

phosphate buffer solution for this acidity. In only one instance out of five did any slight increase in the life-time appear with the phosphate buffer as compared with the other solution. This, however, may have been due to an effect similar to that described recently⁴, which stated that although remarkable success followed stabilization of sodium penicillin with phosphate, it was impossible to produce similar satisfactory results with calcium penicillin solutions.

I should like to express my gratitude to Surgeon-Captain Mussen, R.N., for permission to publish this work.

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¹ Coghill, R. D., *J. Bact.*, **49**, 85 (1945); **51**, 291 (1946).

² Randall, W. M., *J. Amer. Pharm. Assoc.*, **15**, 7 (1945).

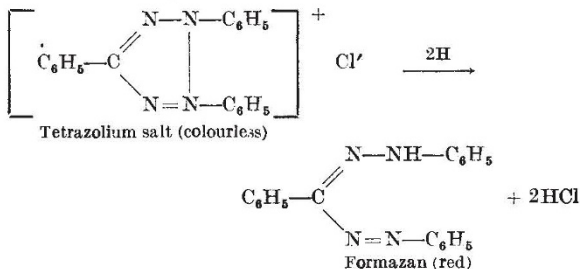
³ Pulvertaft, R. J. U., *Nature*, **158**, 82 (1945).

⁴ Pratt, R., *Nature*, **159**, 233 (1947).

Tetrazolium Salt as a Seed Germination Indicator

A TOPOGRAPHICAL chemical test for germination was devised by Lakon¹ using sodium biselenite, which, on account of its toxicity, he rejected in favour of the tetrazolium salts². Later, he evolved a technique for maize³ with 2,3,5-triphenyl tetrazolium chloride, which was used in Germany during the War⁴. As information about other cereals was inadequate, a preliminary assessment of this compound as a germination indicator has now been made.

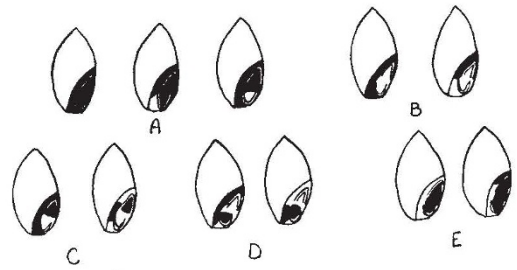
This tetrazolium salt is colourless, non-toxic, water-soluble, and easily reduced by either chemical or phytochemical means⁵ to the triphenylformazan, an insoluble red dye.



When treated with an aqueous solution, the living tissues of germinating seeds are stained red; the conditions of the test being so arranged that the chemical processes of germination have already begun. In cereal seeds the whole of the embryo becomes stained, leaving the endosperm unaffected; whereas dicotyledonous seeds are stained completely.

The seeds are soaked in tap water overnight (18 hr.). Then they are cut through longitudinally in order to bisect the embryo. One half only of each seed is placed in a Petri dish (7 cm.), which just holds 100 grains or vetches, or 25 peas. Tetrazolium salt solution (1 per cent) is poured over them until every seed is just covered, and they are allowed to soak in the dark at 20° C. for 4 hr. The viable seeds have by now become stained, so the solution is poured off and the seeds, after washing with water, are examined individually.

In cereals other than maize, ability to germinate normally is indicated by staining of at least one half of the scutellum, the whole of the shoot part, and



STAINING REGIONS IN CEREAL SEEDS

the transition part between root and shoot where the adventitious roots arise. The accompanying diagram indicates the types of staining encountered; only those in A are capable of normal germination. The same technique has been applied to peas and vetches.

A few typical results are set out in the accompanying table and compared with results obtained by the standard laboratory method.

COMPARISON OF TETRAZOLIUM AND GERMINATION TESTS

Seed	% Seeds capable of normal germination	
	Tetrazolium test	Standard germination test
Oats	85	88
Barley	97	98
Wheat (a)	99	99
Wheat (b)	39	40
Peas	97	97
Vetches	70	66

In the tetrazolium test, results are obtained within 24 hours as compared with ten days or more for the standard laboratory germination test. At the same time, latent causes of abnormality can be observed without any specialized botanical knowledge or skill, or elaborate apparatus. The method is more exacting and time-consuming for the individual worker, but against this must be set the advantage of obtaining a speedy evaluation of seed viability, either as a final or merely as a screening test.

A fuller account of this work will be published elsewhere.

I would like to express gratitude to Mr. C. C. Brett of the Official Seed Testing Station for his advice, and to the directors of May and Baker, Ltd., for permission to publish this communication.

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¹ Lakon, G., *Ber. deut. bot. Ges.*, **57**, 191 (1939).

² Lakon, G., *Ber. deut. bot. Ges.*, **60**, 299 (1942).

³ Lakon, G., *Ber. deut. bot. Ges.*, **60**, 434 (1942).

⁴ C.I.O.S. Report, Item 24, No. XXVI-73.

⁵ Kuhn and Jerchel, *Ber. deut. chem. Ges.*, **74B**, 941.

New Aspects of the Action of Methylthiouracil

G. MANSFELD demonstrated¹ that in the serum of overheated animals a substance, thyrothyryne A, is present which, injected into normal animals, decreases oxygen consumption. Serum of thyroidectomized animals has no effect.

I have shown² that thyroidectomized guinea pigs react to high environmental temperature by a more rapid, higher and prolonged hyperthermia than normal animals. This effect is not due to lack of thyroxine, because thyroxine enhances the effect of