actually induced by some mutagenic agent in the exudate, any with race 2 ability would be favourably selected and would tend to predominate. However, randomly occurring mutants would presumably also appear in the control treatments, but the results of the inoculation experiments indicated that this did not happen. Hence, if the change resulted from mutation, the mutants seem to have been caused by the exudate.

It seems equally likely that the phenomenon depends on a system similar to that of adaptive enzyme formation in bacteria. Such a system might act in either of two ways, depending on whether host resistance is governed by the presence of toxins or by the lack of nutrients essential to the fungus. The first would be the production of an enzyme able to detoxify the root exudate. The second would be the development of an enzyme that increased the ability of the fungus to use nutrient materials from the resistant host that previously were unavailable to it.

Whatever the mechanism underlying this apparently adaptive change in pathogenicity, it seems to illustrate yet another method by which pathogenic fungi may alter their virulence, independently of sexual methods of recombination.

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Chemical Composition of the Brown Alga *Ascophyllum nodosum* (L.) Le Jol.

Presence of Reducing Compounds in *Ascophyllum nodosum*

As early as 1893, Crato[1] noticed highly refractive, colourless vesicles in the cells of brown algae. These vesicles, which are usually termed physodes, are characterized by a number of colour reactions, such as the red colour given with vanillin hydrochloric acid and diazo reagents. They are also known to reduce silver nitrate.

The colour reactions, reducing power and a pronounced astringent taste led Kylin[2] to the conclusion that the physodes contained tannin-like compounds. No attempt has been made to determine the amount of these compounds present in the algae, and their chemical constitution is unknown.

We observed during an investigation with *Ascophyllum nodosum* that dilute acid extracts of this alga contained a reducing compound in amounts varying between 0·2 and 2·2 m.equiv. per gm. dry matter. The extracts showed the colour reactions characteristic of the physodes, and the colour intensity was proportional to the reducing power. It is therefore highly probable that the reducing compounds are identical with the compounds present in the physodes.

When hide powder is added to the extracts the reducing compounds are adsorbed on to the powder. The amount of organic matter removed from the extracts by the hide powder treatment was proportional to the reducing power of the extracts. As much as 9 gm. 'tannins' per 100 gm. dry alga was found in the extracts where the reducing power was 2·2 m.equiv., corresponding to an equivalent weight of about 40.

A detailed report of this investigation will be published elsewhere. Work is in progress on the reducing compounds of other brown algae, as well as on the chemical structure and reactions of the compounds.

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Influence of Habitat on the Chemical Composition of *Ascophyllum nodosum*

In the previous communication, we reported the presence of reducing compounds in *Ascophyllum nodosum*. It was observed that the amounts of these reducing compounds varied in samples collected at different habitats. Plants growing outside or in the outer parts of the Trondheimsfjord, collected in July, showed a reducing power of approximately 2·2 m.equiv. per gm. dry matter. In the inner parts of the fjord the reducing power was lower and reached a minimum of 0·3 m.equiv. in the neighbourhood of Trondheim, where the salinity was low due to fresh water from a river outlet. The results suggested that variations in the salinity were responsible for the variation in reducing power. To test this point samples of *Ascophyllum nodosum* were collected at different localities in Follafjord (series *A*), in Trondheimsfjord between the Rivers Nidelva and Gaula (series *B*), and at one locality in the inner part of Oslofjord. The reducing power of the samples (m.equiv. per gm. dry matter) are shown in Table 1, together with the niacin and biotin contents (μgm. gm. dry matter).

Follafjord is a threshold fjord with a river outlet at the bottom end. In series *A*, localities 1, 2, 3 and 4 lie on the outer side and localities 5, 6, 7 and 8 on the inner side, of the threshold. In series *B*, locality 1 is near the outlet of the River Gaula and locality 6 near the outlet of the River Nidelva.

The results indicate strongly that the salinity of the sea-water has a pronounced influence on the chemical composition of *Ascophyllum nodosum*. The correlation between salinity and chemical composition

Table 1

Locality		Reducing power	Niacin	Biotin
	1	1·57	10·5	0·12
	2	2·15	9·5	0·11
	3	2·02	9·5	0·12
Series *A*	4	1·89	9·0	0·09
	5	0·36	14·0	0·23
	6	0·37	14·5	0·23
	7	0·24	15·5	0·24
	8	0·27	16·0	0·28
	1	0·18	15·0	0·44
	2	0·26	12·5	0·26
Series *B*	3	0·89	10·0	0·20
	4	1·22	12·0	0·13
	5	0·79	17·0	0·23
	6	0·14	22·0	0·41
Oslofjord		0·11	19·5	0·45

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