

Viticulture - Characteristics of the vine - Development of new vine varieties

DEFINITIONS

- Inter: between different species
- Intra: within one species

HYBRIDISATION

- Difference species (interspecific hybridization)
- Began in the US. *V. vinifera* unsuitable and discovered indigenous species. Inter-breed the two to produce hybrids such as Concord, Black Hamburg, and Clinton.
- Started in Europe with the development of rootstocks for grafting in the late 19th century. Nurseries developed hybrid rootstocks by crossing *V. berlandieri* (high calcium tolerance, but doesn't root well from cuttings) with *V. riparian* and *V. rupestris* (phylloxera resistant, grafts well, very poor calcium tolerance).
- Introduction of downy mildew in 1878 in Europe spurred more hybridization. Results produced good yields, some mildew resistance, and some could be planted un-grafted.
- By the late 1950s, hybrids 30% of French vineyard land.
- This led to severe overproduction of poor quality.
- Now, most areas forbid hybrids. Not permitted for QWPSR wines in France & Italy. Abandoned in the late 1950s.
- Hybrids still widely used in eastern USA due to their high winter cold resistance.
- Still active in German institutes.

INTRASPECIFIC VINIFERA CROSSES

- Crosses of one *vinifera* varietal with another.
- Bouschet crossed Aramon x Teinturier = Alicante Bouschet.
 - Anthocyanins in pulps and skins, deep red juice.
- Müller-Thurgau
 - Created by Dr. Hermann Müller in the Geisenheim Grape Breeding Institute in 1882.
 - He was born in the Swiss Canton of Thurgau.
 - Riesling x Madeleine Royale.
 - Aim was to combine the quality of Riesling with the reliability and early ripening of Silvaner (proved to be Madeleine Royale in 2000).
 - Madeleine Royale a still unknown crossing made in 1845.
 - Müller-Thurgau ripens early, earlier than Silvaner, can grow anywhere, sometimes double Rieslings common yields, can be dull and flabby.
 - 2nd most planted in Germany.
 - 42,000 ha worldwide. Most widely planted cross.
- Pinotage
 - Created by Stellenbosch University viticulturist A.I. Perold.
 - Pinot Noir x Cinsault (Hermitage).
- Germans develop Scheurebe, Kerner, and Reichensteiner.

GRAPE HYBRIDISATION

- Crosses is all about flowers.
- Grapes reproduce sexually.
- Pollen from a male fertilizes the female ovary and a seed develops.
- Depending on the individual vine, flowers may be female, male, or hermaphroditic (known as "perfect").
- Majority of cultivated vines are hermaphroditic.
- Fruit does not result without fertilization, so hermaphroditic vine preferred, each plant is capable of producing fruit.
- Male parts of the flower are stamens, each consisting of a pollen-bearing anther supported by a filament. Generally five anthers arranged around the ovary.
- Pollen is shed as the anther ripens and primarily transported by wind, rarely more than 20 feet from the source.
- Pollination occurs when pollen lands on the female parts of the flower.
- Each pollen grain grows a long tube towards the egg within the ovary, and the sperm cells move down this tube.

- The embryo grows within the developing seed, while the entire ovary grows to become the grape berry itself with seeds contained within.

MAKING CROSSES

- **Pollen Collection -**
 - If they “nick” meaning, male happens to be in flower at the same time as the female, then collect a few of the flowering clusters for pollen.
- **Differences in timing require other approaches -**
 - If male is earlier:
 - Dry the clusters (1-2 days) and shake out pollen onto a sheet of glass, then collect it into a vial by scraping the glass.
 - If male flowers after the female:
 - Pollen must be collected, dried, and stored in a freezer (-20C/0F) and the cross is made next year.
 - Stored pollen usually remains viable, but is often not as effective.
- **Preparing the female -**
 - Each flower cluster on a grapevine may hold dozens to hundreds of individual flowers. All steps must be applied to every flower. Guiding principle is to prevent accidental pollination.
 - Before the flowers open, each one is covered by a cap, short for calyptra. The cap is removed a day or two before the cross to prevent self-pollination with perfect-flowered varieties.
 - Most cases the anthers can, with care and practice, be removed at the same time as the calyptra, called Emasculation.
 - After the cluster has been emasculated, you must wait 1-4 days (more for cool temps, less for warm) so that the female parts of the flower mature further and attain peak receptivity, indicated by the appearance of a bead of moisture on the stigma.
 - During the 1-4 days the cluster is covered within a bag.
 - No emasculation necessary if the female variety produces female (imperfect) flowers.
- **Making the cross -**
 - Simply a matter of brushing the pollen onto the stigmas of the emasculated cluster.
 - If both parents are flowering simultaneously, the pollen bearing cluster can be gently brushed against the emasculated female.
 - Stored pollen applied with soft brush sterilized with 70% ethanol.
 - Paper bag is then replaced for protection.
- **Planting the seeds -**
 - Over the course of the season, berries on the cluster mature and ripen within the bags.
 - Clusters collected and the seeds extracted.
 - Seeds contain embryos of new plants with equal amount of genetic material from each parent.
 - Seeds are dropped into a small beaker of water, inviable seeds tend to float and are discarded. Viable seeds are cleaned and stored -20C/0F.
 - Seeds require stratification to germinate well.
 - Seeds along with a dilute solution of fungicide on filter paper in plastic bags are placed in refrigerator (5C/40F) for 3 months. Without this chilling period, germination rates would be very low and growth uniformly would be poor.
 - In March, seeds are planted in small peat pots and germinated in a green house.
 - After frost risk, they are moved outside to a sheltered cold frame location that can be covered if sub-freezing temperatures are expected.
 - In June, seedlings are planted outdoors in an irrigated nursery site.
- **Selections -**
 - The more seedlings planted and the longer spent evaluating them, the better the chance of finding the exceedingly rare selection with potential.