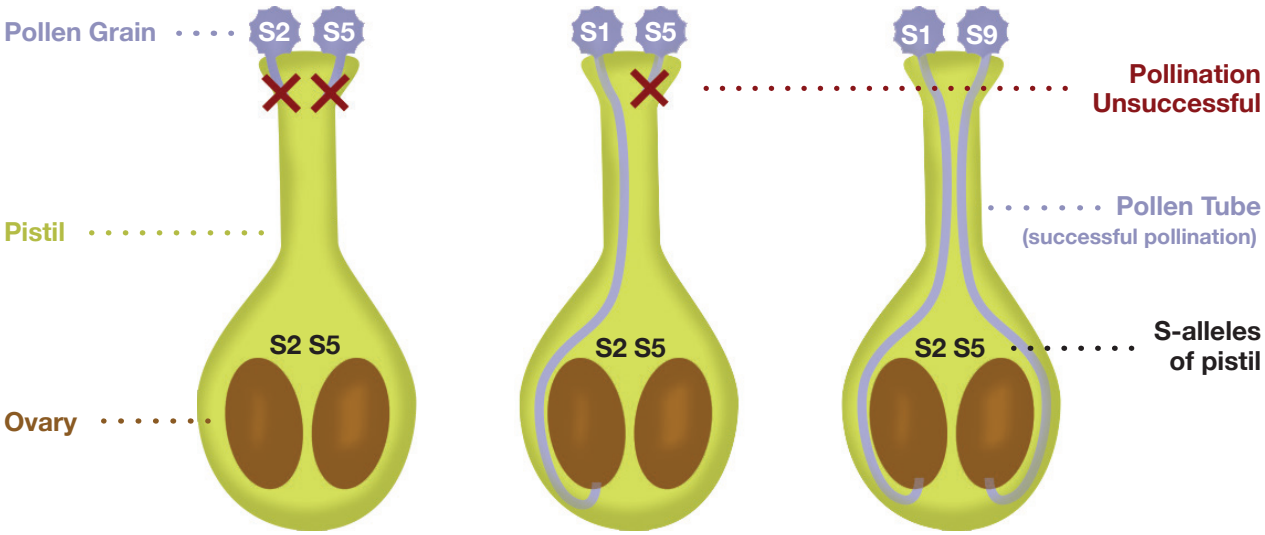
POLLINATION



What are S-alleles?
(and why should you care?)

There is a new buzz phrase in the world of apples, and that is 'S-alleles' (pronounced S ah-leels). I am going to tell you what that means and why it is important to you as a grower

Allele is a fancy word for a gene variant or variation. In this case, the variation is in a gene which functions in the pistil of the apple flower and serves to prevent self-pollination.

We have known for a long time that for fruit set, apples need to be pollinated by another variety, preferably one not closely related.

Identification of the S-alleles allows us to determine more precisely the success rate for pollination between cultivars.

With a great number of new varieties being planted, crosspollination questions have been multiplying. Knowing the S-alleles for a new cultivar will help in orchard planning.

Each regular (diploid) cultivar has two alleles; triploids like Mutsu have three. They are notated as S2 S5 (Gala), S2 S3 (Golden Delic.), etc. Each pollen grain carries only one of the two variants. If an S5 pollen grain lands on a Golden Delicious pistil, it

Key to S-alleles

Common Varieties
Red Delicious – S9 S28
Golden Delicious – S2 S3
HoneyCrisp – S2 S24
Fuji – S1 S9
Gala – S2 S5
Jonathan – S7 S9
MAIA Varieties
MAIA1 (Evercrisp®) – S1 S24
MAIA-L (Ludacrisp®) – S10 S24
MAIA12 (Summerset®) – S9 S24
MAIA11 (Rosalee®) – S1 S2
MAIA-Z (Sweet Zinger®) – S3 S28
MAIA-SM (Sweet Maia®) – S2 S9

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can grow freely and pollinate. If an S2 pollen grain lands on the same pistil, its growth will be blocked. Only 50% of the pollen will be effective in this case. If two cultivars happen to have the same two alleles, neither will pollenize the other at all. Conversely, the best pollenizer will differ in both alleles from the target pistil. See the figure on previous page..

There are about 28 known alleles in Apple, plus additional in Crabapples, so there are many possible combinations, but due to the extensive use of Red and Golden Delicious as parents, and more recently Honeycrisp, certain alleles are more prevalent in current varieties.

MAIA recently used the services of Stefano Musacchi at WSU to determine the S-alleles of some of our varieties, and I invite you to look at the included table to see how they relate to various others. For example, you will see that Golden Delicious is a good pollenizer for MAIA1, MAIA-L, and Fuji (assuming overlapping bloom). It is not so good for Honeycrisp, Gala, MAIA11 or MAIA-Z, as it shares the S2 allele with the first three and the S3 with the last. Research is ongoing to determine the S-alleles of additional varieties, especially for varieties whose parents' S-alleles have not been determined.

When two varieties are crossed, the possible resulting S-allele combinations will equal four. Using Golden by MAIA-L as an example, the offspring will be either (S2 S10), (S3 S10), (S2 S24), or (S3 S24). This information can be useful when the parentage of a new variety is unknown or dubious, as certain possible parents can be eliminated.

As acknowledgement of sources and to encourage further reading, see an article in HortSci Vol. 39 (5) from August 2004 by Broothaerts et al. Also New York Fruit Quarterly Vol. 20 Num. 2 from Summer 2012 by Orcheski and Brown. Finally http://treefruit.wsu.edu/article/crosscompatibility- of-apple-cultivars-and-pollinizers/ by Scheick, Serra and Musacchi Oct 2019.

Brad Phillips
Chairman of the MAIA Science Committee

APPLE CULTIVAR	S GENOTYPE	REFERENCE
BRAEBURN	S9 S24	2
CAMEO	S2 S28	3
COSMIC CRISP™ (CV. WA 38)	S5 S24	MUSACCHI LAB UNPUBLISHED
CRIPPS PINK	S2 S23	4
FUJI	S1 S9	5
GALA	S2 S5	6
GOLDEN DELICIOUS	S2 S3	5
GRANNY SMITH	S3 S23	4
HONEYCRISP	S2 S24	3
KANZI® (CV. NICOTER)	S5 S24	7
RED DELICIOUS	S9 S28	8
ROME	S20 S24	9

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