

Cereal Grain Development Stages By Zadoks, Feekes And Haun

Zadoks Scale	Feekes Scale	Haun Scale	Description	Zadoks Scale	Feekes Scale	Haun Scale	Description
			Germination				Booting
00			Dry seed	40			—
01			Start of imbibition	41		8-9	Flag leaf sheath extending
03			Imbibition complete	45	10	9.2	Boots just swollen
05			Radicle emerged from seed	47			Flag leaf sheath opening
07			Coleoptile emerged from seed	49		10.1	First awns visible
09		0.0	Leaf just at coleoptile tip				Inflorescence Emergence
			Seedling growth	50	10.1	10.2	First spikelet of inflorescence visible
10	1		First leaf through coleoptile	53	10.2		1/4 of inflorescence emerged
11		1.+	First leaf unfolded	55	10.3	10.5	1/2 of inflorescence emerged
12		1.+	2 leaves unfolded				3/4 of inflorescence emerged
13		2.+	3 leaves unfolded	57	10.4	10.7	Emergence of inflorescence completed
14		3.+	4 leaves unfolded				Anthesis
15		4.+	5 leaves unfolded	59	10.5	11.0	Beginning of anthesis
16		5.+	6 leaves unfolded				Anthesis half-way
17		6.+	7 leaves unfolded	60	10.51	11.4	Anthesis complete
18		7.+	8 leaves unfolded	65		11.5	Milk development
19			9 or more leaves unfolded	69		11.6	—
			Tillering				Kernel watery ripe
20			Main shoot only	70			Early milk
21	2		Main shoot and 1 tiller	71	10.54	12.1	Medium milk
22			Main shoot and 2 tillers	73		13.0	Late milk
23			Main shoot and 3 tillers	75	11.1		Dough development
24			Main shoot and 4 tillers	77			—
25			Main shoot and 5 tillers	80			Early dough
26	3		Main shoot and 6 tillers	83		14.0	Soft dough
27			Main shoot and 7 tillers	85	11.2		Hard dough
28			Main shoot and 8 tillers	87		15.0	Ripening
29			Main shoot and 9 or more tillers	90			—
			Stem elongation	91	11.3		Kernel hard (difficult to divide by thumbnail)
30	4-5		Pseudo stem erection	92	11.4	16.0	Kernel hard (can no longer be dented by thumbnail)
31	6		1st node detectable	93			Kernel loosening in daytime
32	7		2nd node detectable	94			Overripe, straw dead and collapsing
33			3rd node detectable	95			Seed dormant
34			4th node detectable	96			Viable seed giving 50% germination
35			5th node detectable	97			Seed not dormant
36			6th node detectable	98			Secondary dormancy induced
37	8		Flag leaf just visible	99			Secondary dormancy lost
39	9		Flag leaf ligule/collar just visible				

**The Haun scale stages used in this example from boot through ripening are based on a seven-leaf plant.

Table 2. Cereal grain development stages by Zadoks, Feekes and Haun.