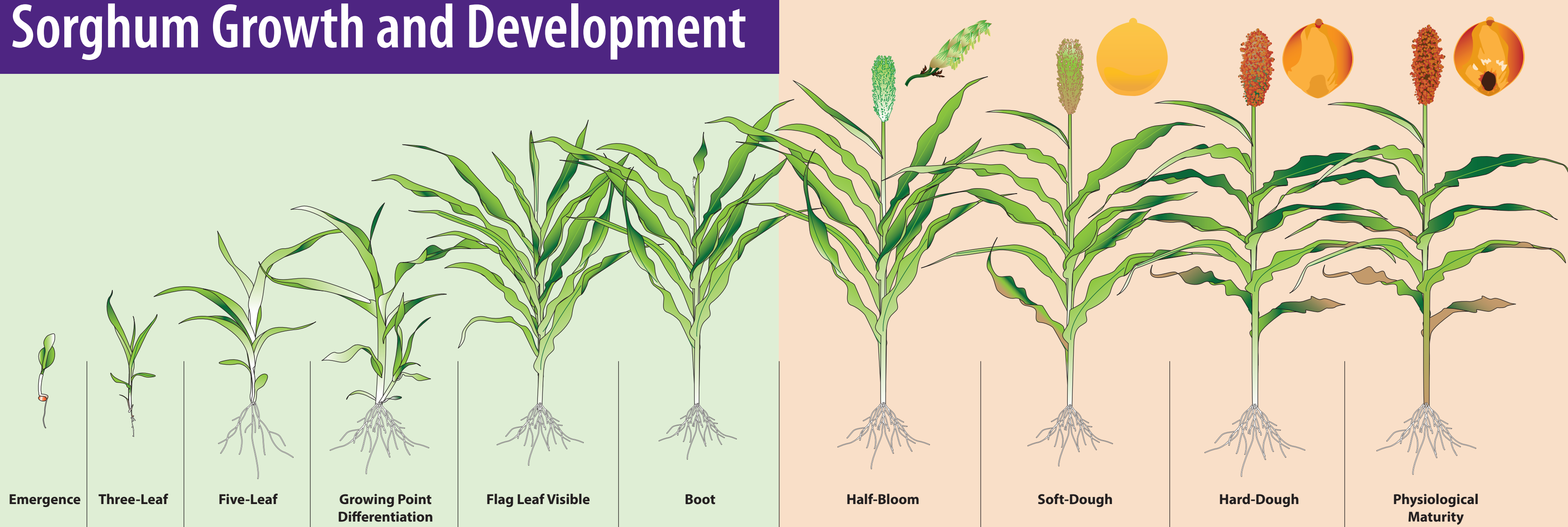


# Sorghum Growth and Development



## Vegetative

## Reproductive

### Stage 0 – Emergence

The plant breaks through the soil surface; early plant growth is slow. The time between planting and emergence depends on soil temperature, residue cover and distribution, soil moisture, planting depth, and seed vigor.

#### Management

Adjust planting time so emergence occurs in warm soil with good moisture conditions. Early planting delays emergence. Treat seed before planting. Preplant or preemergent herbicide is critical. Scout for proper emergence.

### Stage 1 – Three-Leaf

Three leaves are fully expanded with a visible collar (leaf tissue at the junction of the leaf blade and sheath). This stage occurs 10 to 20 days after emergence. Because the growing point is under the soil surface, much of the leaf area can be removed (e.g., hail damage) without killing the plant.

#### Management

Scout for insects, diseases, weeds, and other production issues. Poor weed control can significantly reduce yields.

### Stage 2 – Five-Leaf

Five leaves are fully expanded with a visible collar 20 to 25 days after emergence. The growing point is still below the soil surface. The plant begins rapid growth and the root system expands rapidly. If leaf area loss occurs, regrowth is more vigorous than at the three-leaf stage.

#### Management

Scout for insects, diseases, weeds, and other production issues. Minimizing weed competition from planting through this growth stage is critical.

### Stage 3 – Growing Point Differentiation

Potential leaf number is defined 30 to 40 days after emergence. The growing point is above the soil surface and changes from producing leaves to forming heads. Maximum plant growth and nutrient uptake rates are achieved. Following growing point differentiation, rapid stem elongation and leaf development occur.

#### Management

Scout for weeds, insects, and diseases. Sorghum plants are now more competitive against weeds. Adequate supplies of nutrients and water are critical to maximize growth.

### Stage 4 – Flag Leaf Visible

The final leaf, the “flag leaf,” is visible in the whorl. The head is developing. Rapid stem elongation and increases in leaf area occur. All except the final three to four leaves are fully expanded. Light interception is close to maximum, and growth and nutrient uptake continues at a rapid rate.

#### Management

Adequate supplies of nutrients and water are key to provide maximum growth. While only about 20% of the total growth has occurred, the nutrient uptake is far greater with more than 40% potassium uptake completed, more than 30% of the nitrogen, and more than 20% of the phosphorus taken up by the plant.

### Stage 5 – Boot

The head has developed to nearly full size and is enclosed in the flag-leaf sheath. The upper stalk, known as the “peduncle,” begins to elongate. Maximum potential head size and seed number has been set. This stage occurs 50 to 60 days after emergence. Maximum leaf area has been achieved. It is important to protect the leaf to ensure light interception during grain filling.

#### Management

Severe moisture stress or herbicide injury during this stage may prevent the head from exerting completely from the flag-leaf sheath. From this point onward, leaf area should be protected against any stressors.

### Stage 6 – Half-Bloom

Full exertion of the head occurs at this stage, with 50% of the plants in a field blooming. Total growth is 50% complete. Compared to final nutrient content at maturity, nutrient accumulation is 60% for phosphorus, 70% for nitrogen, and more than 80% for potassium.

#### Management

Grain formation begins. Any limitation in plant size, leaf area, or plant numbers can no longer be corrected; however, if environmental conditions are favorable, the sorghum plant can still compensate for seed number per head and seed weight. Choose a hybrid maturity and planting date so this stage will not occur under severe heat or dry weather.

### Stage 7 – Soft-Dough

Grain formation begins immediately after flowering and the grain fills rapidly (50% dry weight). The stem loses weight due to a remobilization process (from stem to grain). Grains are the main priority for the plant; thus, without a good balance between leaves (source) and grain (sink), the duration of grain filling can be shortened.

#### Management

Severe stress at this stage can result in “blasting” and poor head filling (lighter and chaffy grains). In normal sorghum production scenario, most leaves remain green (stay green) until the end of the season, so yield-reducing leaf loss is uncommon.

### Stage 8 – Hard-Dough

Grain reaches 75% of its final dry weight and nutrient uptake is almost complete. Lower leaves lose functionality due to remobilization of nutrients to grains or senescence. Final yield depends on the rate of grain dry matter accumulation and duration, with longer duration usually translated in greater yields.

#### Management

A severe stress at this growth stage can still reduce grain weight, but not to the extent possible in the soft-dough stage. Freeze can negatively impact yields if the crop does not reach maturity before this event occurs.

### Stage 9 – Physiological Maturity

Grains achieve maximum dry weight and are physiologically mature. Mature grain is identified by looking for the dark spot, the black layer, on the bottom of the kernel (blocking the movement of dry matter and nutrients to grains). Grain moisture ranges from 25% to 35%.

#### Management

Harvest time depends on the environmental conditions. Drying can be promoted using desiccants without affecting yield when applied after maturity.

### Maturity Differences within the Head

Because the sorghum panicle does not go through growth stages evenly, sample grains from the bottom. The first grains to develop and mature are in the top of the panicle. The lower grains are the last to mature.

#### Management

When sampling in the bottom of the panicle, the upper grains have already been through that stage.

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