Seed Growth and Development

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Seeds of grain crops are harvested to either regenerate the crop or as economic yield. Although the seed is harvested in both cases, the utilization, requirements of production, and evaluation of quality may be different. The utilization of seeds to regenerate the crop is considered by McDonald in Chapter 3A, this chapter will focus on the seed as the organ harvested for economic yield as a source of food and feed. However, the developmental processes are the same, regardless of the end use.

Yield can be described simply as the production of assimilate by photosynthesis and the accumulation of these assimilates in the plant parts harvested for yield—the seeds (Charles-Edwards, 1982). Traditionally, research on the physiological basis of yield focused on processes involved in the production of the materials that eventually make up yield with less emphasis on the utilization of these materials by the seeds. In the past 10 to 15 yr, there has been an increased awareness that understanding the yield production process requires an understanding of seed growth and development.

Many plant species are utilized by man as seed crops (Harlan, 1975). Consequently, the structures harvested for economic yield vary in morphology, size, shape and composition. In cereals, the harvested unit is a caryopsis that has high starch concentrations. The legume seed has two large cotyledons high in protein. Seeds of other species accumulate high concentrations of oil (Bewley & Black, 1978). This variation makes it difficult to review seed growth and development for all crop plants in the limited space available. Consequently, this chapter will focus on soybean [Glycine max (L.) Merrill] seed, which has been studied by many seed researchers. However, seed growth characteristics are remarkably consistent across crop species, and species comparisons will be made where appropriate.

Yield is the weight of seeds produced per unit area. These seeds develop from flowers that may be located at different positions on the plant or in the reproductive inflorescence and may reach anthesis at different times. This variation makes it difficult to investigate seed growth characteristics by studying, as a single unit, the growth and development of all seeds on a plant or...