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Overview and Objectives

This reference guide discusses the growth stages of the rice plant. The information presented is based on the data and characteristics of IR64, a modern, high-yielding, semidwarf variety, but applies generally to other rice varieties.

This reference guide will enable you to:

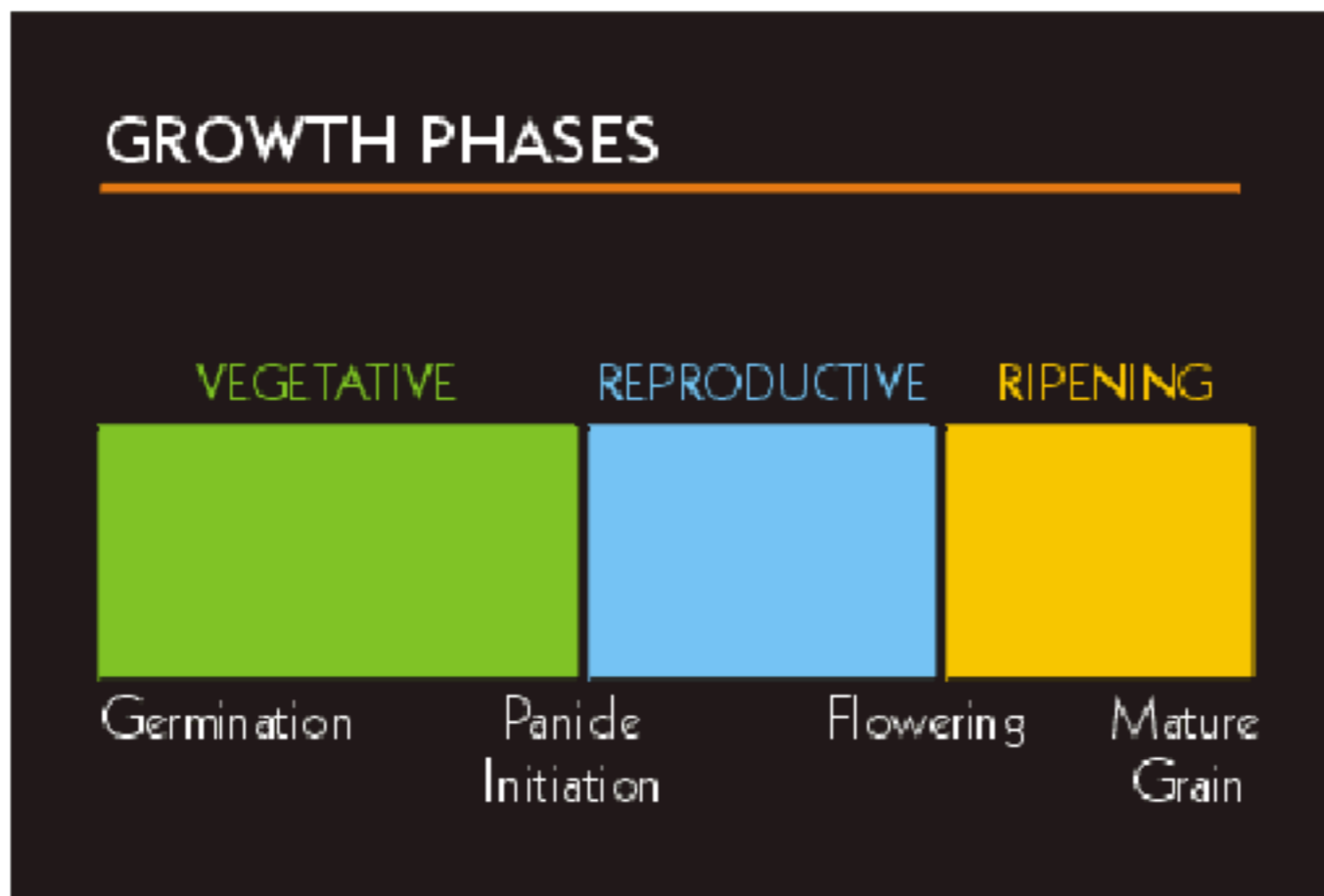
- recognize the 3 basic growth phases of the rice plant and the stages of development in each phase.
- identify the growth stages of a rice plant according to a 0–9 numerical scale. Each number in the scale corresponds to a specific growth stage.
- explain the specific physical changes in a growing rice plant.

Three growth phases

The growth of the rice plant is divided into three phases:

1. vegetative (germination to panicle initiation);
2. reproductive (panicle initiation to flowering); and

3. ripening (flowering to mature grain)



- In the tropics, the reproductive phase is about 35 days and the ripening phase is about 30 days.

- The differences in growth duration are determined by changes in the length of the vegetative phase.

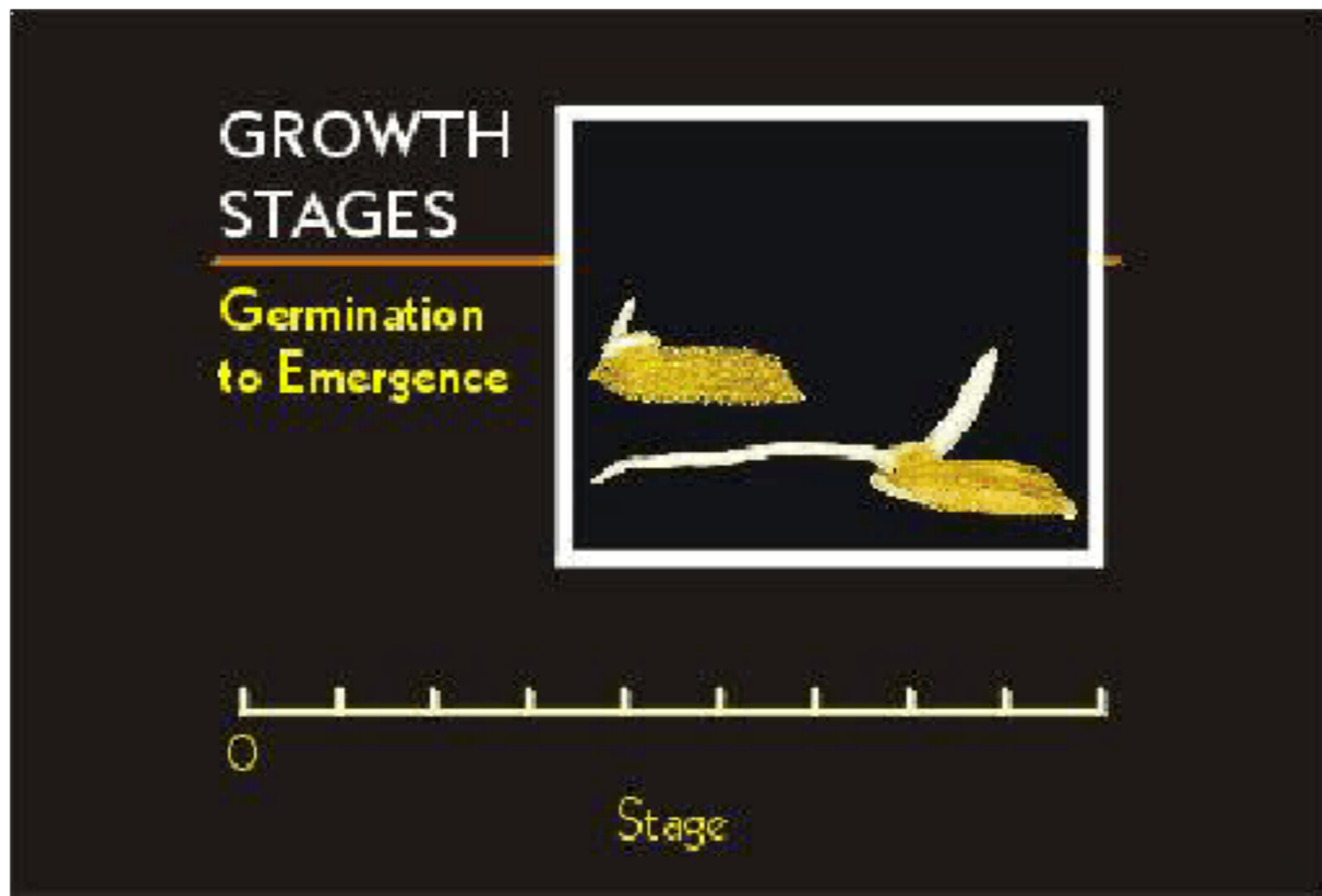
- For example, IR64 which matures in 110 days has a 45-day vegetative phase, whereas IR8 which matures in 130 days has a 65-day vegetative phase.



Growth stages 0–9

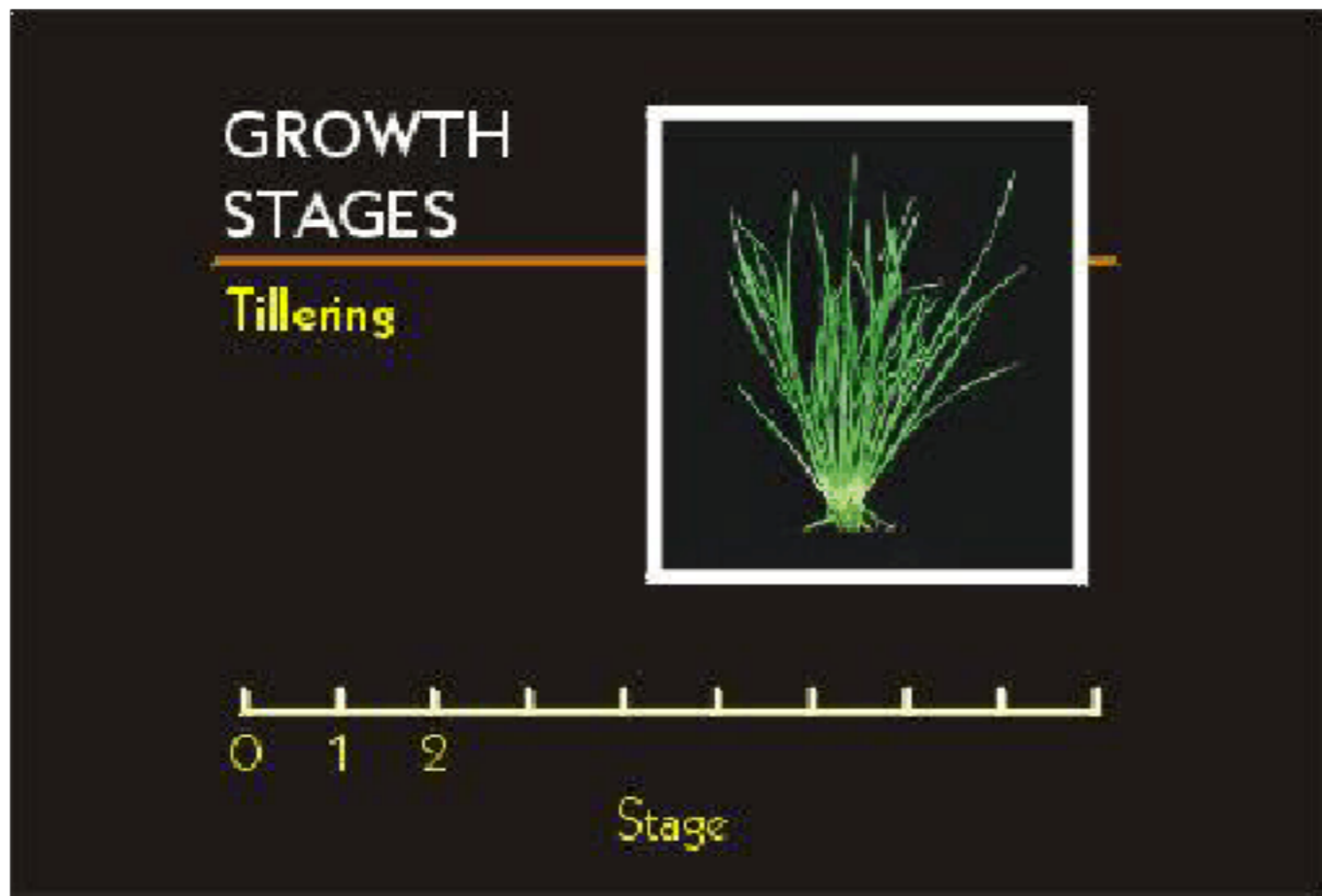
These 3 growth phases consist of a series of 10 distinct stages. These stages are numbered and described as follows:

Stage 0 is from germination to emergence:



Stage 1 is called seedling:

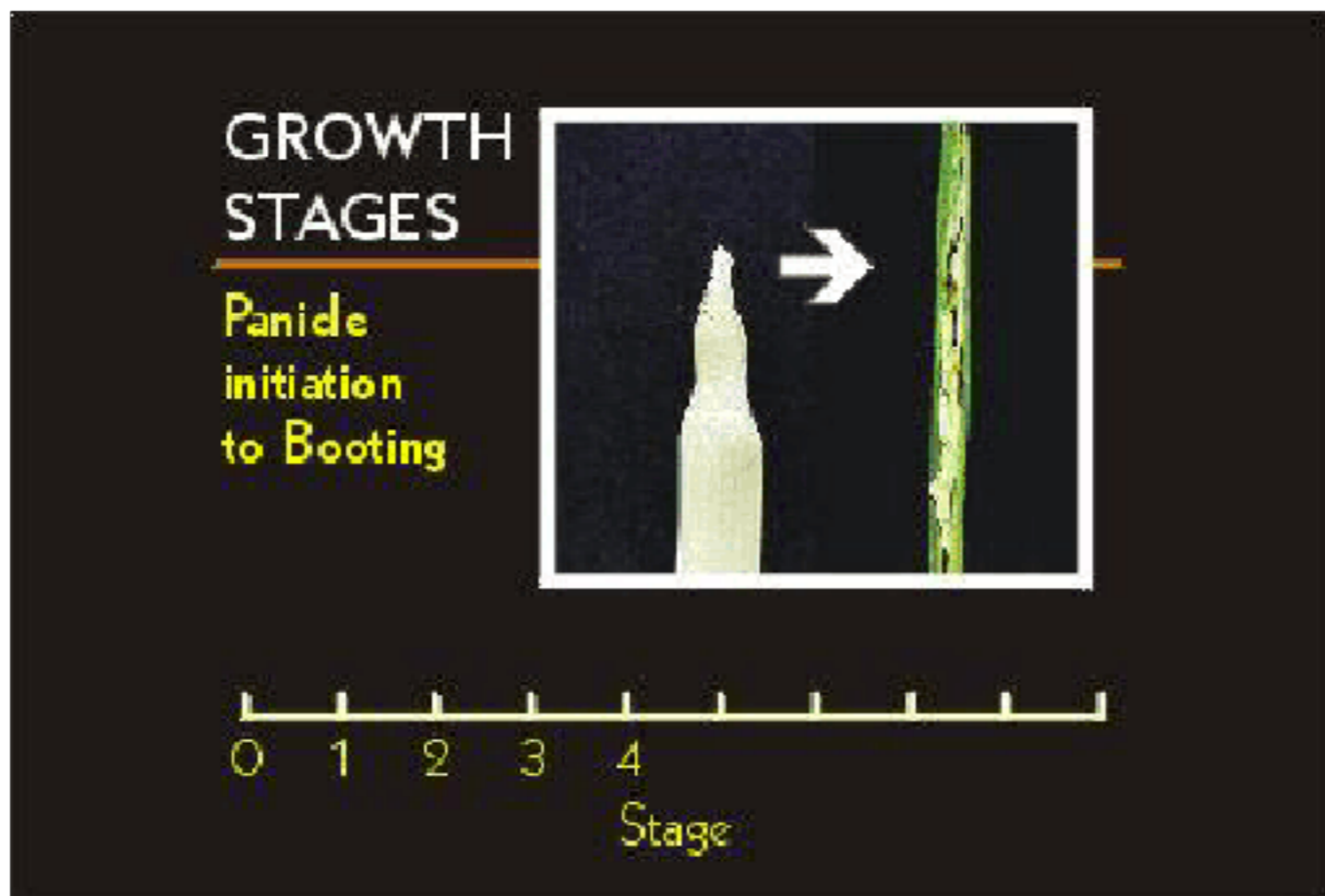
Stage 2, tillering:



and Stage 3 is stem elongation:

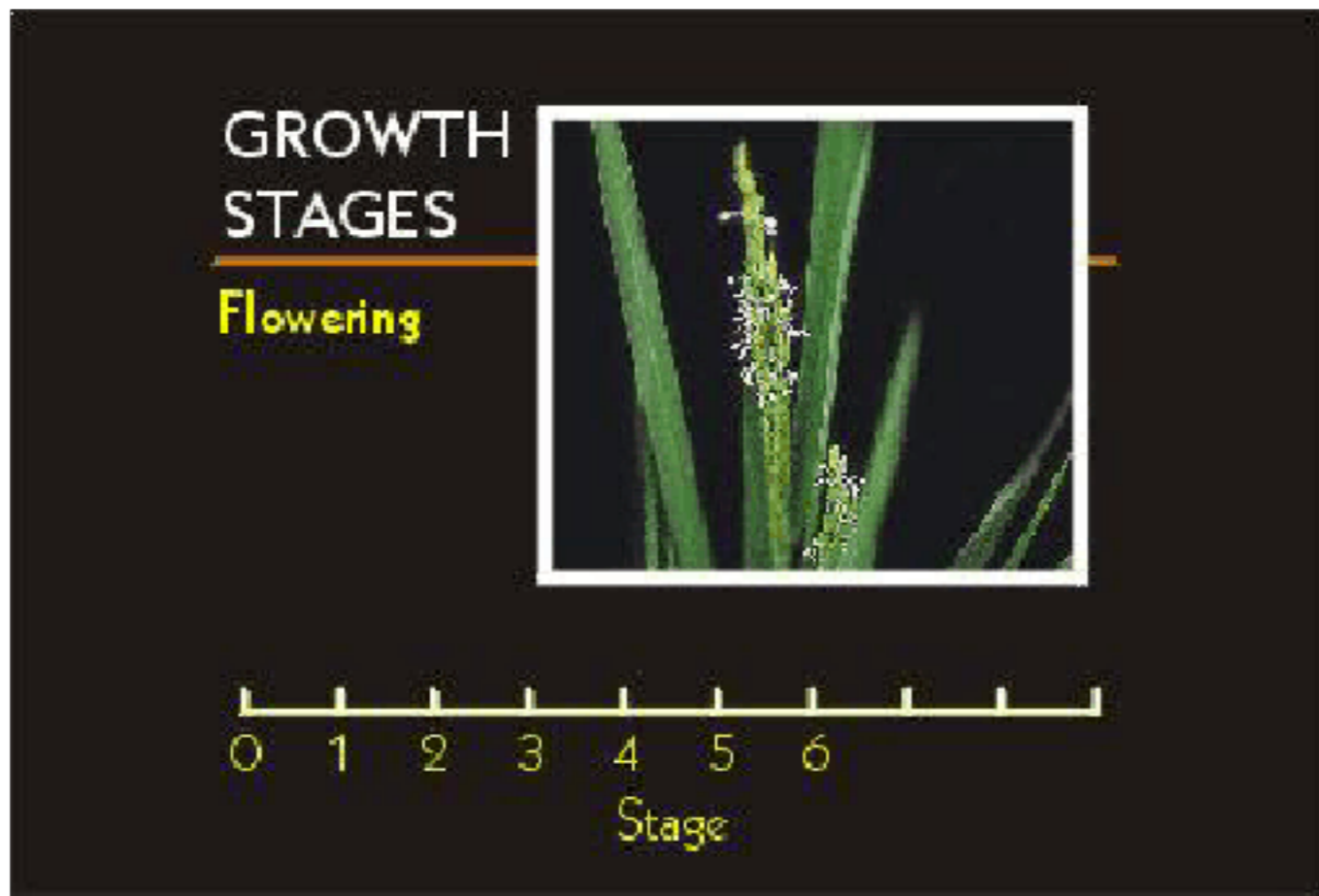
These first 4 stages make up the vegetative phase, the first phase of rice plant growth.

Stage 4 is panicle initiation to booting:



Stage 5 is heading or panicle exertion:

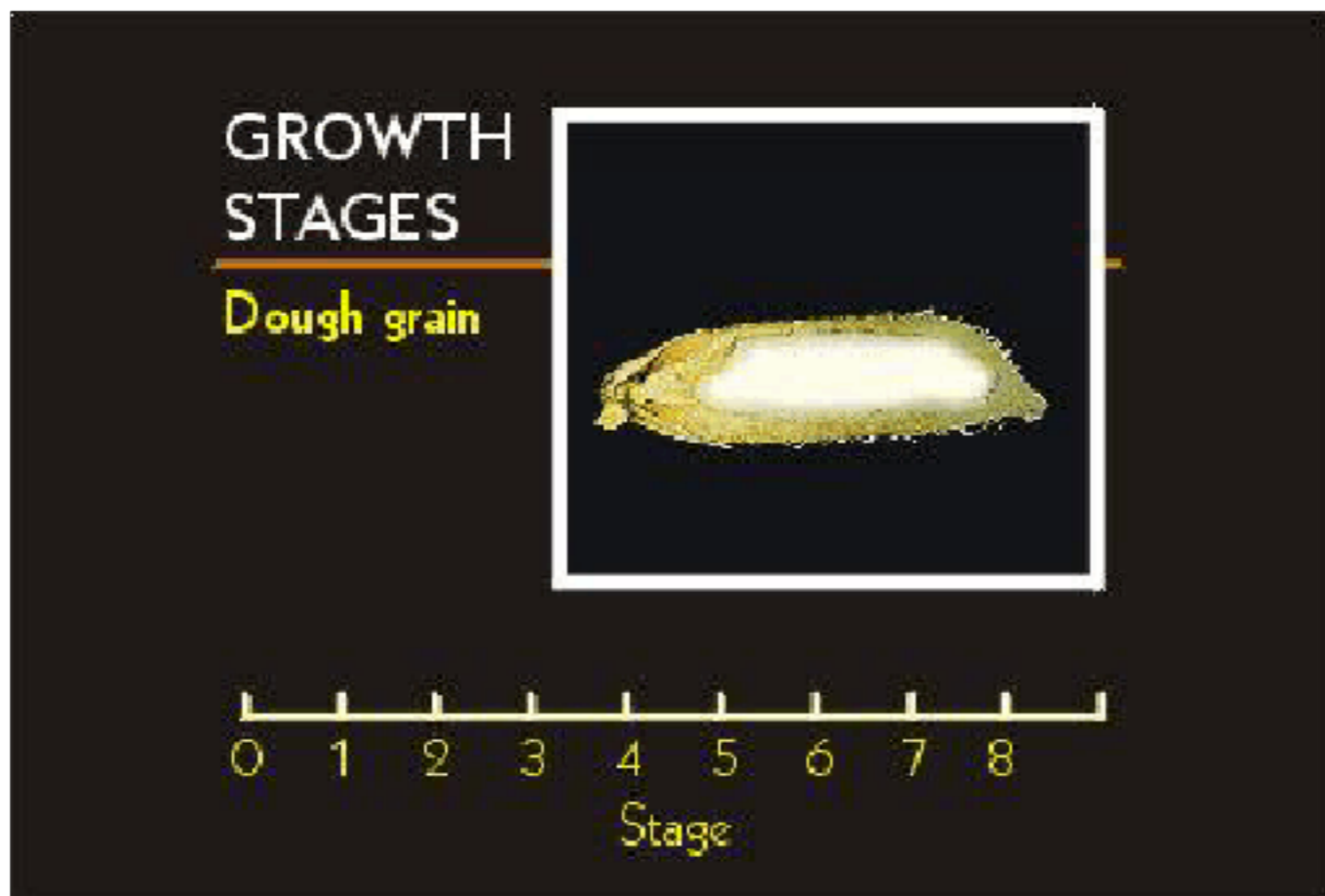
and Stage 6 is flowering:



Stages 4, 5, and 6 constitute the reproductive phase , the second phase of rice growth.

Stage 7 is the milk grain stage:

Stage 8, the dough grain stage:



and Stage 9, the mature grain stage:

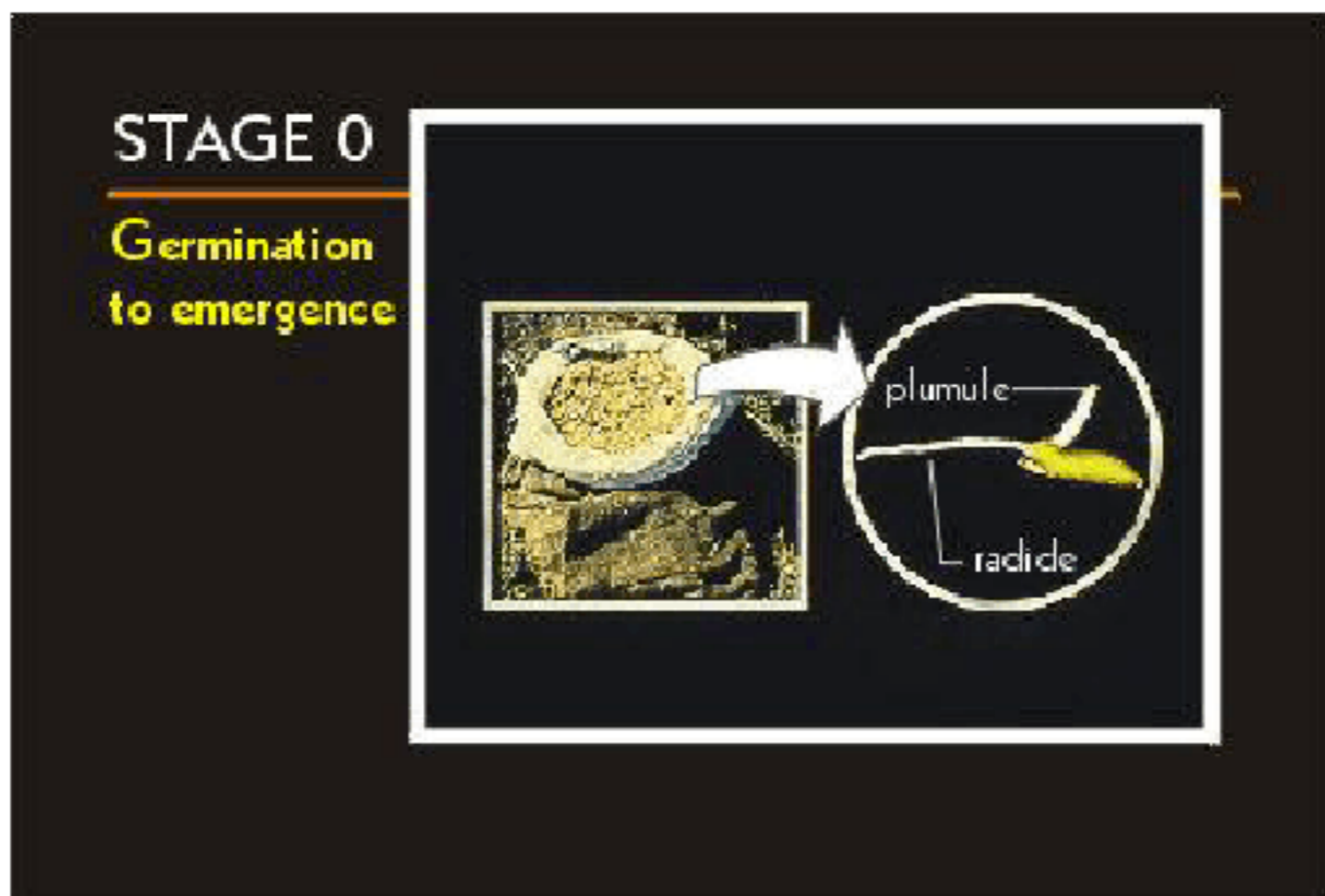
Stages 7 through 9 correspond to the ripening phase , the last phase in the

development of the rice plant.

Vegetative Phase

Stage 0 – Germination to emergence

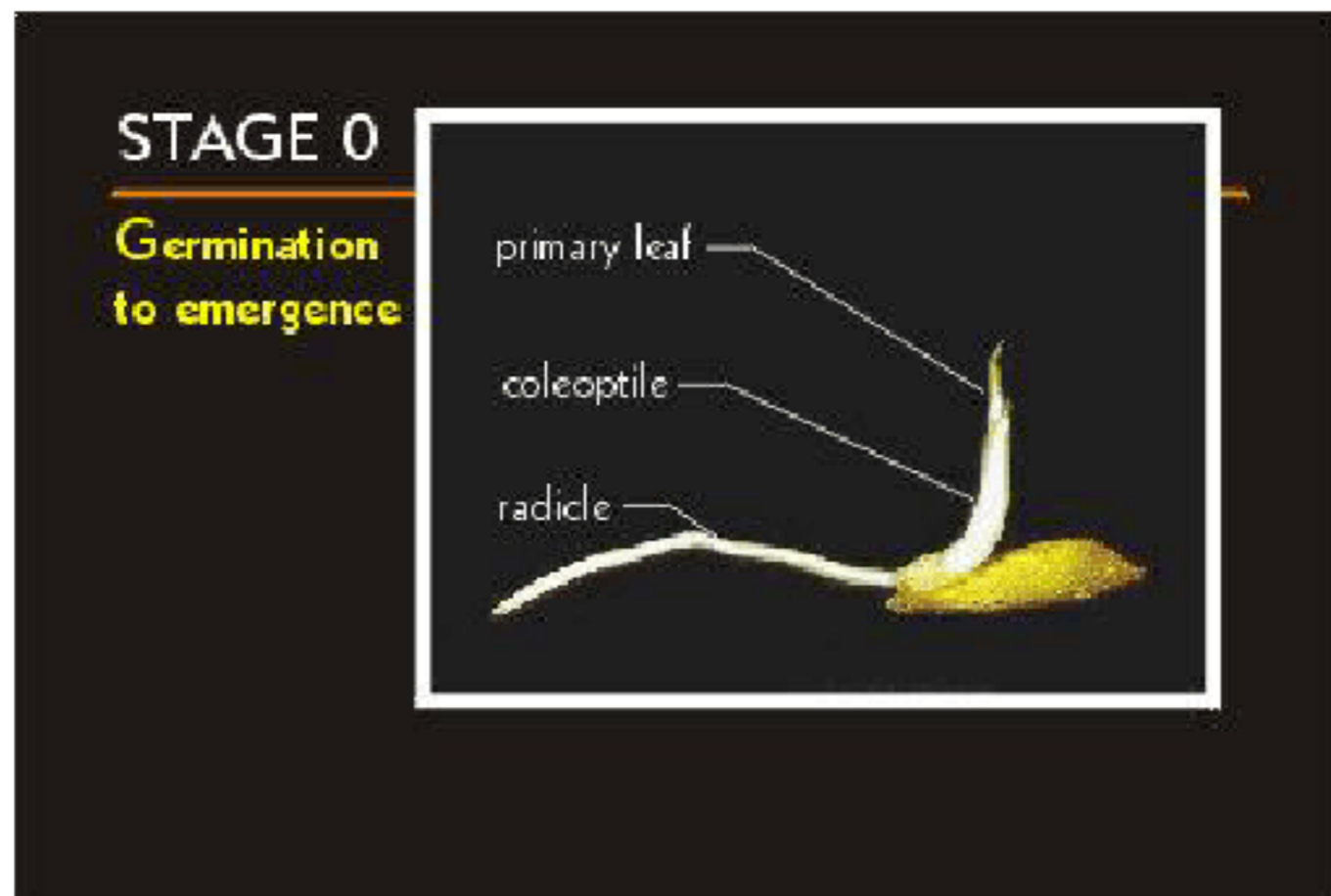
Seeds are usually pregerminated by soaking for 24 hours and incubating for another 24 hours. After pregermination the radicle and plumule protrude through the hull.



By the second or third day after seeding in the seedbed, the first leaf breaks through the coleoptile.

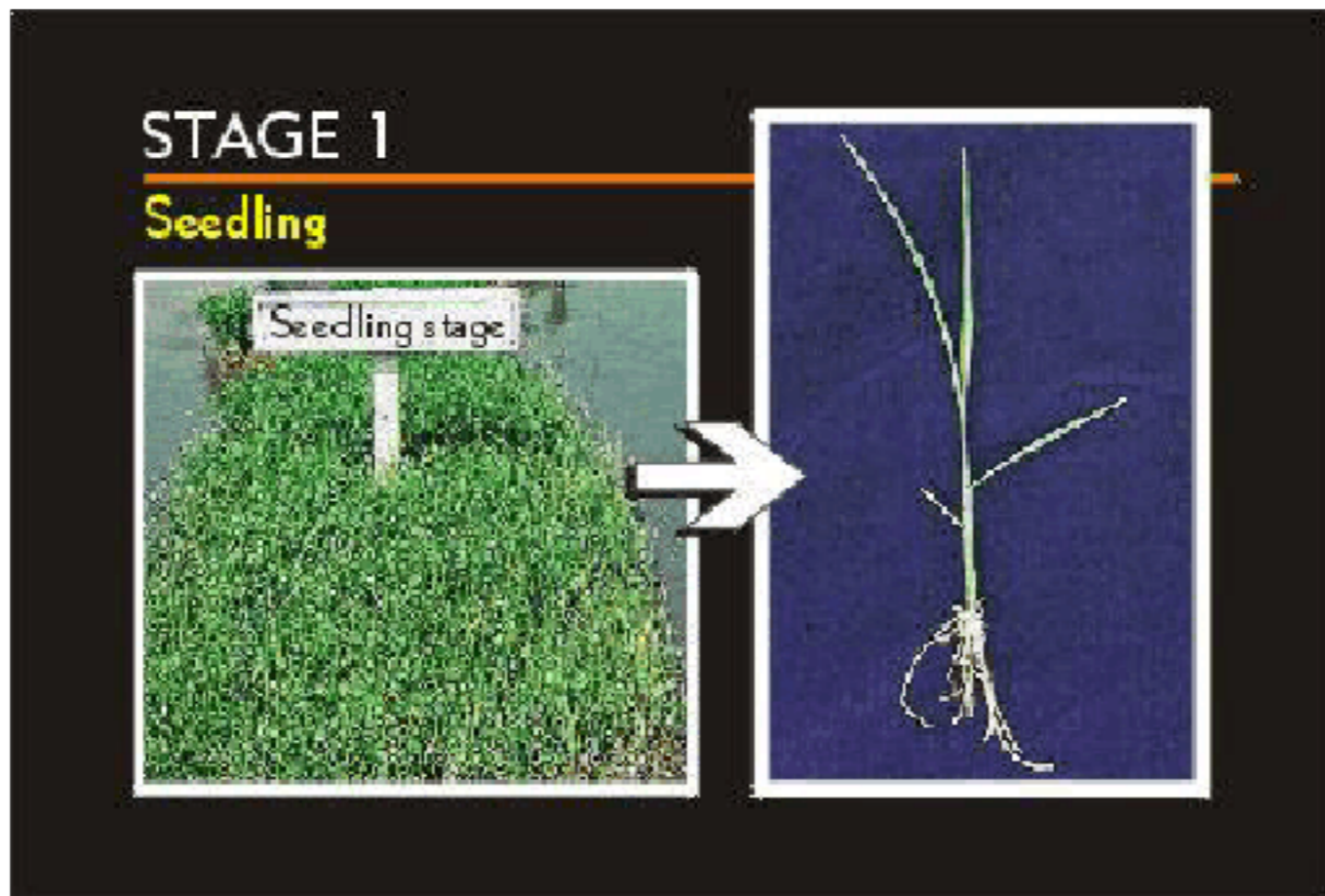
The end of stage 0 shows the emerged primary leaf still curled and an

elongated radicle.



Stage 1 – Seedling

The seedling stage starts right after emergence and lasts until just before the first tiller appears. During this stage, seminal roots and up to five leaves develop.



As the seedling continues to grow, two more leaves develop. Leaves continue to develop at the rate of 1 every 3-4 days during the early stage.

Secondary adventitious roots that form the permanent fibrous root system rapidly replace the temporary radicle and seminal roots.

STAGE 1
Seedling



Seminal roots replaced by secondary adventitious roots

This is an 18-day-old seedling ready for transplanting. The seedling has 5 leaves and a rapidly developing root system.

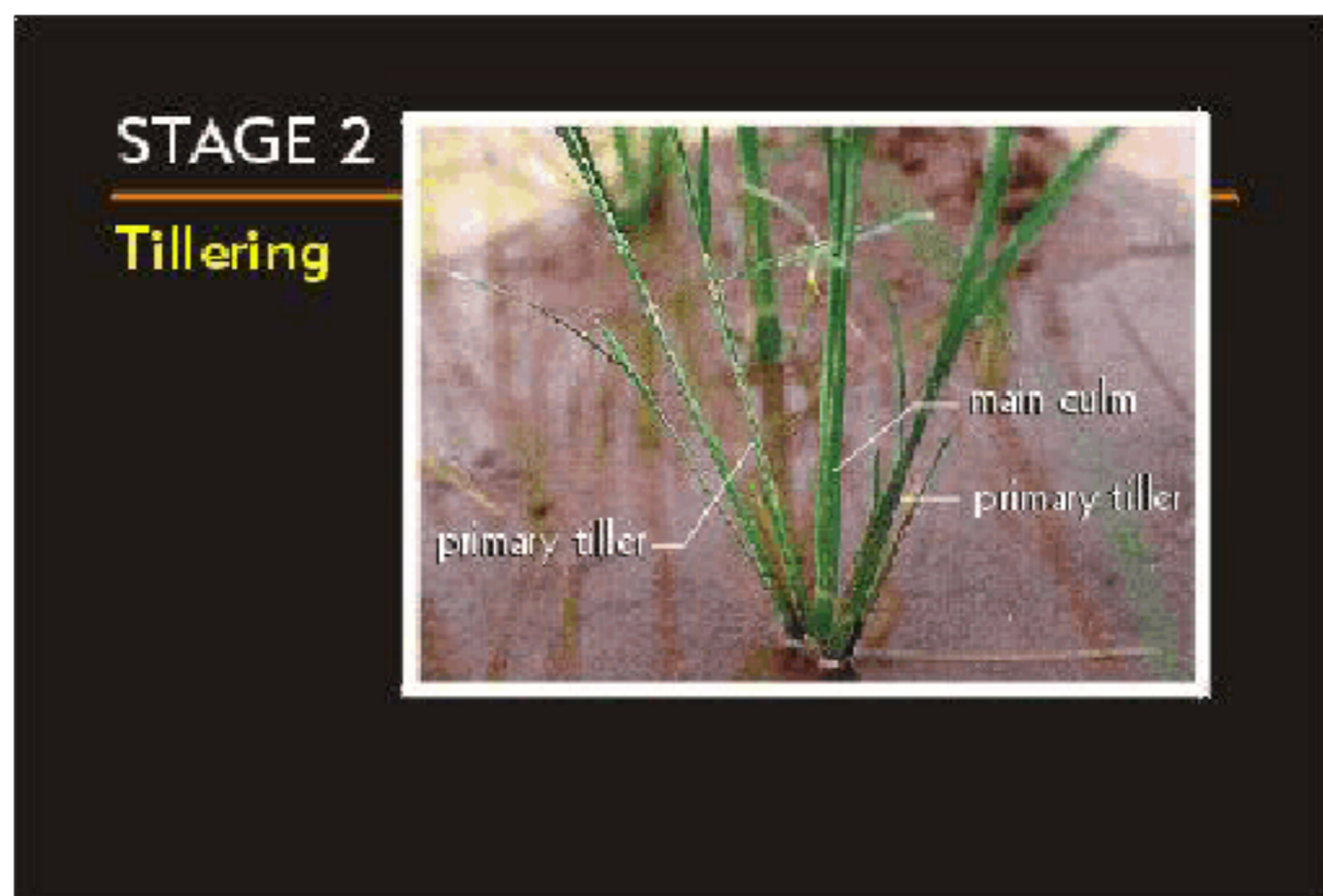
Stage 2 – Tillering

This stage extends from the appearance of the first tiller until the maximum tiller number is reached.



Tillers emerge from the axillary buds of the nodes and displace the leaf as they grow and develop.

This seedling shows the position of the two primary tillers with respect to the main culm and its leaves.



After emerging, the primary tillers give rise to secondary tillers. This occurs about 30 days after transplanting.

The plant is now increasing in length and tillering very actively. Here is a field with plants at the early tillering stage. Note the tiller size and canopy development due to increased leafing and tiller development.



Besides numerous primary and secondary tillers, new tertiary tillers arise from the secondary tillers as the plant grows longer and larger.



By this stage, the tillers have multiplied to the point that it is difficult to pick out the main stem. Tillers continuously develop as the plant enters the next stage which is stem elongation.

Stage 3 – Stem elongation

This stage may begin before panicle initiation or it may occur during the latter part of the tillering stage. Thus, there may be an overlap of stages 2 and 3.



The tillers continue to increase in number and height, with no appreciable senescence of leaves noticeable. Ground cover and canopy formation by the growing plants have advanced.

STAGE 3

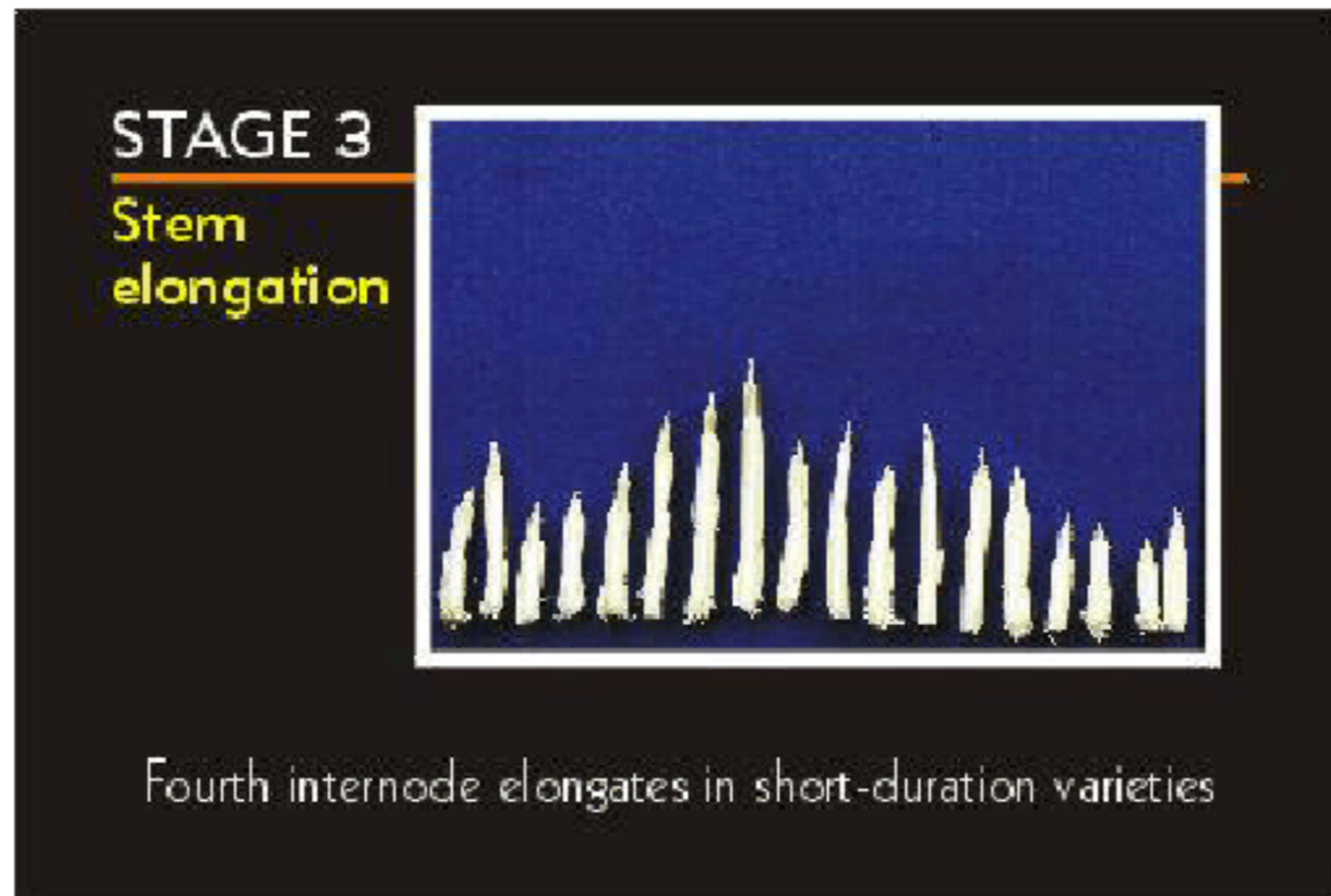
Stem elongation



Tillers increase in number and height

Growth duration is significantly related to stem elongation. Stem elongation is more in varieties with longer growth duration. In this respect, rice varieties can be categorized into two groups: the short-duration varieties which mature in 105–120 days and the long-duration varieties which mature in 150 days.

In early-maturing semidwarfs like IR64, the fourth internode of the stem, below the point where the panicle emerges, elongates only from 2 to 4 cm before panicle initiation becomes visible. This slide shows stems which have been dissected to show the length of the fourth internode at the panicle initiation stage.



Maximum tillering, stem elongation, and panicle initiation occur almost simultaneously in short-duration varieties (105–120 days).

STAGE 3

Stem elongation



Maximum tillering, stem elongation, and panicle initiation are simultaneous in short-duration varieties.

In long-duration varieties (150 days), there is a so-called lag vegetative period during which maximum tillering occurs. This is followed by stem or internode elongation, and finally by panicle initiation.

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