguatera, but there is little information on this point.

The fishes and algae mentioned are common and generally distributed throughout the Philippines. Forsskal's authorship of so many of their names is an indication of their abundance and presence at the Red Sea end of their general biogeographic distribution across the Pacific. Since *Caulerpa* is a genus very widely spread in the tropics and also occurs in cold water in South Australia, for example, it would seem that if it is related to fish poisoning this would already be known. That *Caulerpa* is not so conspicuous a genus in the Eastern Pacific and perhaps the Eastern Atlantic as it is in the western reaches of these same oceans, may account for the lack of literature on this subject. We would appreciate any information relating *Caulerpa* to toxicity in marine products or to food chains either as detritus or directly-grazed material.

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Flower Apices cultured *in vitro*

ALTHOUGH there are numerous reports dealing with the culture of plant tissues *in vitro*, there have been few successful attempts to culture isolated flower primordia. A suitable technique would, however, be valuable for many morphogenetic investigations, and therefore attempts have been made to culture buds of two species of *Viscaria*.

Dissection of flower apices was carried out by aseptic methods which yielded sterile cultures without difficulty. The excised apex was placed on a filter paper bridge[1] dipping into liquid nutrient medium in a 1 in. diameter 'Monax' tube covered with polypropylene film. The cultures were grown at 24° C under a 16 h daylength at an intensity of about 600 lumens per sq. ft. The nutrient medium was based on that of Murashige and Skoog[2]; the concentrations of the major elements and the ferrous sulphate–ethylenediamine tetraacetic acid (EDTA) complex were those recommended and, of the minor elements, one-tenth of those quoted. Other constituents (of which some were derived from Goodwin[3] and some from Vasil[4]) were as follows (quantities per litre); sucrose, 20 g; coconut milk, 100 ml.; casein hydrolysate, 1 g; inositol,