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# The Development of Knowledge and a Conceptual Framework for Seed Longevity

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## Abstract

The length of time a seed can remain viable is known as its lifespan or longevity. Seed longevity is a complicated property that varies significantly between species and even between species-specific seed lots. From anecdotal "Thumb Rules" to empirically based models, biophysical explanations for why those models sometimes work or fail, and the profound realization that seeds are the model of the underexplored realm of biology when water is so limited that the cytoplasm solidifies, our scientific understanding of seed longevity has advanced. Moisture and temperature, as well as the duration of a person's life, are crucial environmental variables that determine survival or demise. The mechanisms by which these factors influence glassy properties and cause cytoplasmic solidification are becoming better understood. The chemical reactions that go into aging are slowed down but not stopped by cytoplasmic solidification. The seed's metabolic capacity is reduced as a result of the continued degradation of proteins, lipids, and nucleic acids, which eventually hampers the seed's ability to germinate.

**Keywords:** Seed longevity • Cryopreservation • Seed ageing • Glassy state

## Introduction

The Internet of things (IoT) adds a fascinating new dimension to field research by enabling researchers to access their data and insights at any time and from any location. As a result, physical and chemical measurements can now be taken on-site or in the laboratory with only a fraction of the effort required for manual data collection [1,2]. It also means that a network of sensors can be set up in a particular area of interest and communicate with each other to give a complete picture of what's going on there. This is especially useful for monitoring the quality of the water because changes in the environment can have serious effects downstream.

The Internet of Things (IoT) has gained popularity in recent years for a wide range of uses, including water quality monitoring. It is possible to continuously monitor the quality of water in real time using IoT devices like the Raspberry Pi and sensors that measure temperature, oxygen, and pH. Using programming languages like Python and Julia, this data can be gathered and analyzed to learn more about water management and make better decisions [3,4]. A system with oxygen and temperature sensors, for instance, could be used to monitor a lake's or river's health. Potential problems like algal blooms or changes in the ecosystem can be identified by detecting changes in temperature and oxygen levels. In a similar vein, the acidity and pollution levels of water bodies can be measured using pH sensors and BOD sensors (biochemical oxygen demand).

While there are undeniable advantages to using IoT for water quality monitoring, there are also some obstacles that must be taken into consideration. Data management is one of the most difficult issues because a large sensor network can generate a lot of data. In addition, it is essential to ensure the quality of the data because this is necessary for accurately predicting future conditions.

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## Methods

Applications of the Internet of Things Although the term "Internet of Things" has been a buzzword in the tech industry for a number of years, it appears that applications of the technology are only just beginning to be fully realized. Water quality monitoring is one area where the Internet of Things is beginning to have a significant impact [5].

Using the Internet of Things to monitor water quality has numerous potential advantages. For example, real-time data that can be used to make decisions about how to use and treat water can be helpful. This is especially important in places where there is a problem with water scarcity. The Internet of Things can also assist in locating and tracking pollution sources, which are essential for preserving public health and the environment.

## Discussion

The chemical reactions that go into aging are slowed down but not stopped by cytoplasmic solidification. The seed's metabolic capacity is reduced as a result of the continued degradation of proteins, lipids, and nucleic acids, which eventually hampers the seed's ability to germinate. This review examines the development of seed longevity knowledge over the past five decades in terms of seed ageing mechanisms, technology, tools for predicting seed storage behavior, and non-invasive methods for assessing seed longevity. It is concluded that seed storage biology is a complex field that encompasses seed physiology, biophysics, biochemistry, and multi-omic technologies. To increase seed storage efficiency for crops and the preservation of wild species biodiversity, it is necessary to simultaneously advance knowledge in these fields.

## Conclusion

To rationally achieve the maximum SERS sensitivity, the SERS mechanism of MOFs must be investigated in greater depth and breadth for applications in SERS measurements. Through the chemistry of the MOF with the analyte of interest, additional novel and simple methods are anticipated to produce distinctive Raman signals. For MOF-based SERS to be used in real-world samples, it will be crucial to work toward reproducible MOF substrates with high enhancement factors.

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## Conflict of Interest

None.

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