Bulk Method of selection

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Introduction

- **Mass** and **pure line Selection** can **not be applied to segregating population e.g. F2,F3,**etc obtained from crosses
- **For handling the segregating generation** the methods generally used are

1. **Bulk Method**
2. **Pedigree method**
3. **Back cross method**

- In this method, **individual plants are selected from F2** and **subsequent generations** **their progenies are grown** and a record of all parent offspring relationship is maintained.

Bulk method

- **Mass Method** or **Population Method**
- **Mass Pedigree Method: Harlan**
- **Population breeding method**
- **Evolution breeding method: Suneson**
  (because of natural selection)

Bulk Method

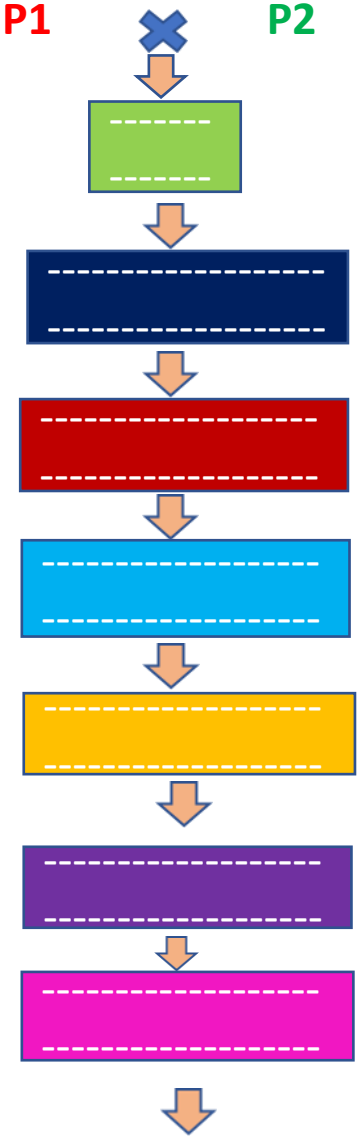
- The bulk method of breeding was **first** used by **Nilson-Ehle** in **1908.**
- This method is also known as "**Mass Method**" or "**The Population Method".**
- Bulk population breeding is a **strategy of crop improvement** in which the **natural selection effect** is solicited more directly in the early generations of the procedure by delaying stringent artificial selection until later generations.

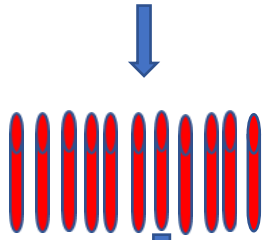
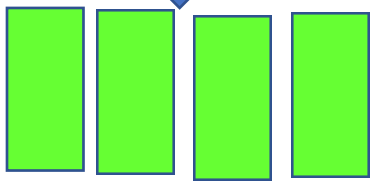
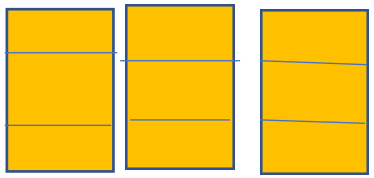
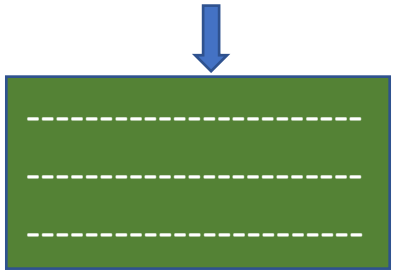
Mainly natural selection: Evolutionary method of breeding
Rarely artificial selection

- In the bulk method, **F2** and **subsequent generations** are harvested in mass or as bulks to raise the next generation.
- At the **end** of bulking period, **individual plants are selected** and evaluated in **a similar manner as in pedigree method**.
- The duration of bulking may vary from **6-7 to 30 or more generations.**
- During bulking period, artificial selection may or may not be practiced, but **natural selection** plays an important role in shifting gene frequencies.
- When **desirable purposes** are **fulfilled** **bulking** is **stopped** **and individual plants are selected and evaluated.**

Bulk method for Isolation of homozygous lines

First Year	Parents	P1 × P2	Selected parents are hybridized
Second year	F1		F1 space planted, seed harvested in bulk
Third year	F2		F2 planted at commercial seed rate; harvested in bulk
Fourth year	F3		As in F2
Fifth year	F4		As in F2
Sixth year	F5		As in F2
Seventh Year	F6		As in F2
Eight Year	F7		i. F7 is space planted ii. Superior plants selected iii. Seeds harvested separately



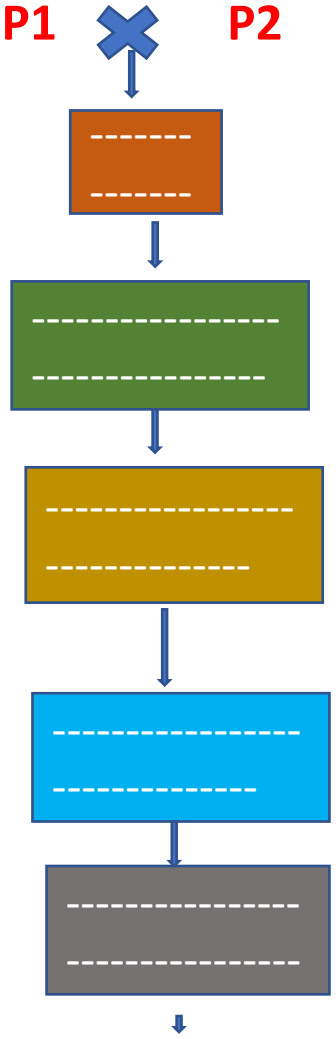
Ninth Year	F8		i. Individual plant progenies grown ii. Inferior progenies eliminated
Tenth Year	F9		i. Preliminary yield trials using standard varieties as check ii. Quality test
Eleventh to Thirteen years	F10-F12		i. Mulit-location yield trials
Fourteenth Year			Seed increase for distribution begins

Single seed Descent Method

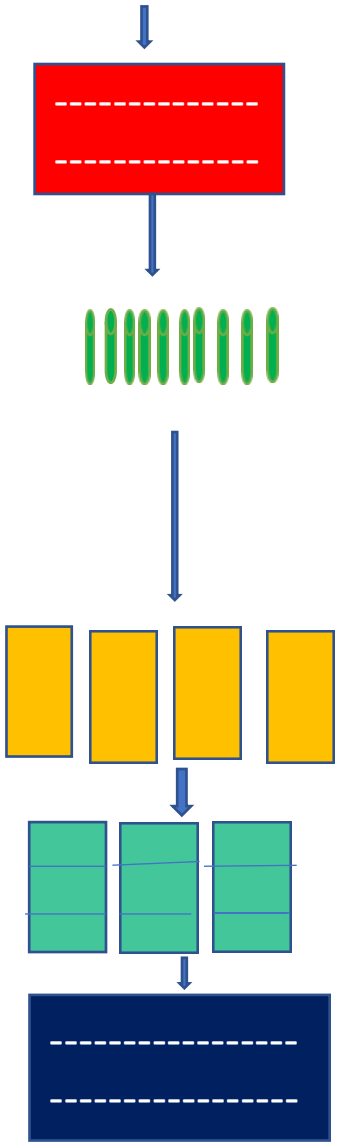
- A modification of bulk method is the **single seed descent method**
- This method is particularly suited for **developing populations of recombinant inbred lines (RILs) from selected cross**.
- The **objective** of **single seed descent method is to rapidly advance the generation of crosses**
- At the end of the scheme **a random sample of homozygous lines is obtained.**

Single seed descent method

First crop	Parent	P1 × P2	Selected parents are hybridized
Second crop	F1		F1 space planted: harvested in bulk
Third crop	F2		i. F2 densely planted ii. From each plant one random seed selected and buked
Fourth crop	F3		i. F3 densely planted ii. From each plant, one random seed selected and bulked
Fifth crop	F4		As in F3 (i) and (ii)
Sixth crop	F5		As in F3 (i) and (ii)



Seventh crop		i. F6 space-planted ii. 100-500 plants with desirable characteristic harvested separated
Eighth crop	**F7**	i. Individual plant progenies grown ii. Weak and undesirable progenies eliminated iii. Desirable homogeneous progenies harvested in bulk iv. Individual plants may be selected only from outstanding progenies showing segregation
Ninth crop	**F8**	i. Preliminary yield trial with a suitable check ii. Quality test
Tenth-Twelfth crops	**F9-F11**	Coordinated yield trials; disease and quality tests
Thirteenth crop		Seed increase for distribution to farmers begins



Advantages

- **Less record keeping than pedigree which saves time and labour.**
- **Very simple, convenient and less expensive.**
- **Natural selection increases the frequency of superior genotypes in the population.**
- **More useful than pedigree method with lower F2 traits**
- **There is greater chance for isolation of transgressive segregated than in pedigree methods due to a large population.**
- **Most suitable for improvement of small grains**

Disadvantages

- **Environmental changes** from season to season so **adaptive advantages shift.**
- It takes much **longer time** to develop a new variety.
- **Not useful in selecting plant types at a competitive disadvantages (dwarf types).**
- Final genotypes may be able to **withstand environmental stress**, but may **not be highest yielding.**
- If useful with a cross pollinated species, **inbreeding depression** may be a problem.
- It provides **little opportunity** for breeder to exercise his skill or judgement in selection

Applications

- Isolation of homozygous line
- The bulk method is suitable for handling the segregating generations of cereals, small millets, grain legumes and oilseeds. It may be for different purposes.
- Isolation of homozygous lines with a minimum efforts and expenses.
- Waiting for the opportunity for selection, natural/suitable environmental condition.
- To provide opportunity for natural selection to change the composition of the population.

References

- **Plant breeding;** Principles and methods, **B.D.Singh,** Kalyani publishers
- **An introduction to Plant breeding, Jack Brown and Peter** Caligari, Blackwell publisher

THANK YOU