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THE ALLEGED GERMINATION OF MUMMY SEEDS.

BY W. GUY JOHNSON.

IN an address on "The History of a Grain of Wheat from the Seed Bed to the Breakfast Table," which was given before the British Association at Cardiff last year, Sir Daniel Hall, F.R.S., chief scientific adviser to the Ministry of Agriculture, said: "When stored some grains of wheat will die within a year, many more in two years, and very few will survive for such a period as ten years. The idea that grains of wheat stored up with mummies in ancient tombs can be made to give a crop is a pure error." Although this has for many years been the practically unanimous opinion of scientific men upon the question, the belief that wheat and other seeds taken from mummy cases will, if planted under proper conditions, germinate, is still widely held. The supposed fact is sometimes used as an illustration of the resurrection, the analogy being obviously more striking in the case of a grain of wheat found in an ancient Egyptian tomb of possibly 5,000 years ago than when the grain of one year is planted the next season and grows in due course. But the fact that seeds do not ordinarily preserve their vitality for any considerable time raises a presumption against too ready an acceptance of alleged instances of the germination of mummy seeds, a presumption which has been greatly strengthened by the discovery of mistake, and in some cases fraud, where such statements have been made on apparently undeniable authority.

The length of time during which seeds can retain the power of growth varies considerably in different cases. The longest period which has been established beyond reasonable doubt is in the case of a *Nelumbium* water lily from a collection which Sir Hans Sloane deposited in the British Museum. This, according to the late Prof. Daubeny and Mr. W. Carruthers, F.R.S., germinated after having been in the boxes at the Museum for 150 years. But the embryo of the *Nelumbium* is protected by a very hard perisperm, which protects it against both the evaporation of the fluids of the seed and the destructive agency of the oxygen contained in

the air for a much longer time than is the case with seeds whose embryo, like that of wheat, has only a thin covering and is much nearer the outer surface of the seed.

A very interesting series of experiments upon the vitality of seeds was conducted by a Committee of the British Association from 1841-1856, and reports upon these were issued annually; the whole series, which ranged over a great variety of plants, was summarized in their final report, and can be seen in the *Proceedings* of the Association for 1857, pp. 43 *sqq.* The results varied considerably according to the different varieties, but the sudden drop in the vitality of most of them after the age of five or six years is very striking, wheat, in particular, being very short lived. The statement of Sir Daniel Hall that very few grains of wheat will normally survive for ten years is not disputed by any one. The following instances selected at random from the eighteen closely printed columns of the report represent generally the results of the experiments, though in the case of some orders the life is longer, and in a few cases the results would suggest differences in the conditions under which the experiments were conducted.

		Age.	No. sown.	No. grew.
<i>Triticum aestivum</i>	1842	1 year	300	180
	1844	3 yrs.	300	163
	1844	3 yrs.	150 ¹	115
	1844	3 yrs.	300 ²	140
	1849	8 yrs.	300	nil
	1857	16 yrs.	150	nil
	1857	16 yrs.	300	nil
<i>Heliophila araboides</i>	1844	1 yr.	600	275
	1846	3 yrs.	600	165
	1851	8 yrs.	600	nil

The order Leguminosæ is apparently better adapted for survival than most, since seeds of various species germinated after the ages of 26, 27, 42 and 43 years; but of the remaining orders, of which nearly two hundred species were experimented on, very few germinated after the eighth year.

The experiments above referred to relate of course only to seeds which have been preserved with due care under ordinary conditions. They do not, therefore, decide the question as to how long a seed will retain its germinating power if conditions specially

¹ In waxed cloth.

² In open jars.

adapted to preservation were to be found. For example, oxygen, though necessary to the exercise of vital function, is also a great cause of the wear and tear or waste of vital energy, and is the main factor in combustion: the rusting of iron being simply a result of the destructive agency of this gas. It may be possible that if seeds could be protected against the action of oxygen, or the effects of excessive moisture, or the evaporation of their vital fluids, or against other causes of decay, their life would be indefinitely prolonged, and it has been supposed that enclosure in a hermetically sealed sarcophagus afforded some such favourable conditions. But admitting that the tomb were so carefully sealed that no oxygen from outside could find entrance, the amount which would necessarily be enclosed, though not large, would, during a long period of years, produce the same result as a greater quantity does in a shorter time. Mr. W. Carruthers, in an article contributed to *Nature Notes* in January, 1895, said that an examination of the seeds and fruits taken from mummy cases showed that "not only has the embryo been dried up and killed, but the whole substance of the seed or fruit has been slowly oxidized, more or less burnt." The article from which the quotation is taken was entitled "The Germination of Mummy Wheat," and the conclusion of the writer was: "It would be no greater wonder to see the hardened and eviscerated mummy, under favourable treatment, rise up and walk, than to see the grains found in its cerements germinate." This is strongly put, and perhaps need not be taken *au pied de la lettre*, but the general conclusion derives some weight from the fact that the author is a Fellow of the Royal Society, and was at the time of writing Head of the Botanical Department, Natural History Museum, and President of the Linnean Society. It is clear that if the conditions presented by enclosure in a mummy case were proved to be favourable to the prolongation of the life of a seed, such extension of the lease of life is comparatively small, and does not support belief in germination after periods of from two to five thousand years.

We are not, however, left entirely to conjecture in the matter, for a number of experiments under proper conditions have been made upon the germinating power of seeds found in the tombs of ancient Egypt, and although these were not upon the scale of those carried out by the British Association, yet they have been sufficiently

numerous to leave no doubt in the minds of people accustomed to weigh evidence. Prof. P. E. Newberry, F.R.S., who, as a botanist, accompanied Dr. Flinders Petrie on some of his expeditions in Egypt, with a view to reporting on the vegetable remains found in the course of his discoveries, told the writer many years ago that it was important that an expert Egyptologist should be present at the opening of the mummy case in order to be assured that it had not been tampered with, and that the seeds should then be given to a botanical expert to be experimented upon by him. A great many experiments were made on seeds found at Hawara and elsewhere by Prof. Newberry, who is an authority on botany and Egyptology, in conjunction with Dr. Flinders Petrie, but in no case did germination take place. A reference will be found to these experiments on p. 53 of *Hawara, Biahmu and Arsinoe*, published by the British School of Archæology in Egypt. Dr. Flinders Petrie told me recently that he had himself made a number of similar experiments, but without result.

The following paragraph from the *Standard* of September 21, 1894, gives a note of an experiment which was conducted with considerable care, and although it is hardly sufficient of itself to "decide" the question, it gave valuable confirmatory support to the negative opinion which had long been held.

"An experiment on Lord Winchilsea's 'Cable' farm has just decided the oft-mooted question whether or not the mummy wheat found in the Egyptian tombs really possesses the germ of life. A few months ago Lord Sheffield, on his return from Egypt, gave Lord Winchilsea a handful of wheat which he had himself taken from a sarcophagus containing a mummy. One hundred of these grains were carefully planted under a glass frame. The result was awaited with interest by those who knew of the experiment, but after some weeks the seeds were discovered to have rotted away."

The experiment was commented upon in an interesting leading article in the same issue of the *Standard* by a writer who was obviously acquainted with the subject, and his judgment was that there was no authenticated instance of the germination of mummy seeds. He said further: "Wonderful tales have been told of buried seeds springing up after being in the soil, it may have been, for ages. But the exact circumstances under which the seeds were found have never been so fully investigated as to render

the acceptance of such stories safe. On the other hand it is certain that wherever a well authenticated sample of ancient seed has been examined, the result has been invariably the same. It has not sprouted."

The subject has, however, been approached by a French naturalist, M. Edmond Gain, from another direction, that of microscopic examination and chemical analysis of the seeds, but with the same result. He contributed a paper entitled "Sur les embryons du blé et de l'orge pharaoniques" to the Académie des Sciences, Paris, which was published in the *Proceedings* of that body for 1900 (vol. 130, pp. 1,643-6). His conclusion was as follows:

"1. Les Céréales pharaoniques, malgré leur apparence extérieure de bonne conservation, ne possèdent plus une organisation cellulaire compatible avec un réveil germinatif.

"2. Leurs réserves sont souvent chimiquement bien conservées et utilisables par un germe viable, mais l'embryon a subi une transformation chimique très accentuée et n'est plus viable. Cette altération chimique indique même que la vie ralentie du grain est abolie depuis très longtemps.

"La conclusion, en ce qui concerne le blé et l'orge pharaoniques, est donc contraire à ce qu'admettait Alphonse de Candolle, et après lui quelques traités classiques."

It is true that the late Dr. John Lindley at one time expressed a belief in the possibility of seeds retaining their power of germination for an indefinite time, and as he was not only a botanist of great distinction, but also a member of the Committee of the British Association referred to above, his opinion cannot be dismissed lightly. It must, however, be said that he does not appear to have based it on any observations or experiments of his own, but upon statements the details of which he had not personally investigated, and that Prof. Daubeny and Prof. G. Henslow, both members of the same Committee, expressed a directly contrary opinion, and it would be difficult now to find a botanist of any eminence who shared his view. The late Sir Joseph D. Hooker wrote very definitely: "I am of opinion that there is no truth in the assertion that wheat taken from mummy cases in Egypt and 4,000 years [old] (or even 1,000) has germinated." Hugh Macmillan, the author of *Bible Teachings in Nature*, and of some other books of a semi-scientific kind, did, it is true, countenance the popular belief, and the wide circulation of his books gave additional cur-

rency to it ; but in reply to an inquiry on the subject he wrote :

“ I may state that my views regarding the statements about the germination of seeds in my books to which you allude have undergone considerable modification. Whatever countenance I may seem by my remarks to have given to the popular belief that mummy wheat has germinated, I should now entirely withdraw. I believe it has been proved beyond doubt that the originators of the idea were cheated by the crafty substitution unobserved of recent wheat for the grains of old wheat found in mummy cases. Arabs have sold to credulous travellers as coming out of the same tombs as this ancient wheat dahlia bulbs and maize grains—implying that the Pharaohs 3,000 years ago must have been in commercial relations with America, from which these bulbs and seeds came ! Experiments made under proper conditions, by properly qualified scientific men, upon authentic seeds have in every case signally failed. They seem as dead as a door nail.”

The words just quoted explain the growth of the popular belief. In some cases Arabs have sold to credulous travellers seeds and other things alleged to have been taken from ancient tombs. In others these have been placed there beforehand so that they might be taken out before the eyes of the purchaser. At least one instance is known of fraud on the part of the gardener in England to whom the seeds were entrusted for experiment (*Journal of Botany*, Jan., 1879). In another case, where no fraud is alleged, a find of wheat was discovered to have been stored in some common corn jars in Cairo, which might well have contained a few grains of the ordinary stock (*Nature Notes*, Aug. 15, 1890). There is in every case either direct proof of fraud, or some loophole for innocent mistake, or else a defect of evidence necessary to establish the fact beyond reasonable doubt.

For some further details as to how accident, mistake, or fraud has given rise to the popular view on this subject, reference should be made to the articles by Professor G. Henslow and Mr. Carruthers in *Nature Notes*, which have been quoted above ; and also a brief but most interesting paper on the subject by Professor Flinders Petrie, F.R.S., in *Ancient Egypt*, 1914, part 2. In this paper Professor Petrie mentions the case of some unopened mummy coffins which were presented by Ismail Pasha to a great personage in England. When opened over here, grains of wheat were found in it, some of which grew. On inquiry being made it was found that the coffins had been stored in the stables in Egypt and had

been seen with the corn heap run over them. Any crack or warp in the lid would easily allow of the entrance of seeds, and these when taken out and planted would, naturally enough, germinate.

With regard to the statement on page 181 that plants of the order Leguminosae are better adapted for survival than most, there is, of course, no evidence or probability that their seeds will retain the power of germination for a period nearly as long as that considered in this paper. It is desirable to mention this, as mummy peas have been as much cited in this connection as mummy wheats. Mr. Arthur W. Sutton has informed me, since this paper was in print, that there is a well-known type of garden pea called the "Mummy," or Crown Flowered, Pea, botanically known as *Pisum umbellatum*. This pea, as its name implies, bears its flowers in a cluster or umbel at the top of a long flattened or fasciated stem. It has been grown for at least forty or fifty years in the Trial grounds at Reading, and every few years correspondents, hearing of so-called "mummy" peas, have sent samples with stories of the seeds having been taken out from Mummy cases, though the evidence breaks down on investigation.

I should like to express here my grateful appreciation of the unvarying kindness shown to me by those whom I have consulted at different times when looking up this question. The names of some have been mentioned above. To these should be added, Dr. A. B. Rendle, F.R.S., of the Natural History Museum; Miss Murray, of the British School of Egyptian Archæology; Mr. Watson, Curator, and Mr. Skan, Librarian, at Kew. To Mr. Skan I am especially indebted for directing me to M. Edmond Gain's paper in the *Proceedings* of the Académie des Sciences.

The matter is perhaps not of great practical importance, and it has been long settled so far as the botanical world is concerned; but, though perhaps at the cost of disturbing long-cherished beliefs, it is as well to correct unfounded impressions. If ostriches do not bury their heads in the sand on the approach of danger, and if mummy wheat will not grow, it is better not to draw on them for illustrations, even if speeches and sermons may lose something that is familiar and picturesque by the omission.

W. GUY JOHNSON.