

Reciprocal Recurrent Selection

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Definition and scheme

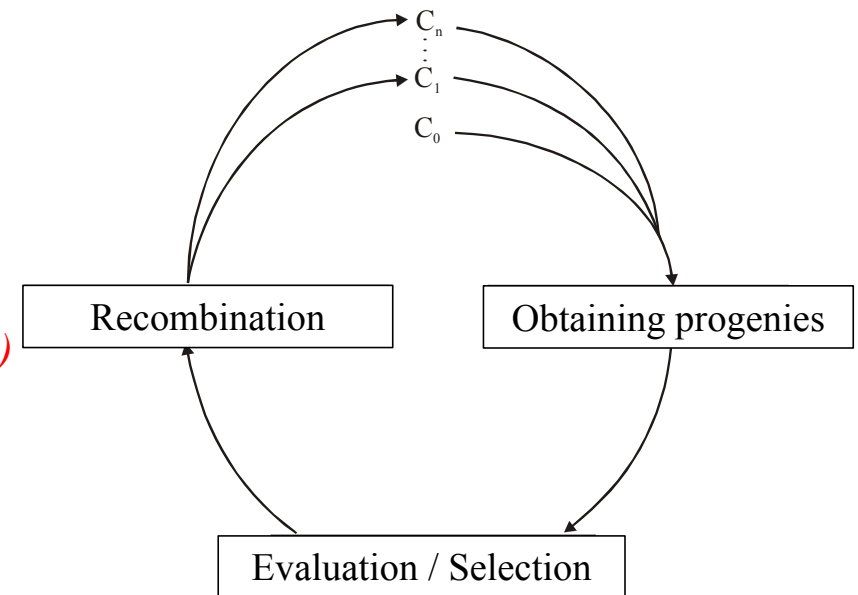
- Continuous process which aims the increasing of the allele frequencies but without miss substantial genetic variability.
- Dynamic process – every cycle is possible to release na improved material and add more genetic variability

- Three stages

i) Obtaining progenies

ii) Evaluation and selection – identify the best parents

iii) Intermate the selected progenies (next cycle of selection)

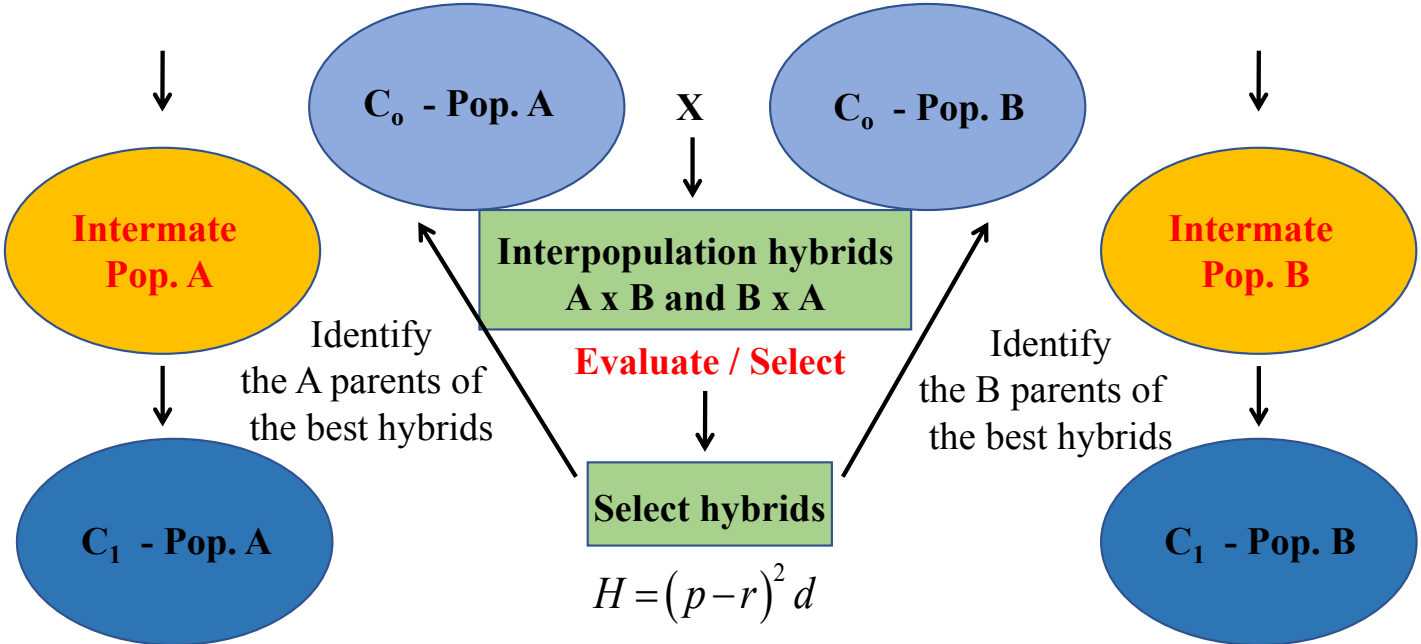


General scheme of RRS

A x A (S₁ or HS)

A x B and B x A (HS, FS or testers)

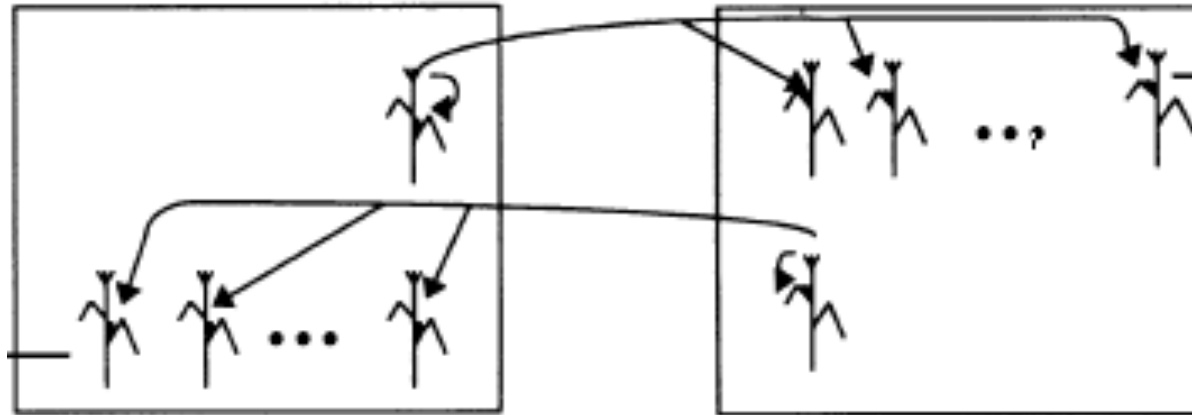
B x B (S₁ or HS)



Increase the heterosis between populations

Stages of RRS

- **Stage 1: *obtaining progenies***



Testers, HS, FS or S_1 – Which one is the best for RRS?

Stages of RRS

- **Stage 2: evaluation and selection**

- **Breeding objectives**

$$RS = \frac{i}{\sigma_P} c \sigma_A^2$$

$$RS = i_1 \cdot c \cdot \frac{\sigma_{A1:2}^2}{\sigma_{P1:2}} + i_2 \cdot c \cdot \frac{\sigma_{A2:1}^2}{\sigma_{P2:1}}$$

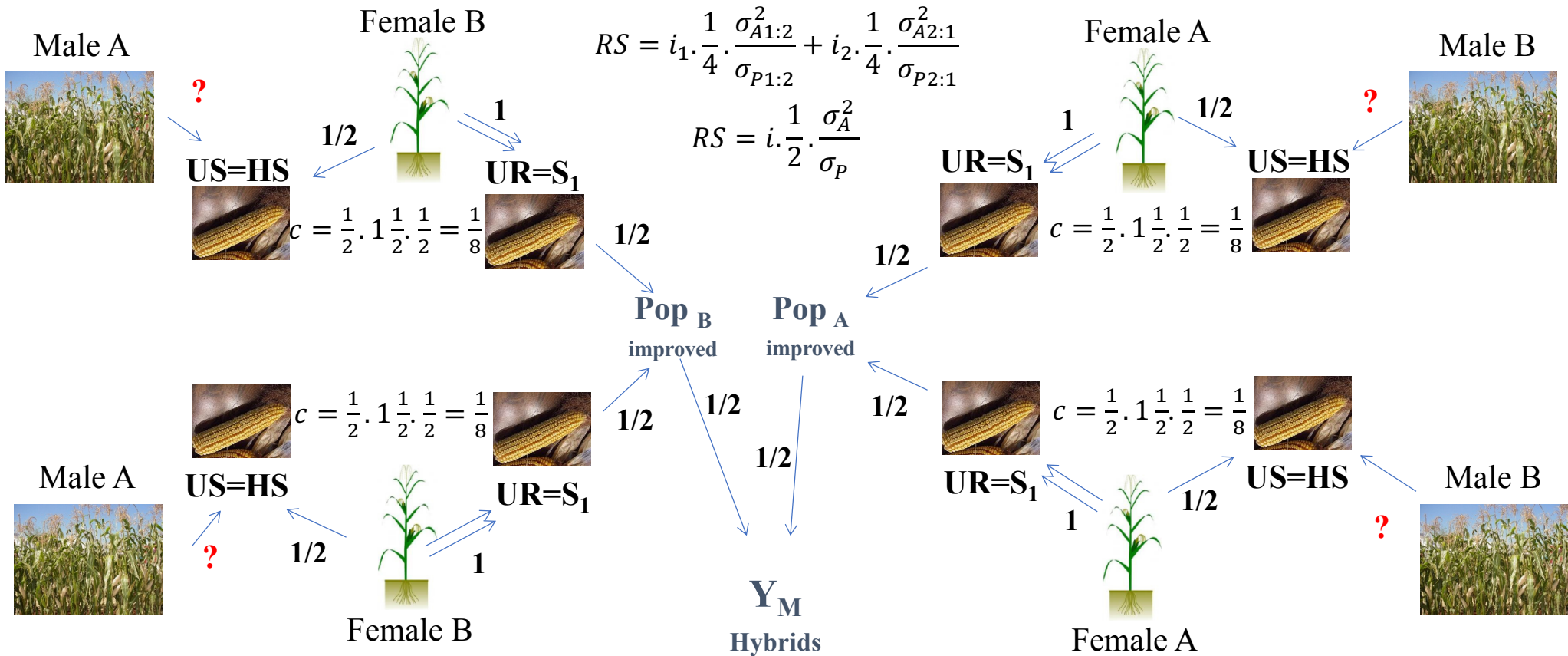
Avaliação	Recombinação	c	Ne	Ne (10% de 200)
MI	MI	¼	4	80
MI	S ₁	½	1	20
IC	IC	½	2	40
IC	S ₁	½	1	20

%	20	10	1	0.1
i	1.40	1.76	2.67	3.37

$$Ne = \frac{1}{2F}$$

- **c** = Parental control and additive covariance between the units of selection and recombination
- **Effective population size** - *evaluation* (200) and *intermate* (10 to 20)
- Avoid to miss the genetic variability and boost the genetic drift

Scheme - interpopulation HS / S₁



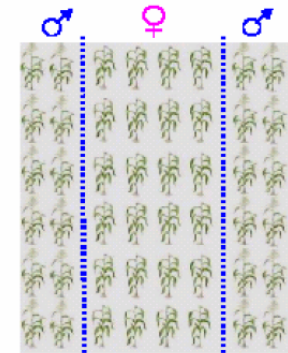
Stages of recurrent selection

- **Stage 3: intermate** – each group separately
- Produce genetic variability for the next cycle
- Combine the superior allele/genes selected from different individuals in the newest genotypes

Ireland Method

$$Vq = \frac{pq}{2N}$$

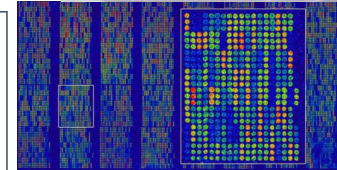
1	2	3	4	5	1	2	3
4	5	1	2	3	4	5	1
2	3	4	5	1	2	3	4
5	1	2	3	4	5	1	2
3	4	5	1	2	3	4	5
1	2	3	4	5	1	2	3
4	5	1	2	3	4	5	1
2	3	4	5	1	2	3	4
5	1	2	3	4	5	1	2
3	4	5	1	2	3	4	5



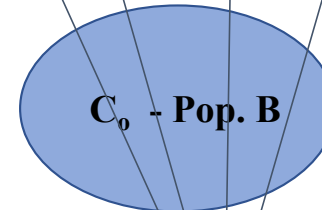
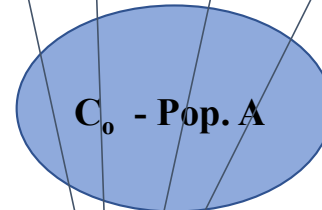
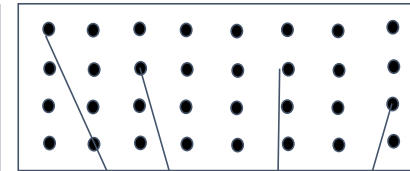
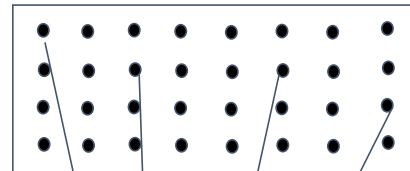
- 50 plants at least in the female rows
- Just one cycle of random intermate is enough to achieve the HWE
- Use the same number of seeds to hybridize and to compose the post-harvest sample

Macho: mistura das sementes das progênies selecionadas
 Fêmea: progênies selecionadas

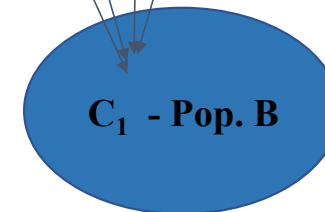
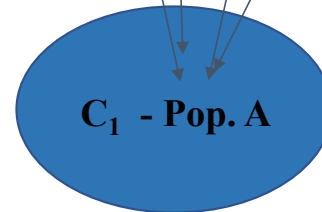
Genomic Reciprocal Recurrent Selection



Many cycles of
Genomic selection



Identify the A and B
parents of
the best hybrids
based on markers



Training / Validation Set

Genotyping the lines
Phenotyping the hybrids (NCII)
Adjust the models and identify the
marker effects per group

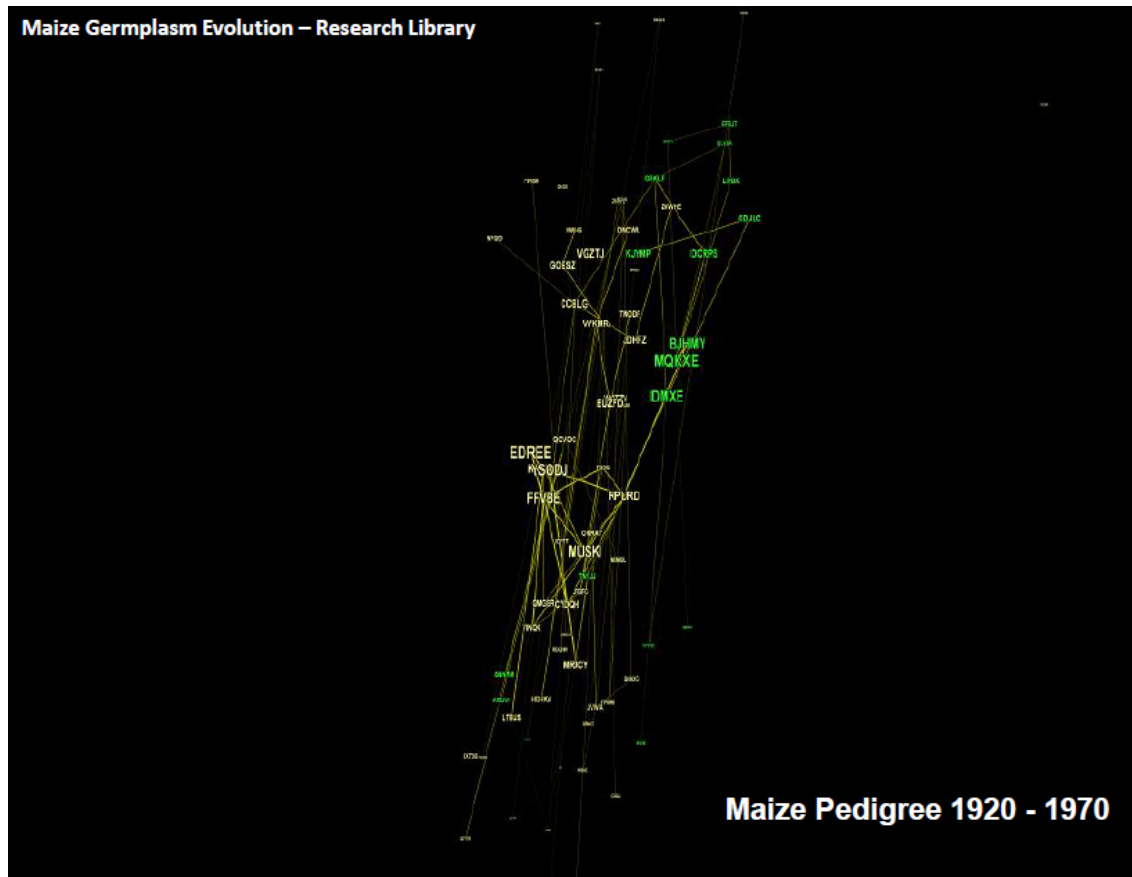


Improved lines
(hybrids or the newest TS)



Doubled haploids

Germplasm of DuPont - Pioneer



Germplasm of DuPont - Pioneer



Germplasm of DuPont - Pioneer

