## Comparison among Hybrid, Synthetics and Composite

| Sl. No. | Basis | Hybrids | Synthetics | Composite |
|---|---|---|---|---|
| 1 | Base population | Inbreds | Inbreds or clone | Varieties or other heterozygous source. |
| 2 | Parents | Usually 2-4 (6 in triple cross) | 4-10 | Two to many |
| 3 | Pollination | Controlled | Random, open pollinated | Open pollinated |
| 4 | General combining ability (GCA) | Tested | Tested | Usually not tested |
| 5 | Heterosis | More | Less than hybrid and composite | Less than hybrid |
| 6 | Seed used | F1 | F1 to F4 | F1 to F4 |
| 7 | Seed cost | More | Less than composite and hybrid | Less than hybrid |
| 8 | Seed replacement | Annual | After 3-4 years | After 3-4 years |
| 9 | Varietal maintenance | Difficult | Easy | Easy |
| 10 | Re-construction | Possible | Possible | Not possible |

## Differences between Autopolyploid and allopolyploids

| Character | Autopolyploid | Allopolyploid |
|---|---|---|
| 1) Chromosome number | Multiple of one genome. | Multiple of two or several genome. |
| 2) External morphology | Resembling a single diploid ancestral. | Resembling of two or more ancestral. |
| 3) Chromosome pairing | Multivalent, frequent | Mostly univalent, multivalent due to auto synthesis. |
| 4) Segregation pattern in F2 | Polysomic | Polysomic to diosomic |
| 5) Example | i. Watermelon (*Citrullus vulgaris)*<br>ii. Sugarbeets (*Beta vulgaris)* | i. Cultivated wheat (*Triticum aestivum).*<br>ii. Cultivated Tobacco (*Nicotiana tabacum)* |

## Comparison among clones, purelines and inbreds

| Particulars | Clone | Pureline | Inbred |
|---|---|---|---|
| 1) Mode of pollination | Cross pollination. | Self pollination | Cross pollination |
| 2) Nature of reproduction. | Asexual | Sexual | Sexual |
| 3) Genetic make-up | Heterozygous | Homozygous | Heterozygous |
| 4) Obtained through | Asexual reproduction from a single plant. | Natural self pollination from a single homozygous plant. | Artificial self pollination or close inbreeding and Selection for several generation. |
| 5) Maintained through | Asexual reproduction | Natural self pollination | Artificial self pollination or close inbreeding. |
| 6) Genotypically | Identical | Identical | Almost identical |
| 7) Used directly as a variety | Yes | Yes | No |
| 8) Organism where found. | Plants | Plants | Plants, animal |

## Distinguish between Biotic & Abiotic Stress

| Biotic stress | Abiotic stress |
|---|---|
| 1. Biotic stress include living organism. e.g. insect, pest, bacteria, fungi etc. | 1. Abiotic stress include physical factors of environment. e.g. Temperature, moisture, wind, soil salinity and alkalinity etc. |
| 2. The effect of biotic stress is changeable. | 2. The effect of abiotic stress is stable. |
| 3. The effect of biotic stress is density dependent. | 3. Density independent. |
| 4. Directly related to stress. | 4. Indirectly related to stress. |
| 5. Generally man can control it such as spraying insecticides in case of insect. | 5. Generally man can not control it. e.g. high temperature beyond the control of stress. |

## Comparison between Pedigree and bulk method

| Pedigree method | Bulk method |
|---|---|
| 1. Individual plants are selected in F2 and the subsequent generations and individual plant progenies are grown. | 1. F2 and subsequent generations are maintained as bulks. |
| 2. Artificial selection, artificial disease epidemics, etc. are an integral part of the method. | 2. Artificial selection, artificial disease epiphytotics etc. may be used to assist natural selection. In certain cases, artificial selection may be essential. |
| 3. Natural selection does not play any role in the method. | 3. Natural selection determines the composition of populations at the end of the bulking period. |
| 4. Pedigree records have to be maintained which is often time consuming and laborious. | 4. No Pedigree records are maintained. |
| 5. It generally takes ~12 years to develop a new variety and to release it for cultivation. | 5. It takes much longer for the development and release of a variety. The bulk population has to be maintained for more than 10 years for natural selection to be effective. |
| 6. It is the most widely used breeding method. | 6. It has been used only to a limited extent. |
| 7. It demands close attention from the breeder from F2 onword as individual plant selection have to be made and Pedigree records have to be maintained. | 7. It is simple, convenient and inexpensive and does not require much attention from the breeder during the period of bulking. |
| 8. The segregating generations are space planted to permit individual plant selection. | 8. The bulk populations are generally planted at commercial planting rates. |
| 9. The size of population is usually smaller than that in the case of bulk method. | 9. Large population are grown. This and natural selection expected to increase the chances of recovery of transgressive segregants. |

## Comparison between backcross and Pedigree method

| Pedigree method | Backcross method |
|---|---|
| 1. F1 and the subsequent generations are allowed to self pollinate. | 1. F1 and the subsequent generations are backcross to the recurrent parent. |
| 2. The new variety developed by this method is different from the parents in agronomic and other characteristics. | 2. The new variety is identical with the recurrent parent except for the character under transfer. |
| 3. The new variety has to be extensively tested before release. | 3. Usually extensive testing is not necessary before release. |
| 4. The method aims at improving yielding ability and other characteristics of the variety. | 4. The method aims at improving specific defects of a well adapted, popular variety. |
| 5. It is useful in improving both qualitative and quantitative characters. | 5. It is useful for the transfer of both quantitative and qualitative characters provided they have high heritability. |
| 6. It is not suitable for gene transfer from related species and for producing substitution of addition lines. | 6. It is the only useful method for gene transfer from related species and for producing addition and substitution line. |
| 7. Hybridisation is limited to the production of F1 generation. | 7. Hybridization with the recurrent parent is necessary for producing every backcross generation. |
| 8. The F2 and the subsequent generation are much larger than those in the back cross method. | 8. The back cross generations are small and usually consists of 20-100 plants in each generation. |
| 9. The procedure is the same for both dominant and recessive genes. | 9. The procedures for the transfer of dominant and recessive genes are different. |

# Comparison between pureline and mass selection

| Pureline selection | Mass selection |
|---|---|
| 1. The new variety is a pure line. | 1. The new variety is a mixture of purelines |
| 2. The new variety is highly uniform. In fact, the variation present within a pureline variety is purely environmental. | 2. The variety has genetic variation for quantitative characters, although it would be relatively uniform in general appearance. |
| 3. The selected plants are subjected to progeny test. | 3. Progeny test is generally not carried out. |
| 4. The variety is generally the best pure line present in the original population. The pure line selection brings about the greatest improvement over the original variety. | 4. The variety is inferior to the best pure line because most of the pure lines included in it will be inferior to the best pureline. |
| 5. Generally, a pureline variety is expected to have a narrower adaptation and lower stability in performance than a mixture of pure lines. | 5. Usually the variety has a wider adaptation and greater stability than a pureline variety. |
| 6. The plants are selected for their desirability. It is not necessary that they should have similar phenotype. | 6. The selected plants have to be similar in phenotype since their seeds are mixed to make up the new variety. |
| 7. It is more demanding because careful progeny tests and field trials have to be conducted. | 7. If a large number of plants are selected, extensive field trials are not necessary. Thus, it is less demanding on the breeder. |
| 8. Generally, 7 to 8 years are required to develop a new variety. | 8. Generally, 6 to 7 years are required to develop a new variety. |
| 9. Selection within a pureline variety will be ineffective unless it has become genetically variable. | 9. Selection within a variety developed though mass selection will be effective since it has genetic variation. |
| 10. The produces of a pureline variety is uniform in quality. | 10. The produce is generally not uniform since different purelines making up the variety may differ in the quality of their grains, etc. |
| 11. The variety is easily identified in seed in certification programs. | 11. The variety is relatively difficult to identify seed certification programs. |
| 12. Pureline selection is used in self pollinated and often cross pollinated crops. | 12. Mass selection is used in both self and cross pollinated crops. |

## Comparative study among the four methods of recurrent selection

| Item | SRC | RS-GCA | RS-SCA | RRS |
|---|---|---|---|---|
| 1. Source population | 1 | 1 | 1 | 2 |
| 2. Duration/ Selection cycle | 2 years | 3 years | 3 years | 3 years |
| 3. Types of tester | No tester | Heterozygous | Homozygous | Open population |
| 4.Exploitation / Utilization of genetic variance | Additive genetic variance | Additive genetic variance | Non- additive genetic variance | Both additive and non-additive genetic variance |
| 5. Type of test | No test | GCA-test | SCA- test | Both GCA and SCA test |