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Seed Maturity Influences Quality

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SEED MATURITY INFLUENCES QUALITY

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The life of a seed begins with fertilization. At some point in time - after fertilization and before physiological maturity - the seed becomes capable of germination. This varies with the species. Some grasses may be capable of germination within four to five days after fertilization. Other species take longer. Wheat seeds have been reported to be capable of some germination only five days after anthesis (blooming). Sorghum seeds germinated 35%, 10 days after anthesis; cotton 30%, 22 days after anthesis; and soybean 10%, 35 days after anthesis. At initial germination, and for several days after, seedlings are very weak and cannot sustain life except under the most favorable condition. The capability of seeds to survive increases as seed size and dry weight increase until it reaches physiological maturity.

Losses in quality can occur during this period in the life of the seeds. Insect damage, such as stinkbug damage in soybean, causes a drastic reduction in germination. Todd and Turnipseed (2) found soybean seeds with no stinkbug damage to emerge 86.5%, light stinkbug damaged seeds emerged 69.5%, medium damaged seeds emerged 14.5%, heavy damaged seeds emerged only 3.8%, and severely damaged seeds emerged zero in field tests.

Application of certain herbicides can affect seed quality. Again in soybean, 2,4-D herbicide applied during pod filling increased abnormalities by as much as 64.3%. The application of dicamba during flowering reduced emergence of seeds produced from 44 to 100%; when applied during pod fill, results were very similar (3).

The application of 2, 4-D to cotton prior to complete maturation of the seeds greatly increases abnormal seedlings. Diseases, particularly the viruses, can infest seeds during this time in the life of the seeds. Seedborne diseases are beyond the scope of this paper. There are numerous publications on the subject. Seed Science and Technology Volume 11, No. 3, 1983 contains the Proceedings of an International Symposium on Seed Pathology.

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Weather can cause losses in seed quality prior to physiological maturity. In some years, corn seeds freeze before they mature. Cool nights can cause immature seeds in cotton.

Physiological maturity is the "high point" in the life of the seeds. At this point, seeds attain maximum dry weight, maximum germination and maximum vigor (Figure 1). Fortunately, most seeds reach this point in a good state of health most of the time.

At physiological maturity, seeds are quite high in moisture. Seed moisture content will range from 30 to 60% at this point depending on the species (Figure 1). Few crops can be mechanically harvested at this point because of the high seed moisture. One exception is corn. Corn can be harvested in the ear at approximately 35% seed moisture without risk of mechanical damage, then dried to a safe moisture content before further conditioning.

Beginning at physiological maturity, seed quality begins to decline. This decline (deterioration, aging, proceeding toward death) cannot be reversed or stopped. It can be controlled (delayed, life extended) through manipulation of storage conditions. Cool, dry, or frozen storage may extend the life of a seed for long periods. However, eventually this decline culminates in death.

A second major point in the life of a seed is field maturity (Figure 2). At this point, seeds are approximately 18 to 20% moisture. Seeds of many species can be harvested at this point with a minimum amount of mechanical damage. Drying is necessary if harvest is begun at this point. Seeds harvested at field maturity and properly dried are generally high quality seeds. Soybeans harvested at 20% moisture and dried may germinate as high as 98% (1). Rice is a crop that is traditionally harvested at 18 to 22% seed moisture and dried. Seed quality in rice is generally not a problem.

Losses in quality are generally minor from physiological maturity to field maturity. Insects can be a minor problem as can disease except those transmitted into the seeds earlier. Deterioration due to weather is very minimum.

Harvest maturity (Figure 2) is the point where seeds are sufficiently dry for safe storage with little or no drying. Seed moisture content is generally 14% or less. There is a minimum amount of mechanical damage when harvesting equipment is properly adjusted.

From field maturity to harvest maturity, weather is a primary problem. Many of the seedborne diseases are acquired during this period. High temperatures, high relative humidity and rainfall cause fluctuation in seed moisture. All of these factors culminate in reductions in seed quality. If seeds can be harvested at the point of harvest maturity, seed quality is usually good. If adverse field

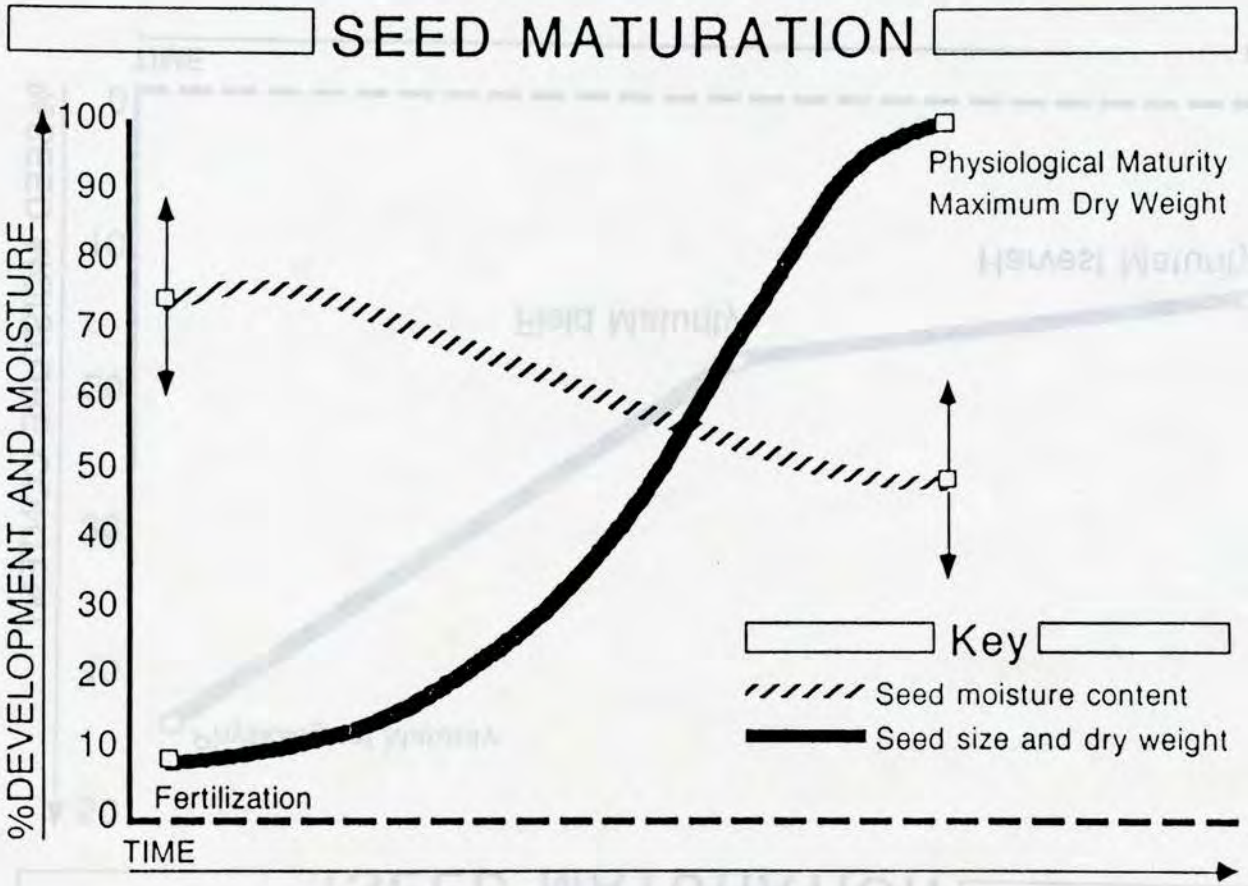

Figure 1. Physiological maturity of a typical seed.

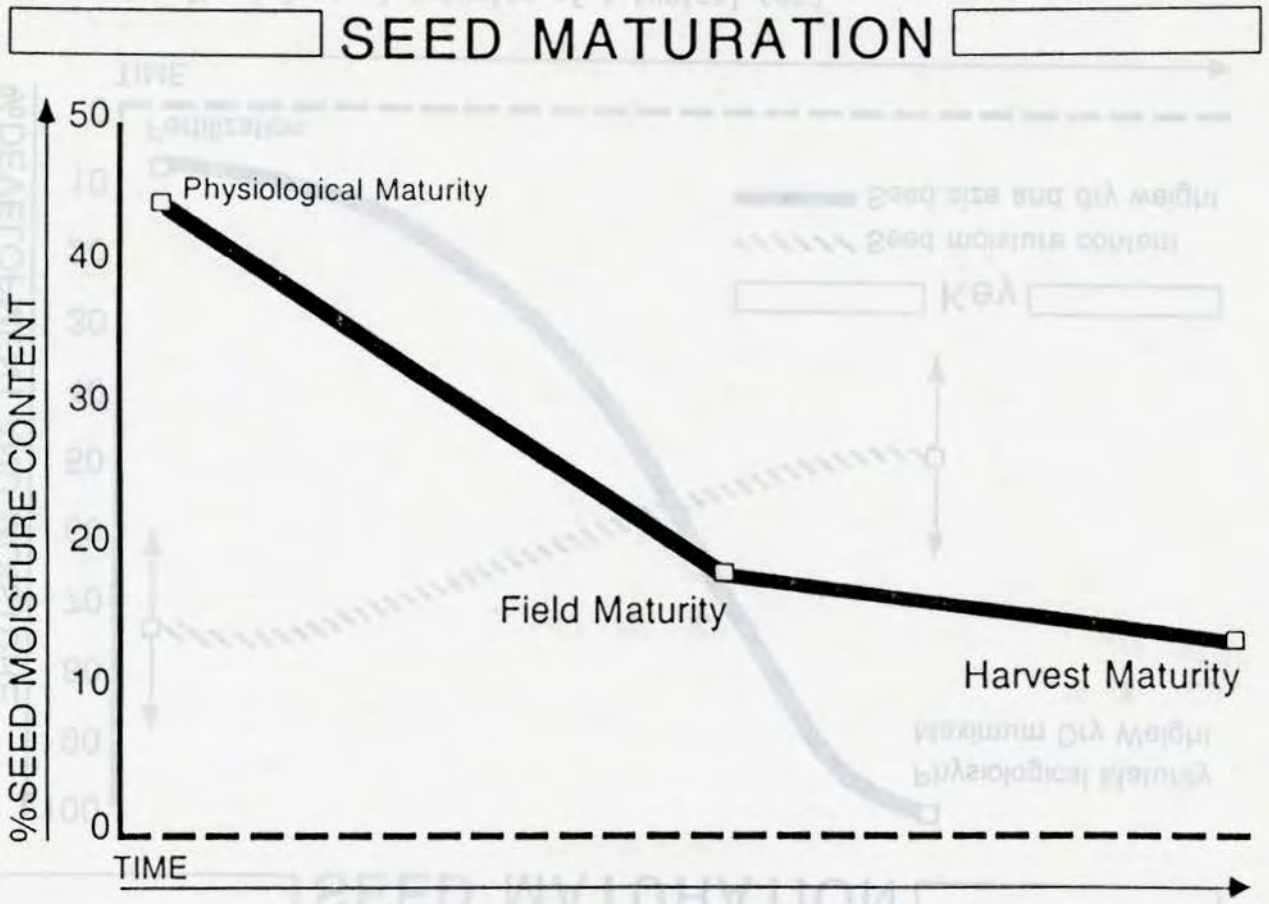

Figure 2. Physiological, field, and harvest maturity of seeds.

conditions do not prevail, quality will "hold" for sometime. However, in the humid regions of the world, often this time is short. In arid regions, excessive seed drying can be a problem.

The relationship between field exposure and seed quality of soybeans is illustrated in Table 1.

Summary

The life of a seed begins when fertilization takes place. The capability to germinate is attained prior to maturation. Seed quality can be affected by insects, diseases and weather prior to maturity. At physiological maturity, seeds reach maximum dry weight, germination and vigor. At this point, seed moisture content is generally too high for mechanical harvesting. Beginning at physiological maturity, quality begins to decline culminating at some point in time in death of the seeds. This declining process is irreversible but can be controlled.

Field maturity occurs when seeds are in the 20% moisture range. They can be mechanically harvested at this point but must be dried for safe storage. From physiological maturity to field maturity, insects, diseases and weathering are not generally a serious problem. Seeds harvested at field maturity and properly dried are generally high quality.

Harvest maturity occurs when seeds are sufficiently dry for safe storage with little or no drying, in the range of 14% seed moisture or less. From field maturity to harvest maturity, weathering is a primary problem. Most externally borne diseases infest seeds during this period. Loss of seed quality due to field exposure can be severe. However, seeds harvested when harvest maturity is initially reached are generally good quality.

Literature Cited

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Table 1. Effect of weathering on moisture content (M.C.) and germination of seeds of the Hill and Bragg soybean varieties.

Date of Harvest[a]	Hill		Bragg	
	M.C.	Germination %	M.C.	Germination %
9/15	26			
9/22	13	96		
9/29	17	97		
10/06[b]	20	78		
10/13	11	76	26	98
10/20[b]	19	71	18	98
10/27	12	53	13	93
11/03[b]	14	37	14	92
11/10			12	92
11/17[b]			20	89
11/24[b]			13	86
12/01			15	87
12/08			11	84
12/15[b]			14	84

[a]Seeds are hand harvested and threshed, then cleaned with hand screens and aspirator before germination test.

[b]One or more before germination test.