**Corn Growth and Development**

**Vegetative Stages**

**VE – Emergence** Emergence occurs when the first leaves, called the spike or coleoptile, appear above ground. The seed absorbs water (about 30% of its weight) and expands. The radicle root quickly emerges near the tip of the kernel, depending on soil moisture and temperature conditions. The coleoptile emerges from the embryo side of the kernel and is pushed to the soil surface by mesocotyl elongation. The mesocotyl encloses the plumule leaves that open as the shoot approaches the soil surface.

**Management** Ideal soil temperatures (50 to 55 degrees Fahrenheit) and moisture conditions promote rapid emergence (5 to 7 days). Optimum seed placement varies from 1 to 2 inches deep. Appropriate planting depth of corn helps to decrease water stress. Cold, dry, and deep planting can delay emergence and decrease yields.

**V1 – First-Leaf** One leaf with collar visible (structure found at the base of the leaf). The first leaf in corn has a rounded tip. From this point until flowering (VT stage), leaf stages are defined by the uppermost leaf visible. The growing point is located below the surface until the late V5 stage.

**Management** Scout for proper emergence (e.g., 30 plants in 17 inches of row spacing = 30,000 plants per acre), early-season winds, insects, diseases, and other production issues.

**V2 – Second-Leaf** Nodal roots begin to emerge below ground. Seminal roots begin to senesce. Moisture is fairly evenly distributed throughout the root system. Leaves still developing on apical meristems (primary growth of the plant).

**V3 – Third-Leaf** Semi-leaf 

**V4 – Fourth-Leaf** Six leaves with collar visible. The first leaf with the rounded tip is senescent; consider this point when counting leaves. The growing point emerges above the soil surface. All plant parts are initiated. Sometime between V4 and V6, the potential number of rows (near germination) is set. The growing point is located below the surface, in the lowest, below-ground nodes of the plant.

**Management** Scout for weeds, insects, and diseases. Razed nutrients uptake begins at this stage. Timing nutrient applications to match this uptake enhances the potential for greater nutrient use efficiency, particularly for mobile nutrients such as nitrogen.

**V10 – Tenth-Leaf** Begins development in the lower above-ground nodes of the plant. Until this stage, rate of leaf development is approximately 2 to 3 days per leaf.

**Management** Nutrient profile (K >> nitrogen = N >> phosphorus = P) and water (0.25 inch per day) demands for the crop are high. Heat, drought, and nutrient deficiencies will affect potential number of kernels and ear size. Scout for root lodging issues and diseases (e.g., corn root, brown spot). Rating control is critical since corn does not tolerate early-season competition from weeds, nematodes, and radiation well.

**V14 – Fourteen-Leaf** Rapid growth. This stage occurs approximately two weeks before flowering. Nutrients are available to the plant. scout for root lodging issues (e.g., common rust, brown spot). Abnormal corn ears can result and be obvious from this time until flowering.

**VT – Tassel** Potential kernels per row is set, final potential grain number (number of ovules), and potential ear size are being determined. Last branch of the tassel is visible at the top of the plant. Silks may or may not have emerged. The plant is almost at its maximum height.

**Management** Nutrient (K + P and water) (0.10 inch per day) demands for the crop are close to maximum. Heat and drought will affect potential number of kernels near the base of the ear. Silks remain active until pollinated. Pollen falls from the tassel to the silks, fertilizing the ovule to produce an embryo. Potential kernel number is determined. Maximum plant height is achieved. Following fertilization, silus division is occurring within the embryo.

**V15 – Silking** Flowering begins when a silk is visible outside the husks. The first silks to emerge from the husk leaves are those attached to potential kernels near the base of the ear. Silks remain active until pollinated. Pollen falls from the tassels to the silks, fertilizing the ovule to produce an embryo. Potential kernel number is determined. Maximum plant height is achieved. Following fertilization, silus division is occurring within the embryo.

**Management** Nutrient (N and P accumulation is still progressing, K is almost complete) and water (0.33 inch per day) demands for the crop are high. Heat and drought will affect pollination and final grain number. Defoliation by hail or other factors such as insects will produce a large yield loss.

**R1 – Silking** Silks are present. Corn is pollinated by the pollen falling from the tassel to the silks. Pollen grains land on the stigma, the ovule, and begin to be fertilized. Potential kernels are set, and the plant is physiologically mature.

**R2 – Blister** Silks dark. Corn is ready for harvest. Most of the kernels are dented. Kernel weight is almost complete. Harvesting is commencing. Grain filling is commencing. Management Stress can reduce yield potential by reducing final grain number (abortion).

**R3 – Milk** Silks drop due to things such as European corn borer damage.

**R4 – Dough** Starchy material within the kernels has dough-like consistency (approximately 26 to 30 days after R1). Rapid accumulation of starch and nutrients occurs, kernels have 70% moisture, and begin to dent on the top. Material squeezed out of the kernel has dough-like consistency. Management Stress can produce unfilled or shallow kernels and “shotty” ears. Impact of frost on grain quality can be severe when it occurs at this stage (25 to 40% yield loss from light to killing frost, respectively).

**R5 – Dent** Most of the kernels are denting. Kernel moisture declines to approximately 55% (38 to 42 days after R1) as the starch content increases.

**R6 – Maturity** A black layer forms on the base of the kernel, blocking movement of dry matter and nutrients from the plant to the kernel (50 to 60 days after R1). Kernels are almost at their maximum weight (30 to 35% moisture) and are physiologically mature.

**Management** Grain is not ready for forage storage. Frost or any biotic or abiotic stress does not impact yields after this development stage. Lodging from disease, insect damage, or hail can result in physical loss of yield. Yield can be protected, but recommended moisture for long-term storage is 14%. Scout fields for the drop due to things such as European corn borer damage.

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**Yield components and critical growth stages for their definition in corn production.**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Ear Mass (grams)</th>
<th>Ears per area</th>
<th>Weight (dry matter)</th>
<th>Black layer</th>
<th>Kernel weight</th>
</tr>
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<tbody>
<tr>
<td>V1</td>
<td>20</td>
<td>50</td>
<td>30</td>
<td>30</td>
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<tr>
<td>V2</td>
<td>40</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>0.5</td>
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<tr>
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<td>150</td>
<td>70</td>
<td>70</td>
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<tr>
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<td>120</td>
<td>200</td>
<td>90</td>
<td>90</td>
<td>0.9</td>
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<tr>
<td>V5</td>
<td>160</td>
<td>250</td>
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<td>110</td>
<td>1.1</td>
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<tr>
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<td>200</td>
<td>300</td>
<td>130</td>
<td>130</td>
<td>1.3</td>
</tr>
</tbody>
</table>

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**Milk Line Progression**

**Corn Growth and Development Stages**

**Milk Line**

**Milk**

**Line**

**Yield**

**Components**

**of Corn**

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