

# COTTON HYBRIDIZATION

**Dr. Şaire Ramiz TÜRKOĞLU**

**Ministry of Food, Agriculture and Animal Sciences  
General Directorate of Agricultural Researches and Politics  
East Mediterranean Agricultural Research Institute  
Adana/TURKEY**

# VARIABILITY FINDING /GENERATING ?

- Genetic improvement depends on genetic variability.
- The perfect cultivar does not exist, and it is the plant breeder's job to either
  1. identify the more desirable genotypes that already exist but are not currently isolated or
  2. combine the desirable traits from two or more parents into an improved cultivar while eliminating the undesirable parental traits.



# SOURCES OF GERmplasm

- Once breeding objectives have been established, the breeder must find sources of germplasm to meet those objectives.
  1. The first choice of parental material usually is existing cultivars because they will have the fewest undesirable traits that must be eliminated.
  2. A second genetic resource is obsolete cultivars or introduced germplasm.



# SOURCES OF GERMPLASM

3. Another source of genetic material is germplasm lines developed primarily by public breeders in germplasm enhancement programs.
- Many of these germplasm lines are developed to provide alleles for specific characteristics believed to be useful to other breeders in cultivar development.
  - A summary of pedigrees and characteristics of germplasm lines registered in Crop Science has been published.



# SOURCES OF GERMPLASM

- The primary traits of concern to applied breeders (e.g., yield, fiber quality, and appropriate maturity) are inherited quantitatively and genetic gains in individual traits generally made through transgressive segregation of recombinants.
- Transgressive segregation requires parents to be genetically dissimilar.
- Thus, excessive use of the primary source of genetic material (i.e., successful, locally adapted cultivars) can result in little or no genetic advance because no new alleles are being brought into the system, particularly when those cultivars are closely



# SOURCES OF GERMPLASM

- Once parents are chosen, the breeder must use them to synthesize populations from which desired genotypes can be selected.
- This is accomplished usually by artificial hybridization of two or more parents .





# HYBRIDIZATION ?

- Hybridization is the crossing of genetically different parents for the sake of creating variability, often with the purpose of obtaining genotypes with transgressive performance.
- Hybridization is utilized to combine genes for desirable characters, to add a gene for a desirable character through a backcross, or to intensify genes for a quantitative character in a recurrent selection program.



# HYBRIDIZATION ?

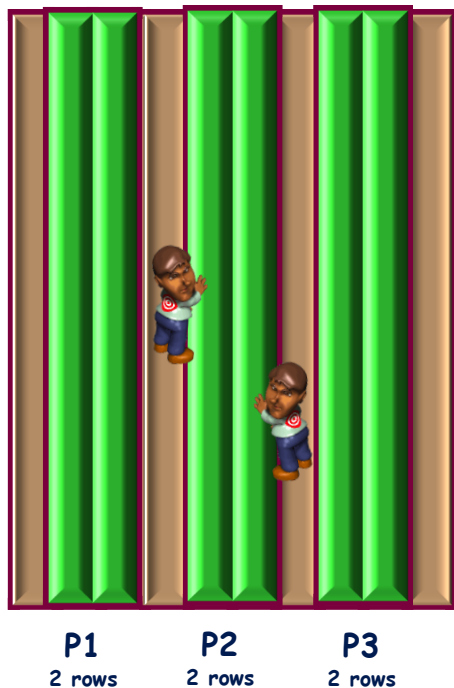
- Hybridization is the most widely used breeding method of developing new cotton varieties.
- Hybridization (crossing between two parents) results in new combinations, but drastic changes should not be expected.
- Generally pedigree selection procedure is followed during the segregating generations.





# STEPS IN CROSSING COTTON

- Once the determined parents are sown in a proper plan to facilitate the crossing procedure during hybridization time in the field.



- For that aim every parent can be sown in two rows and one empty row should be planned between two different parents.
- It is easier and better for the crossing flowers to work in the empty rows.



# STEPS IN CROSSING COTTON

- Crossing procedure mainly needs at least two days to obtain a combination.
  - Emasculation (during afternoon on the first day)
  - Pollination (during morning on the second day)



# STEPS IN CROSSING COTTON

## Emasculation Day (16.11.2011 - Afternoon)

Find the flowers in proper stage for emasculation and pollination.



### Female

1. Emasculate the flower
2. Close the stigma to protect it from foreign pollen.
3. Mark the flower



### Male

1. Close the male flower to protect it from foreign pollen.
2. Mark the flower

## Pollination Day (17.11.2011 - Morning)

1. Take of the marked male flower.
2. Pollinate the emasculated female flower
3. Close the stigma again
4. Put the label





# SUITABLE STAGE FOR HYBRIDIZATION

- On the day prior to anthesis, the corolla will "candle" or elongate and usually extend beyond the enclosing bracts, giving the appearance of an unburned candle tip.
- At this stage the anthers are compressed around the staminal column with the stigma protruding from the tip.
- This is the suitable stage of both female and male flowers for crossing (emasculatation and pollination).



**BOTH FEMALE & MALE**

# HYBRIDIZATION ?

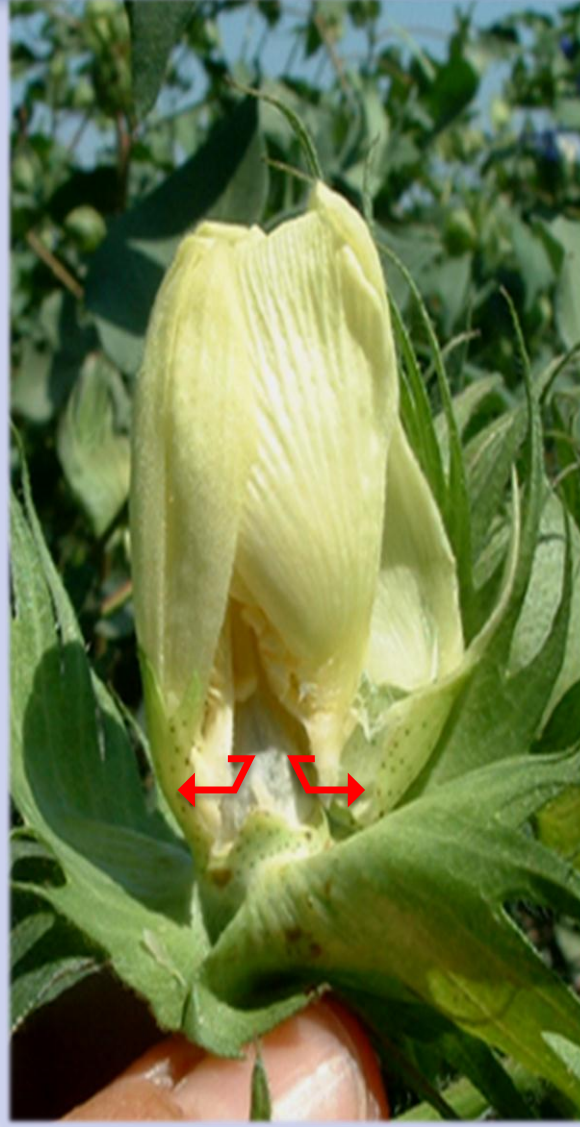
- To prepare the female for hybridization, the corolla and anthers are removed from candle-stage flowers (Emasculation)



FEMALE



# EMASCULATION



FEMALE



# HYBRIDIZATION ?

Various techniques for removing anthers are used.

- The common and faster method is to remove the corolla and anthers by hand from candle-stage flowers.
- It should be used by experienced personnel.
- In the method the calyx, corolla, and staminal column are removed in one piece.



FEMALE

# HYBRIDIZATION ?



The safest but slowest method is;

- to remove the corolla and
- pluck the anthers from the ends of the filaments,
- leaving the staminal column intact.



**FEMALE**



# HYBRIDIZATION ?

- This method should be used during extremely hot and dry weather conditions.
- It can be used for the parents crossing of them is difficult.



**FEMALE**



# HYBRIDIZATION ?

- In hybridization avoiding uncontrolled pollination is important and stigmas of emasculated flowers should be protected from random pollen using a soda straw, paper bag, or other similar device.
- In addition the flower marked with colored yarn or another easy-to-find marker.



**FEMALE**

# HYBRIDIZATION ?

- At that time male flower should be protected from avoiding uncontrolled pollen contamination.
- It can be closed using a thin yarn, an attacher, or other similar device and
- marked with colored yarn or another easy-to-find marker,



MALE



# EMASCULATION

- Emasculated female flower and closed male flower are marked with colored yarn or another easy-to-find marker,



**FEMALE**



**MALE**



# HYBRIDIZATION ?

- The day following emasculation, pollen from the male parent is applied to stigmas of seed parent, usually between 10 A.M. and 1 P.M. In the field, pollen viability declines later in the afternoon.
- However, pollen may remain viable for 24 hours or more if stored at 2-3°C .



# HYBRIDIZATION

After pollinating the emasculated female flower slipping the soda straw over the stigma again .





# POLLINATION

Put the label pollinated flowers stem !



Female Parent / Male Parent  
Date

After the pollination of one combination and before passing another one, clean up the hands by alcohol !



# EMARI







## REFERENCES



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THANKS...





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