Devernalization of Spring Rye by Anærobic Conditions and Revernalization by Low Temperature

A PREVIOUS letter in NATURE[1] presented evidence to show that in winter rye (var. Petkus) anærobic conditions at normal temperatures (20° C.) when alternated with ærobic conditions at 1° C. quantitatively annul the vernalizing effect of low temperature. It appeared possible, therefore, that spring rye of the same variety might be devernalized by the application of anærobic treatment at 20° C. Previous work[2,3] has shown that the process of vernalization in winter rye decreases the number of leaves produced on the main axis before flower initiation, as well as decreasing the period of time required to reach anthesis. An increase in these characteristics in spring rye after anærobic treatment would thus indicate a process of devernalization.

The experiment was performed by sealing the grains in tubes, with sufficient water to imbibe them fully, in an atmosphere of pure nitrogen, leaving for varying periods at 20° C., and then sowing in sand culture. Periods up to three weeks alone could be used, as longer exposures to anærobic conditions led to death of the seeds.

The results of this experiment are given in Table 1.

Table 1.

DEVERNALIZATION OF SPRING RYE BY ANÆROBIC TREATMENT.

Preliminary period in nitrogen	No. of leaves on main axis	Days to anthesis	No. of replicates
Control (none)	6·80 ± 0·20	50·3 ± 0·49	10
1 week	7·52 ± 0·11	52·6 ± 0·45	23
2 weeks	7·67 ± 0·13	54·4 ± 0·73	24
3 weeks	8·29 ± 0·36	57·4 ± 1·7	7

A significant increase in leaf number and time to anthesis follows anærobic treatment, thus establishing the possibility of devernalization at normal temperature.

The process of vernalization is held by us to be a specific effect of low temperature, and in confirmation of this view it has been established that spring rye partially devernalized by anærobic conditions may again be vernalized by subsequent exposure in air to 1° C. The data are given in Table 2.

Table 2.

REVERNALIZATION OF SPRING RYE AFTER ANÆROBIC TREATMENT
All variants, except controls, received 3 weeks' chilling at 1° C. in air after removal from anærobic conditions.

Preliminary anærobic treatment	No. of leaves on main axis	Days to anthesis	No. of replicates
Control (none)	6·80 ± 0·20	50·3 ± 0·49	10
1 week	—	47·3 ± 0·34	14
2 weeks	7·10 ± 0·23	50·5 ± 0·79	10
3 weeks	All plants failed		

It will be noted that both leaf number and time to anthesis have been reduced to the level of the controls which were untreated.

These results thus add further evidence for the reversible nature of the vernalization process.

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[1] Gregory, F. G., and Purvis, O. N., NATURE, **138**, 1013 (Dec. 12, 1936).
[2] Purvis, O. N., *Ann. Bot.*, **48**, 919–955 (1934).
[3] Purvis, O. N., and Gregory, F. G., *Ann. Bot.*, N. S. [i] (in the Press).

Artificially Prepared Visible Paracrystalline Fibres of Tobacco Mosaic Virus Nucleoprotein

A RECENT letter in these columns[1] contained photomicrographs of mesomorphic or paracrystalline fibres of tobacco mosaic virus which had formed spontaneously in clarified juice expressed from diseased tobacco leaves. Similar fibres have now been prepared from solutions of the pure virus protein by suitably adjusting the *p*H value of the medium and the salt and virus concentrations. Although the fibres may be produced over a relatively wide range of *p*H values, the best results are obtained at a *p*H value of about 5 (near to the point where, in the comparative absence of salts, virus solutions are most viscous or gel-like).

The pure virus was obtained by a combination of precipitation with 15 per cent ammonium sulphate solution at *p*H 7 with isolectric precipitation from acetate buffers at *p*H 3·4 as previously described[2]. A suitable salt concentration is provided by 0·4 *M* ammonium sulphate. The fibres formed under these conditions have the same dimensions and properties as the fibres previously described[1], except that they are frequently more easily broken up.

Spontaneously formed fibres, when separated and dissolved in water, give a solution containing no visible (×1000) particles, but by adjusting the *p*H value and salt concentration the long flexible paracrystalline fibres are re-formed. Samples of pure virus protein prepared from spontaneously formed fibres, from artificially formed fibres or prepared in the ordinary way, contain (on a dry weight basis) the same percentage nitrogen (16·6) and phosphorus (0·5), and when diluted to one part by weight in a million give comparable numbers of primary lesions on *Nicotiana glutinosa* leaves.

The temperature at which artificially formed fibres disrupt is the same as for the spontaneously formed ones. Taken in conjunction with the evidence presented in the previous letter[1], there can be no doubt of the identity of the fibres with the virus.

Bernal and Fankuchen[3], by means of X-ray analysis, deduced the arrangement of the virus molecules within the paracrystalline aggregates. They point out that in view of this structure, homogeneity of the aggregates is less certain. I assume that by this they mean that viruses like yellow tobacco mosaic, a closely related mutant strain of ordinary mosaic virus, may form a part of such aggregates without altering the general arrangement. This is a possibility which cannot be overlooked. However, my preparations were derived from plants which had been artificially infected with virus separated at its iso-electric point of *p*H 3·4, and which had been raised in an isolated compartment of an insect-proof glasshouse and showed no symptoms other than those of ordinary mosaic.

The finding of Bawden and Pirie[4] that the virus contains nucleic acid has been confirmed, and my preparations contain 0·52 per cent phosphorus. There is evidence to associate the acid prosthetic groups deduced by me[5] on the basis of the *p*H activity curve for this virus, with the nucleic acid demonstrated by Bawden and Pirie. The circumstance that Stanley's[6] earlier preparations contained no demonstrable amounts of phosphorus, and the presence of small but variable amounts in his later preparations[7] are understandable when it is realized that during the purification processes his preparations were exposed to *p*H values which are known to

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