Hydrogen Peroxide Formed During the Combustion of Hydrogen and Oxygen

IT is well known that the chief product in the photochemical combination of hydrogen and oxygen is hydrogen peroxide. It is also known that hydrogen peroxide is a product of the thermal reaction, both in slow combustion at 550° C. and 1 atmosphere pressure (Pease[1]) and in explosive combustion (Poljakow[2]) at low pressure. The quantities produced have not been sufficient to indicate whether the hydrogen peroxide is a primary product of the reaction or only a concomitant, resulting, for example, from recombination of hydroxyl radicals at the walls. We are obtaining in explosive combustion at low pressure a condensate containing up to 30 per cent hydrogen peroxide (grams per 100 c.c. of solution) in a continuous manner provided that the cooling is sufficiently rapid. The significance of the formation of so much peroxide is being further investigated.

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Behaviour of the 'Nucleolar Olistherozone'

THE first recognition of the relation between the nucleolus with the set of chromosomes was made in 1912, when S. Nawashin[1] discovered, in certain chromosomes, what he called 'satellites'. He noted that, in resting nuclei, the satellites are on the nucleolus and he stated them to be picked out by the respective sat-chromosomes, during the prophase.

It was later on that McClintock[2] stated that the satellite is not separated from the chromosome during mitosis, being only removed from the remainder of chromosome, during the telophase, owing to the intercalary condensation of the nucleolus. It is in this removal of the satellite from the remainder of chromosome that, according to McClintock, what we call[3] the 'nucleolar olistherozone' originates.

I thought, in 1939[4,5], that the nucleolus, when condensing, would not extend the olistherozone, but the extension of this in the telophase would be the normal behaviour of these primary and autonomous formations and would correspond physiologically to a preparation of this zone in order to condense the nucleolus in it.

Observations since 1939, carried out by me[6], in a great amount of material of different species of higher plants, convinced me that the olistherozone is not extended by the nucleolus nor does it extend itself spontaneously for condensing the nucleolus: related to nucleoli condensation in the telophase, there is no extension of the olistherozone, the nucleolar condensation being made without extension of the zone. Nevertheless, it can happen that the zone may be already extended in the telophase, when the nucleolus condenses, owing to the fact that it has been extended in the anaphase due to the chromatic agglutination[7] (= stickiness) of the chromatids.

The observation of these extensions in the telophase and in resting nuclei can then be considered as an indirect method of verifying the existence of spontaneous agglutination[7], that existed and ceased, in the tissues under observation, before the latter had been fixed.

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Effect of High Temperature on Vernalized Mustard Seed

IN earlier publications[1,2], it has been shown that when dried vernalized unsplit seeds of mustard T. 27 are stored at room temperature for 836 days, or subjected to 30° ± 2° C. for 39 days, no devernalization takes place. Furthermore, from a series of monthly sowings extending over a period of two years, of the same batch of maximally vernalized unsplit seeds of mustard, it was found that the shortest vegetative periods (from sowing to opening of first flower) were in sowings of June, when for the fortnight after sowing the average maximum temperature of the glasshouse was over 35° C. and the minimum temperature, 19° C.

In view of the recent note by Purvis and Gregory[3] on "Devernalization by High Temperature", the effect of high temperature on resoaked dried and fresh vernalized unsplit seeds of mustard T.27 was observed. Since a significant 20 per cent reduction of 'scores' (devernalization) was observed by these authors in the case of vernalized winter rye subjected to 35° C. for forty-eight hours, we selected a similar high temperature treatment for our experiments with mustard.

For one experiment, two types of vernalized unsplit seeds were used: (*A*) dried seeds stored at room temperature from May 11, 1939, that is, for six years and 24 days; and (*B*) fresh seeds chilled for 53 days. *A*-seeds were soaked under water for five hours, to make the moisture contents of *A*- and *B*-seeds more or less similar, before both were subjected for forty-eight hours to (i) 35° ± 2° C. and (ii) room temperature (28°–21° C.). For controls, seeds chilled for 55 days were used. All the differently treated seeds were sown on June 6, 1945, in pots kept in a glasshouse. The average maximum temperature of the glasshouse for the fortnight following June 6 was 35·3° C., the minimum, 19·6° C. The germination of *A*-seeds was very poor, but the viable seeds produced healthy plants with vegetative cycles similar to plants from fresh seeds chilled for 55 days.

In a second experiment, only seeds chilled for 55 days and dried for 41 days were subjected to high temperature for 48 hours. Since the maximum temperature of the glasshouse was 7°–8° C. higher than room temperature at this period, seeds germinated at room temperature for 48 hours were used as controls. The data of the two experiments are given in the accompanying table.

AVERAGE NUMBER OF DAYS FROM SOWING TO OPENING OF FIRST FLOWER OF MUSTARD T.27. NUMBER OF PLANTS IS STATED IN BRACKETS.

Sowing date	Plants from seeds	Temperature treatments		
		35° ± 2° C. for 48 hours	Room temperature 48 hours	Control
6.6.45	*A*	36·33 ± 1·01(6)	36·00 ± 1·05(6)	
	B	38·50 ± 0·56(18)	38·70 ± 1·13(20)	38·75 ± 1·14(12)*
19.7.45	*B*†	39·62 ± 1·60(8)	39·13 ± 1·50(15)	

* Seeds chilled for 55 days; † seeds chilled for 55 days, dried 41 days.

The statistical analysis of the data indicates that in both sowings there is no significant difference in the vegetative periods of plants from differently treated *A*- and *B*-seeds. The conclusion is therefore justified that no significant devernalization takes place in mustard T.27 when (*a*) dried vernalized unsplit seeds are stored at room temperature for over six years, or (*b*) the resoaked stored or fresh vernalized unsplit seeds are subjected to 35° ± 2° C. for 48 hours.

Results of experiments now in progress with vernalized wheat and other strains of mustard are likely to indicate whether the contradictory responses to high temperature of vernalized seeds of winter rye and of mustard T.27 are to be attributed to the thermostable nature of the changes induced in vernalized unsplit mustard seeds or to other causes.

This investigation has been undertaken in connexion with a scheme of research work which is being financed by the Imperial Council of Agricultural Research, New Delhi.

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A Seedling Disease of Flax Caused by *Macrosporium sp.*

IN 1944 a sample of flax seed of the variety Newlands was received at this laboratory. The outstanding macroscopic feature of the sample was the dull colour of a very high proportion of the seed. When sown in pots in the glasshouse the seed germinated well, but the cotyledons of some seedlings showed brown lesions generally towards the margin but sometimes as minute spots towards the centre. When such seedlings were kept in a moist atmosphere, the lesions enlarged rapidly until the infected cotyledons were killed, and these became covered with an olivaceous mould. The fungus spread exteriorly to the hypocotyls of the diseased seedlings and also to the hypocotyls and cotyledons of healthy seedlings in contact with them. Death of such seedlings generally followed in a short time.

The fungus fructifies readily on the dead seedlings, and the conidia are borne singly or occasionally in pairs on the ends of short, straight, light brown, septate conidiophores. These conidia are club-shaped, light brown in colour, have 6–12 septa and are usually muriform. Each conidium bears a long straight hyaline appendage at its apex. The appendages also display septation along the portion adjoining the conidium and average 75μ in length. The conidia vary from 60μ to 105μ in length and are about 25μ broad at their widest point. They were identified as belonging to a species of *Macrosporium*. The fungus, which appears to be carried as mycelium in the seed coat, was isolated in pure culture from infected seed and grew freely on potato glucose agar. The hyphæ show considerable anastomosis, and bodies resembling appressoria develop on hyphal branches in contact with the base of the petri dish. Conidia similar to those found on diseased seedlings are produced in pure culture.

Healthy flax seedlings were rapidly killed as a result of inoculation with conidia obtained from a pure culture, radicles, hypocotyls, and cotyledons being invaded and destroyed. A similar type of infection was noticed when some of the seed from the original sample was germinated on moist filter papers in petri dishes. Such diseased seedlings became covered with the olivaceous growth of mycelium characteristic of the fungus.

In 1945 a small plot of flax of the variety Buda was examined in which a large number of the plants showed brown lesions towards the bases of the stems. Some of the stems were bent over and broken at this point. When the diseased portions of such stems were incubated in a moist chamber, a fungus fructified upon them which was similar to that already found on the Newlands sample. Seed from the sample which had produced the diseased crop of Buda was later found to be infected by the same species of *Macrosporium* as was the Newlands. Dead flax seedlings of an unknown variety which were sent for examination to this laboratory in 1945 also yielded this fungus.

It was observed during the course of the investigation that the parasite thrives under conditions of high atmospheric moisture, and thus would in a wet spring be likely to cause poor stands in crops sown with infected seed.

So far as I am aware, this fungus or the disease it causes has not previously been recorded. The investigation is being further pursued.

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