

# GROWTH STAGES

A-1145

## Vegetative Stages



True leaf — 4 cm



V-E



V-2



V-4



V-12

## Reproductive Stages



R-1



R-2



R-3



R-3 Top View



R-4 Top View



R-5.1



R-5.5



R-5.9

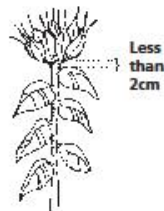


R-6



## Stages of Sunflower Development

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R-2



R-3

**Table 8.** Sunflower growth stages and description. From A. A. Schneiter and J. F. Miller. 1981. Description of Sunflower Growth Stages. Crop Sci.11: 635-638.

Stage	Description
<b>VE Vegetative Emergence</b>	Seedling has emerged and the first leaf beyond the cotyledons is less than 4 cm long.
<b>V (number)</b> Vegetative Stages (e.g. V-1, V-2, V-3 etc.)	These are determined by counting the number of true leaves at least 4 cm in length beginning as V-1, V-2, V-3, V-4, etc. If senescence of the lower leaves has occurred, count leaf scars (excluding those where the cotyledons were attached) to determine the proper stage.
<b>R-1 Reproductive Stages</b>	The terminal bud forms a miniature floral head rather than a cluster of leaves. When viewed from directly above, the immature bracts have a many-pointed star-like appearance.
<b>R2</b>	The immature bud elongates 0.5 to 2.0 cm above the nearest leaf attached to the stem. Disregard leaves attached directly to the back of the bud.
<b>R3</b>	The immature bud elongates more than 2 cm above the nearest leaf.
<b>R4</b>	The inflorescence begins to open. When viewed from directly above, immature ray flowers are visible.
<b>R5 (decimal)</b> (e.g., R-5.1, R-5.2, R-5.3, etc.)	This stage is the beginning of flowering. The stage can be divided into sub-stages dependent upon the percent of the head area (disk flowers) that have completed or are in flowering. Ex. R-5.3 (30%), R-5.8 (80%), etc.
<b>R6</b>	Flowering is complete and the ray flowers are wilting
<b>R7</b>	The back of the head has started to turn a pale yellow.
<b>R8</b>	The back of the head is yellow but the bracts remain green.
<b>R9</b>	The bracts become yellow and brown. This stage is regarded as physiological maturity.

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**Figure 2.** Sunflower growth stages and description. From A. A. Schneiter and J. F. Miller. 1981. Description of Sunflower Growth Stages. Crop Sci.11: 635-638.

## EFFECT OF FROST ON SUNFLOWER

Crops differ in how sensitive they are to frost based where the growing points are and what inherent mechanisms the plant has to prevent ice crystal formation. Broadleaf crops (eg. soybean, canola and sunflower) that have their growing point at the top of the plant are more sensitive to frost than grass species. In grassy species, the growing point often remains below the ground, protected until initiation of the reproductive growth stage (bolting).

Sunflowers are most frost tolerant when emerging and in the cotyledon stage. During this early growth stage, plants can withstand temperatures in the 25 to 26°F (-3.3 to -3.8°C) range for short periods. As the plants develop through the vegetative stages, V2-, V4-, V6- they become progressively more sensitive to frost and terminal bud damage can occur. At the V2- stage, the lowest temperature plants can withstand is 26 to 27°F (-2.7 to -3.3°C) degrees, but for the V4-, V6- stages, 28-29°F (-1.6 to -2.2°C) degrees is the lower limit. If planted early, the crop could just be getting established with the strong possibility of a deep frost in mid-May.

Cool temperatures (33 to 34°F or 0.5 to 1.1°C) over several days, coupled with wet soils and dew helps reduce frost damage. Growth may slow delaying maturity with minimal effect on yield. Most damage can be expected if temperatures change rapidly between extremes. Frost damage can result in loss of apical dominance causing branching from axillary buds and multiple heads later in the season. Yield and quality are affected greatly.



**Figure 3.** Sunflower frost damage symptoms. MAFRI.



**Figure 4.** Frost damage during flowering symptoms. D. Berglund. NDSU.

The disk flowers are very sensitive to frost. During flowering, temperatures of 28 to 30°F (-1.1 to -2.2°C) can result in damaged buds and sterile sections or rings in the flowering head. After pollination and petal drop, sunflower can withstand temperatures as low as 25°F (-3.8°C) with minor damage. A killing frost (23 to 25°F (-3.8 to -5°C) for 6 or more hours) prior to the R-8 stage can cause minor damage which includes reduced yield, oil content and seed quality/test weight. During the final stages of crop development, a killing frost will only cause minor damage, including reduced yield, oil content and seed size or grade.