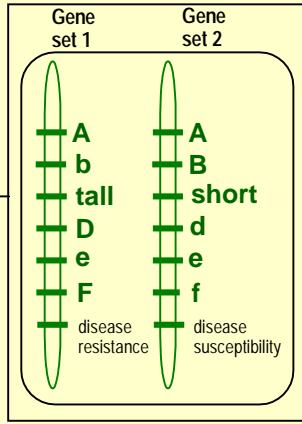
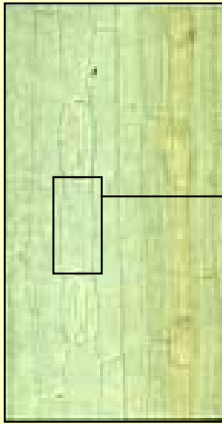


# Doubled Haploids in Plant Breeding

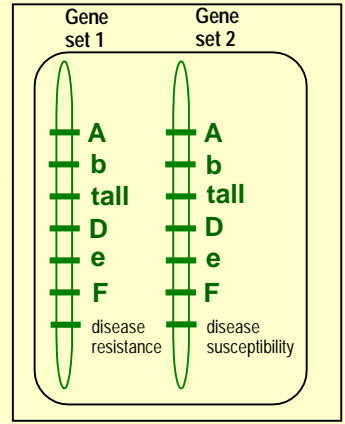
## What is a doubled haploid plant?

Cells are the building blocks of plants.



A doubled haploid plant has cells containing 2 gene sets which are exactly identical.

*If one gene set has the disease resistance gene, so will the other.*



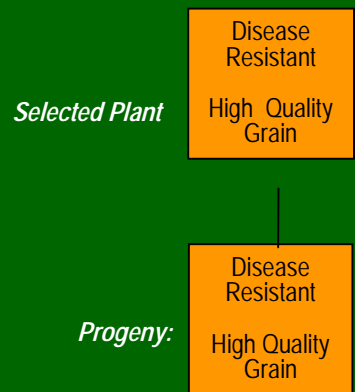
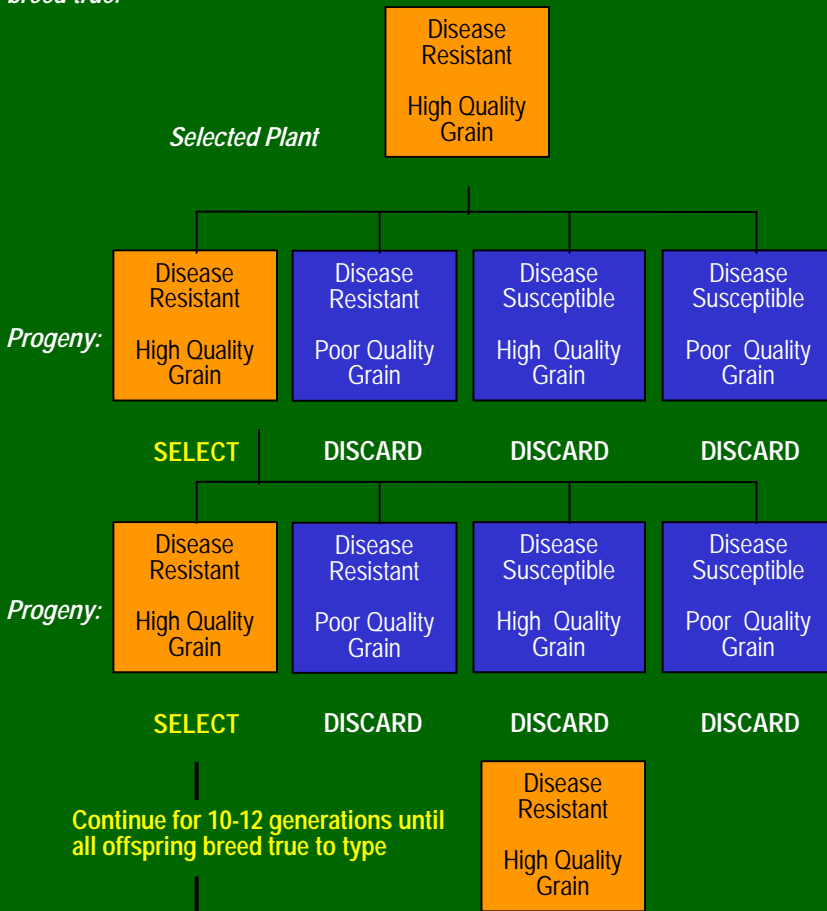
Each cell contains 2 sets of genetic information which are almost (but not exactly) identical.

*For example, one gene set may carry a gene for disease resistance when the other set does not.*

## How do doubled haploids accelerate breeding?

*Plants selected from a conventional breeding population do not breed true.*

*Plants selected from a doubled haploid breeding population always breed true.*

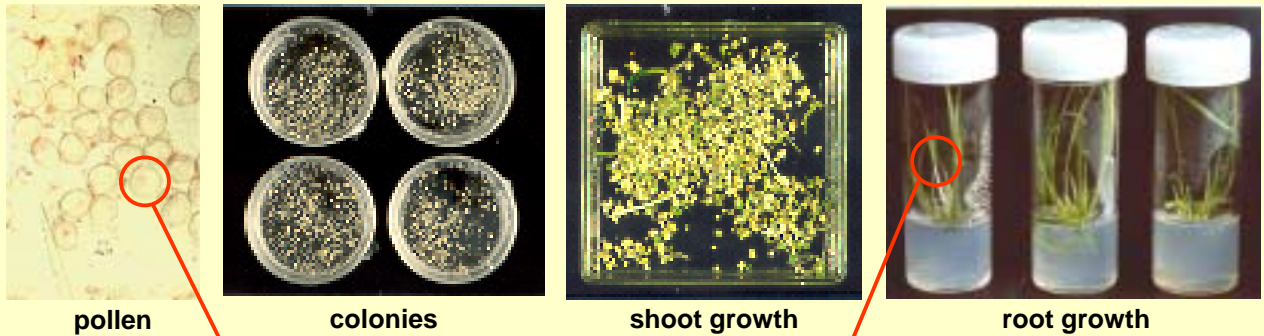


**This attribute of doubled haploids allows new cultivars to be released 3 to 5 years earlier than with conventional breeding.**

# How are doubled haploids produced?

## 1. Tissue culture of immature pollen

Using tissue culture techniques referred to as "anther culture" and "isolated microspore culture", immature pollen grains can grow to produce colonies of cells. The colonies are transferred to media with different plant growth regulators and sugars to induce growth of shoots and then roots.

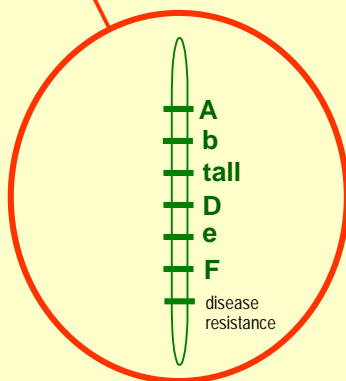


pollen

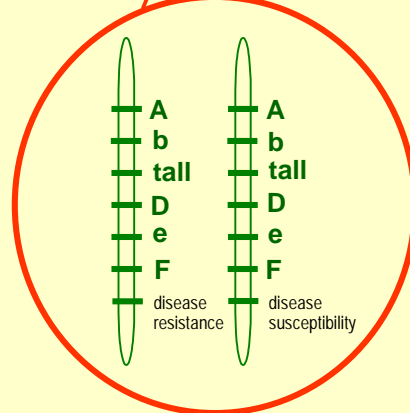
colonies

shoot growth

root growth



Pollen has only one set of genetic information (ie. It is "haploid")

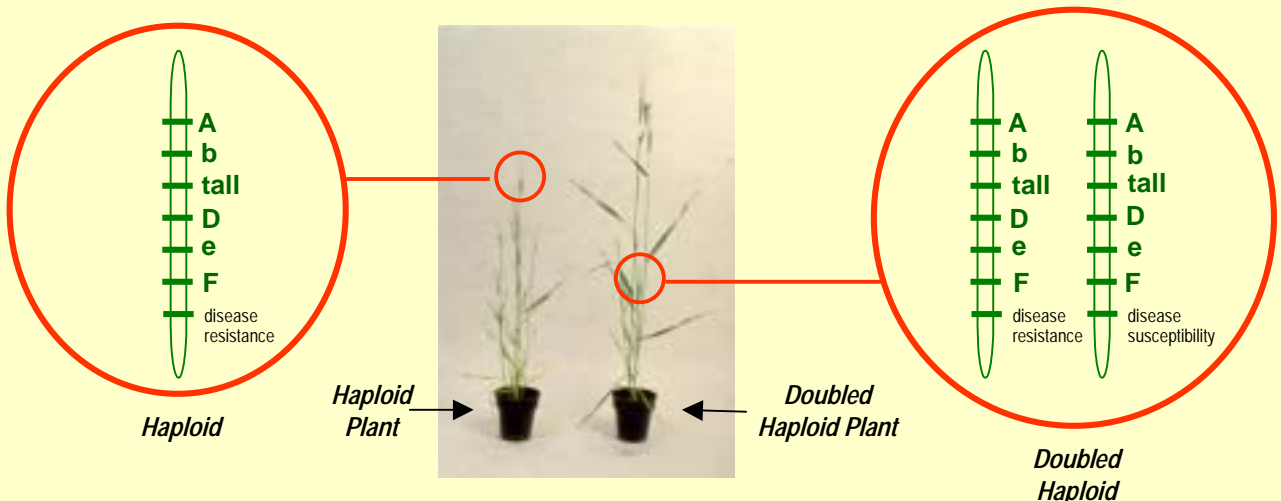


This genetic information is duplicated in the culture process to produce a "doubled haploid".

## 1. Crossing with other species

When barley is pollinated by the wild barley *Hordeum bulbosum*, the resulting embryos contain only the barley genes because the *Hordeum bulbosum* genes are excluded from the embryo.

If the embryos are cultured *in vitro* they will grow into haploid plants.



Haploid plants are sterile but can be converted to fertile doubled haploids by treating them with the chemical colchicine.

Wheat doubled haploids can be produced in a similar manner if wheat is pollinated with maize.

# Doubled haploids: tools for rapid oat breeding

## Benefits

- True breeding plants in one generation
- Potential to produce cultivars 3 years earlier
- More efficient screening for grain quality and disease resistance

## Method



*Pollination*

*Embryo rescue*

