Growth and Development

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For a successful wheat management program, you need to understand how the wheat plant grows and develops. You have to make management decisions and apply inputs, such as nitrogen, fungicides, herbicides, and insecticides, at the proper stages of growth, not according to calendar dates. Wheat (like any other crop) responds best to inputs at certain stages of development. You can maximize potential effectiveness of an input and optimize production and profit by knowing wheat growth stages and observing plant development. The most popular system of identifying wheat growth stages is the Feekes scale (Figure 2-1, Table 2-1). The Feekes scale goes from 1.0 (just after emergence) to 11.4 (ripe for harvest).

A critical developmental stage in determining yield is the grain filling period from 10.51 (flowering) to 11.3 (kernel hard). The longer this filling period lasts, the greater the chance is for a high yield. If this period is shortened due to hot, dry weather or serious disease conditions, yields will tend to be lower. The kernel reaches its maximum weight at physiological maturity during growth stage 11.3 (kernel hard) at about 38 to 42 percent moisture. Harvesting can begin any time after physiological maturity, depending on the method of harvesting and the drying facilities available (refer to Section 10—Harvesting, Drying, and Storing Wheat). Become familiar with the Feekes scale because application windows for pesticides and growth regulators are based on it. The Feekes scale will be referred to throughout this publication.

Table 2-1. Wheat growth stages identified by the Feekes scale.

Stage		Description
Tillering	1	One shoot (number of leaves can be added), first leaf through coleoptile.
	2	Beginning of tillering; main shoot and one tiller.
	3	Tillers formed; leaves often twisted spirally. Main shoot and six tillers. In some varieties of winter wheat, plant may be “creeping,” or prostrate.
	4	Beginning of the erection of the pseudo-stem; leaf sheaths beginning to lengthen.
	5	Pseudo-stem (formed by sheaths of leaves) strongly erected.
Stem extension	6	First node of stem visible at base of shoot.
	7	Second node of stem formed; next-to-last leaf just visible.
	8	Flag leaf (last leaf) visible but still rolled up; ear beginning to swell.
	9	Ligule of flag leaf just visible.
	10	Sheath of flag leaf completely grown out; ear swollen but not yet visible.
Heading	10.1	First spikelet of head just visible.
	10.2	One-quarter of heading process completed.
	10.3	Half of heading process completed.
	10.4	Three-quarters of heading process completed.
	10.5	All heads out of sheath.
Flowering	10.51	Beginning of flowering.
	10.52	Flowering complete to top of head.
	10.53	Flowering completed at base of head.
	10.54	Flowering completed; kernel watery ripe.
Ripening	11.1	Milky ripe.
	11.2	Mealy ripe; contents of kernel soft but dry. Soft dough.
	11.3	Kernel hard (difficult to divide with thumbnail).
	11.4	Ripe for cutting. Straw dead.

Figure 2-1. The Feekes scale of wheat development.