was replaced by the same amount of sterile redistilled water. The other 3 lichen extracts were only tested in concentrations of 5 and 10 g/l. The cells were processed after 1-hour exposure to $5 \times 10^{-7} M$ colchicine. Processing, fixation and preparation of slides have been described previously[6].

The results from some of the experiments are shown in Table II. In each case 100 metaphases were analyzed for chromosomal aberrations. The frequency of chromosomal aberrations was not influenced by the treatments with the different extracts. However, the extract of *Nephroma arcticum* produced a marked reduction of the mitotic index at concentrations of 10 and 12.5 g/l. The other 3 extracts did not have any effect on the mitotic index at the concentrations tested. This finding is in good agreement with that obtained for *Vicia faba*.

The results presented in this paper concerning the mitotic inhibition produced by different lichen extracts may partly explain results obtained in earlier investigations by HENNINGSSON and LUNDSTRÖM[3]. Recently, these authors have shown that low concentrations of extract from *Nephroma arcticum* inhibit the growth of several decay fungi. Extracts from other lichens had not the same inhibiting influence on growth (HENNINGSSON and LUNDSTRÖM, under preparation).

Zusammenfassung. Der Einfluss verschiedener Wasserextrakte aus Flechten auf Chromosomenstruktur und Zellteilung an Bohnenwurzeln und Zellkulturen des chinesischen Hamsters wurde untersucht. Es kam zu keinen Chromosomenaberrationen. Einzig der Extract von *Nephroma arcticum* hatte in schwacher Konzentration einen hemmenden Einfluss auf den Mitoseverlauf. Diese mitosehemmende Wirkung könnte die Ursache sein, dass *Nephroma arcticum* das Wachstum vieler holzzerstörender Pilze hemmt.

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Resistance in Some Wild and Cultivated Grasses to the Phytotoxicity of a Systemic Fungicide

In the last decades, extensive use of chemicals for agricultural and other purposes has subjected the wild as well as the cultivated species of plants to a new evolutionary sieve. Genetic differences in barley and oats for reaction to the insecticides DDT[1] and Toxaphene[2] and a herbicide, Barban[3], have been reported. More recently, different reactions of wheat mutants for resistance to a systemic fungicide, Calixine, have been observed[4]. However, comparative studies on wild plants, particularly those which have made a genomic contribution in the evolution of their cultivated relatives, do not seem to have been reported. Such studies are possible in the tribe Triticeae, in which wild species of *Aegilops* have participated in the evolution of the cultivated species of *Triticum* and where cytogenetic and biochemical information is available on all the related species. This report concerns such comparative studies.

Forty different (Table) lines representing species and varieties of *Aegilops, Triticum, Secale, Hordeum*, and *Avena*, including three synthetic species[5], were grown with 10 replications in a randomized block design in a greenhouse with automatic irrigation, and kept at 22 °C. The systemic fungicide 4-tridecyl-2, 6-dimethylmorpholin (= tridemorph) (Calixine) produced by BASF, Germany, which has been used for the effective control of the mildew, *Erysiphe graminis* in Germany, Great Britain, Denmark, and the Netherlands, was sprayed (0.1% concentration) 24 days after sowing. One week after spraying, chlorosis of leaves was noted on some plants, but many plants appeared unaffected (Table). An extended scale (0–4)[4] was used in the classification of treated plants according to the degree of chlorosis. The horizontal line in the Table gives the distribution of 10 plants in each line for chlorosis of leaves, and the last column records the average character. The Table also includes the genomic contitutions and somatic chromosome numbers of the treated material. Since the application of fungicides began only recently, the pivotal – cum – differentiated genome system[6] does not seem to be operative, as indicated by the reactions of differnet species sharing common genomes.

Inheritance of reaction to DDT is governed by a major gene with susceptibility dominant over resistance[1], and since no gross morphological features are associated with the reaction, there appeared to be no selective advantages or disadvantages for the gene during the evolution of the cultivated forms[1,7]. Species of *Aegilops, Secale, Hordeum*, and *Avena* were resistant to Calixine, whereas the reaction in the genus *Triticum* was quite variable (Table). Since *Triticum* is also different from the other genera in morphology[8,9], the possibility of an important role of the morphological features in the development of chlorosis cannot be ruled out. *Triticum monococcum* and *Triticum aegilopoides* were more like *Aegilops* in their reactions. This indicates an additional similarity[10,11] of these diploid wheats ($2n = 14$) with *Aegilops*. Of all the hexaploids of *Triticum* studied only the two induced mutants (Mutant No. 11 and Sonora Sharbati) were resistant to Calixine. This might be a coincidence, but the observation presents a possibility of producing tolerant varieties through induced mutations.

Three synthetic polyploid species which have not dunergone genetic diploidization were susceptible to Calixine. The behaviour of *Aegilops ventricosa* × *Triticum aegilopoides*[12] was almost an additive reaction of the constituent species.

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Classification of plants for reaction to Calixine

S. No.	Material	Genomes	Somatic chromosome number	Characters					Average character	
				0	1	2	3	4		
1.	*Aegilops squarrosa* L.	D	14	10	–	–	–	–	0	R
2.	*A. cylindrica* Host	DC	28	10	–	–	–	–	0	R
3.	*A. juvenalis* (Thell.) Eig	DC^uM^j	42	10	–	–	–	–	0	R
4.	*A. crassa* Boiss.	$D^1D^2M^{cr}$	42	8	2	–	–	–	0.2	R
5.	*A. ventricosa* Tauch	DM^v	28	–	2	8	–	–	1.8	R
6.	*A. columnaris* Zhuk.	C^uM^c	28	10	–	–	–	–	0	R
7.	*A. triuncialis* L.	C^uC	28	10	–	–	–	–	0	R
8.	*A. triaristata* Willd. (6x)	$C^uM^tM^{t2}$	42	10	–	–	–	–	0	R
9.	*A. umbellulata* Zhuk.	C^u	14	8	2	–	–	–	0.2	R
10.	*A. biuncialis* Vis.	C^uM^b	28	2	8	–	–	–	0.8	R
11.	*A. triaristata* Willd. (4x)	C^uM^t	28	–	10	–	–	–	1.0	R
12.	*A. variabilis* Eig	C^uS^v	28	–	4	4	2	–	1.8	R
13.	*A. speltoides* Tauch	B (= S)	14	10	–	–	–	–	0	R
14.	*A. bicornis* (Forsk.) Jaub. et Sp.	S^b	14	–	8	2	–	–	1.2	R
15.	*Triticum monococum* L.	A	14	6	4	–	–	–	0.4	R
16.	*T. aegilopoides* (Link) Bal.	A	14	–	8	2	–	–	1.2	R
17.	*T. durum* Desf. P.I. 210382	AB	28	8	2	–	–	–	0.2	R
18.	*T. durum* Desf. P.I. 191149	AB	28	–	6	4	–	–	1.4	R
19.	*T. durum* Desf. C.I. 4566	AB	28	–	–	2	8	–	2.8	S
20.	*T. durum* Desf. P.I. 192056	AB	20	–	–	–	8	2	3.2	S
21.	*T. aestivum* L. em Thell. Mutant 11	ABD	42	4	2	4	–	–	1.0	R
22.	*T. aestivum* L. em Thell. Sonora Sharbati	ABD	42	–	6	4	–	–	1.4	R
23.	*T. aestivum* L. em Thell. Sonora	ABD	42	–	–	10	–	–	2.0	S
24.	*T. aestivum* L. em Thell. Kranich	ABD	42	–	–	10	–	–	2.0	S
25.	*T. aestivum* L. em Thell. Klieber	ABD	42	–	–	8	2	–	2.2	S
26.	*T. aestivum* L. em Thell. Kolibri	ABD	42	–	–	8	–	2	2.4	S
27.	*T. aestivum* L. em Thell. Koga II	ABD	42	–	–	8	–	2	2.4	S
28.	*T. aestivum* L. em Thell. Starke	ABD	42	–	–	2	8	–	2.8	S
29.	*T. aestivum* L. em Thell. Cato	ABD	42	–	–	4	4	2	2.8	S
30.	*T. aestivum* L. em Thell. Ajeeba	ABD	42	–	–	–	2	8	3.8	S
31.	*T. aestivum* L. em Thell. Mutant 23	ABD	42	–	–	–	–	10	4.0	S
32.	*Secale cereale* L. Petkus Winter	R	14	10	–	–	–	–	0	R
33.	*S. cereale* L. Petkus Spring	R	14	6	4	–	–	–	0.4	R
34.	*Hordeum vulgare* L. Emir	–	14	2	8	–	–	–	0.8	R
35.	*H. vulgare* L. Lofa	–	14	–	8	2	–	–	1.2	R
36.	*Avena sativa* L. Astor	–	42	8	2	–	–	–	0.2	R
37.	*A. sativa* L. Steel	–	42	8	2	–	–	–	0.2	R
	Synthetic species									
38.	(*Aegilops ventricosa* × *Triticum aegilopoides*)	ADM^v	42	–	–	4	6	–	2.6	S
39.	*Triticale* (6x)	ABR	42	–	–	2	8	–	2.8	S
40.	*Triticale* (8x)	ABDR	56	–	–	2	2	6	3.4	S

0, normal; 1, 1/20 of leaf area chlorotic; 2, 1/10 of leaf area chlorotic; 3, 1/4 of leaf area chlorotic; 4, 1/2 of leaf area chlorotic. R, resistant; S, susceptible.

Such studies have theoretical as well as practical implications and are important not only for widening the safety margins for the application of chemicals to plants, but can also be instrumental in obtaining much needed information on the evolution of the specificity of gene action.

Zusammenfassung. Auf den Blättern einiger Gräser (*Aegilops, Triticum, Secale, Hordeum* und *Avena*) wurde der Grad der durch das systemische Fungizid Calixin verursachten Chlorosis näher untersucht.

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