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OLD CORN SEED (FRUIT) VIABILITY

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ABSTRACT: Genetic corn used to demonstrate the inheritance of two traits in an introductory biology course was purchased in 1963 from the Carolina Biological Supply Company. Over the years, the students picked at the end kernels until they were loosened and started to separate from the cob. To prevent further deterioration, the disfigured ends of each cob were cut off, and the remaining kernels were coated with polyurethane varnish. In 1988, an attempt was made to germinate some of the varnished seeds. Some germination of the 25 year old kernels was noted after 10 days. The polyurethane coating may have prolonged the viability of the seeds.

INTRODUCTION

Many plant seeds do not remain viable for more than a few weeks, when stored under ambient temperature and relative humidity. Other seeds retain their viability for only a few years. Since the late-19th century, there have been numerous claims to unusual periods of seed longevity which in some cases involve thousands of years (e.g. Arctic lupine (10,000 years) or wheat taken from the Egyptian pyramids (3,000 years)). Other plants purportedly having long seed viability include lotus, barley, oats, mallows, mullein, and lamb's quarters. Unfortunately, only those plants whose seed longevities range between one and one hundred fifty years can be accurately documented. Even for some of these, the validity of the report has been questioned (Roos, 1986).

Seeds taken from bricks by Hendry and Kelley in 1925 and stored in glass vials for 50 years gave indications that some of the embryos were viable. However, the seeds did not germinate, although one seed of *Medicago* produced a radicle and thickened cotyledons (Roos, 1986). In the one hundredth year of Dr. Beal's buried seed experiment involving 23 species, only *Verbascum thapsis* (or perhaps *V. blattaria*) and *Malva rotundifolia* survived the century mark (Kivillan and Bundurski, 1973).

The longest documented viability in seeds of our common agricultural crops is reported in the work of Aufhammer and Simon. When they attempted to germinate wheat, oat, and barley seeds which had been stored in a tube for more than 120 years, they found that 21% of the oat seeds and 12% of the barley seeds germinated. None of the wheat seeds germinated (Roos, 1986).

Although there seems to be ample evidence that corn seeds stored longer than twenty-five years under ambient temperatures and humidity can be germinated successfully, little documentation has found its way into the literature. A notable exception is the work of Haferkamp, Smith, and Nilan (1953). In their study, the seeds of agricultural crops were tested for germination after thirty-two and thirty-three years in storage under ambient conditions. Some of these seeds germinated. The low moisture content of the atmosphere in Lind, Washington, the site of the tests, seemed to be a major factor in the retention of seed viability.

MATERIALS AND METHODS

Genetic corn used to demonstrate the inheritance of two traits was purchased from the Carolina Biological Supply Company in 1963. About ten years ago, the ends of the deteriorating ears were cut off, and the remainder of each ear was heavily painted with several coats of polyurethane varnish to affix the kernels to the cob. (A similar process is now being used by Carolina (personal communication)). These ears were replaced with new ears in 1988.

The old ears were used to test for corn seed viability after long-term storage under ambient conditions. The kernels were either tested directly (i.e., they were untreated), or they were subjected to one of two treatments. Treated seeds were immersed in full-strength commercial Chlorox for 30 seconds and then rinsed with either deionized water (Treatment 1) or tap water (Treatment 2). Immersion in Chlorox for longer than 30 seconds proved to be lethal to the embryos. The Chlorox was used to inhibit the growth of mold, which normally terminated the experiment after about 11 days. Despite the use of Chlorox, little inhibition of mold was noted. Except for the yellow-wrinkled seeds, which were limited in number, lots of twenty-five kernels were put into petri dishes with moist toweling to test for germination.

Seeds from two ears of new corn were used to run comparative germination tests with the seeds from the old ears. After three days, germination of the new seeds was complete, yielding a germination rate of 100%. Unpainted corn of the original shipment was discovered in 1989. Two attempts to germinate their uncoated kernels were made. The old uncoated corn failed to germinate in both trials.

Table 1. Germination of twenty-five year-old corn kernels coated with polyurethane varnish by genotype. For a discussion of the treatments used, the reader is referred to the text.

Test	Duration (days)	Treatment	Phenotypes	Number Seed	Percent Germinated
1	12	Untreated	purple-smooth	25	36% (9)
			yellow-smooth	25	32% (8)
			purple-wrinkled	25	0% (0)
			yellow-wrinkled	8	25% (2)
2	13	1	purple-smooth	25	24% (6)
			yellow-smooth	25	8% (2)
			purple-wrinkled	25	0% (0)
			yellow-wrinkled	13	7.7% (1)
3	10	2	purple-smooth	25	12% (3)
			yellow-smooth	25	32% (8)
			purple-wrinkled	25	0% (0)
			yellow-wrinkled	8	0% (0)
4	10	2	purple-smooth	25	16% (4)
			yellow-smooth	25	4% (1)
			purple-wrinkled	50	2% (1)
			yellow-wrinkled	6	0% (0)

RESULTS AND DISCUSSION

In the four tests in which the embryos survived (Table 1), the average germination of the varnished kernels was 13.3%. In each case, the trial was terminated by mold growth in the petri dish. Untreated kernels showed a higher germination rate (22.9%) than the kernels that were treated with Chlorox (9.4%). Even a 30 second immersion in Chlorox proved detrimental to germination. Scarification of the polyurethane-coated kernels did accelerate germination slightly but did not enhance germination percentages overall.

Corn and rye have poor viability records when no special conditions are imposed on storage of the seeds. In these germination trials, twenty-five year old genetic corn, heavily coated with polyurethane varnish for about ten years, exhibited a moderately good rate of germination, while uncoated kernels of the same origin failed to germinate. Perhaps, the polyurethane coating contributed to the increased viability of the coated seeds.

LITERATURE CITED

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