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Hybridizers List of New Smith Intersectional Hybrids

by D. R. Smith

By this time, most of you have probably had the opportunity to visit my website on intersectional hybrids at <www.intersectionalpeonies.com>. Although, the majority of the new hybrids pictured there are from the *Martha Washington x Golden Era* cross, a few are from other matings. For those who are especially interested in these hybrids or would like to try and duplicate my results, it would obviously be helpful to have a complete list of all the hybrids that appear on the site along with their corresponding seed and pollen parents. Over the years, I have kept very careful records of my hybridizing work and therefore, there is little or no uncertainty regarding the parentage of my hybrids. As a result, I am able (and quite happy) to share this data with those who are interested in having this

type of information. This list is given in Table 1. With only one exception, all of the parent plants used to produce these hybrids are commercially available. A list of sources for these parent plants can found on page 11 of this issue. Twelve (12) of these new hybrids have been named and submitted for registration with the American Peony Society (August 2002). These plants are indicated with an † in Table 1. The registrations for these will appear in the December 2002 issue of the APS Bulletin (No. 324). Others from Table 1 will be registered in the near future.

Color Streaking Effects in Intersectional Hybrid Flowers

by D. R. Smith

Color streaking is one of the more interesting flower coloration effects observed among the intersectional hybrids. This effect is exhibited in various forms and degrees and occurs in about 10-15% of my intersectional seedlings. Generally, I consider these effects to be undesirable abnormalities (i.e., genetic defects), but in some cases they add charm and interest to the flowers. In extreme cases, the result is usually unattractive, however, some would undoubtedly disagree. One such example is shown in Figure 1 below. Here, there is a combination of both dark purple and white streaks and flecks on a base of lavender pink. Other more subtle (and also more attractive) examples of color streaking are shown in Figures 2 and 3. Other examples can be found on my intersectional website at

www.intersectionalpeonies.com

Fig. 1. Smith Intersectional Hybrid Seedling # IC-94-24 (*Martha Washington x Golden Era*)

Table 1. Hybridizers list of Smith intersectional hybrid peonies listed on the intersectional peony website at <intersectionalpeonies.com>.

	Cultivar Name	*First Bloomed*	*Flower Type*	*Flower Color*	*Herb. Lactiflora Seed Parent*	*T.P. Pollen Parent*
1	IC-92-03	2000	S-SD	Lt. Yellow	Martha Washington	Golden Era
2	IC-93-01	1999	S-SD	Lt. Yellow	Martha Washington	Golden Era
3	IC-93-06	2000	SD-D	Yellow	Martha Washington	Golden Era
4	IC-93-14R	2000	SD	Pink	Martha Washington	Golden Era
5	IC-93-18	2002	SD	Yellow	Gertrude Allen	Golden Era
6	IC-93-21	2000	D-FD	Yellow	Martha Washington	Golden Era
7	IC-93-22	2000	S-SD	Yellow	Martha Washington	Golden Era
8	IC-93-26	2001	SD	Yellow	Martha Washington	Golden Era
9	IC-94-02	2000	D	Yellow	Martha Washington	Golden Era
10	IC-94-03	2000	D	Lt. Pink	Martha Washington	Golden Era
11	IC-94-10	2001	D	Yellow	Martha Washington	Golden Era
12	IC-94-13	2000	SD	Yellow & Pink	Martha Washington	Golden Era
13	IC-94-14	2001	S	Pink	Martha Washington	Golden Era
14	IC-94-15	2001	SD	Yellow	Martha Washington	Golden Era
15	IC-94-16	2001	D	Yellow	Martha Washington	Golden Era
16	IC-94-27T	2002	D	Yellow	Martha Washington	Golden Era
17	IC-94-29	2000	S	Near White	Gertrude Allen	Golden Era
18	RC-95-01	2000	SD-D	Yellow & Pink	Age of Gold	Martha Washington
19	IC-95-02	2002	SD-D	Yellow	Martha Washington	Smith's Yellow*
20	IC-95-06	2002	SD	Yellow	Martha Washington	Golden Experience
21	IC-95-09	2002	S	Yellow	Martha Washington	Golden Era
22	IC-95-16	2001	SD-D	Yellow	Martha Washington	Smith's Yellow*
23	IC-95-17	2002	SD-D	Lt. Pink	Martha Washington	Smith's Yellow*
24	IC-95-21R	2000	SD-D	Pink Blend	Martha Washington	Golden Era
25	IC-95-23	2001	SD-D	Yellow	Martha Washington	Golden Era
26	IC-95-26	2001	SD-D	Pink Blend	Martha Washington	Golden Experience
27	IC-95-30R	2001	SD-D	Pink	Martha Washington	Golden Era
28	IC-95-34	2002	SD-D	Yellow	Martha Washington	Golden Era
29	IC-95-37R	2002	SD-D	Yellow	Martha Washington	Golden Era
30	IC-95-39	2002	SD-D	Pink	Martha Washington	Golden Era
31	IC-95-41R	2002	SD-D	Lt. Yellow	Martha Washington	Golden Experience
32	IC-95-42R	2002	SD-D	Yellow	Martha Washington	Golden Experience
33	IC-95-45R	2001	S	Yellow	Martha Washington	Golden Era
34	IC-95-47	2002	SD-D	Yellow Blend	Martha Washington	Golden Era
35	IC-95-51R	2002	SD-D	Yellow	Martha Washington	Golden Era
36	IC-95-53	2000	SD-D	Yellow	Dewey's HP1-61	Golden Era

Smith's Yellow* is an unregistered home grown lutea hybrid from the cross (Golden Era x Alice Harding). This plant has been previously referred to in several **Pæonia articles under the garden name *Smith Family Yellow*. The garden name for this variety has been changed so that the name *Smith Family Yellow* could be used for one of my new intersectional hybrids

Fig. 2. Smith Intersectional Hybrid Seedling # IC-95-23, Parentage: (*Martha W. x Golden Era*)

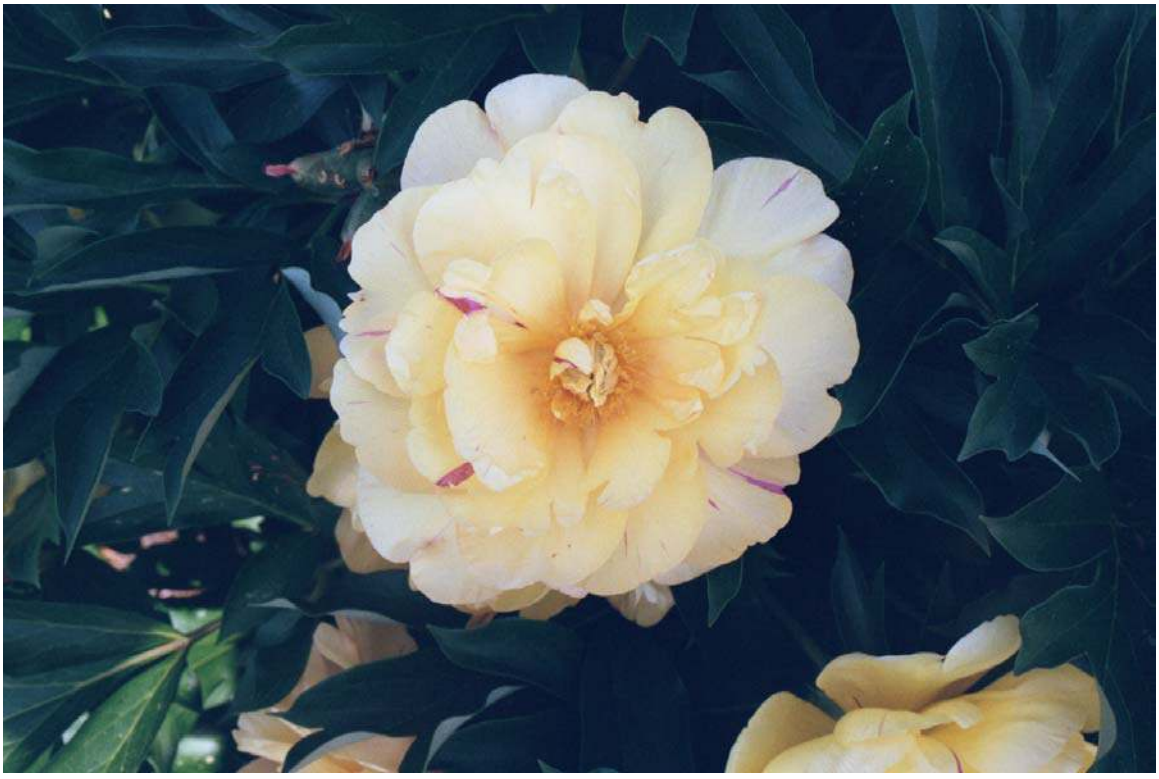

Fig. 3. Smith Intersectional Hybrid Seedling # IC-93-06, Parentage: (*Martha W. x Golden Era*)

A step-by-step guide to producing intersectional hybrids

Producing the seeds

Step 1. (Collecting Pollen) Collect pollen from fertile advanced generation tree peony hybrids (usually referred to as lutea hybrids). Use the most effective pollens available [specifically this means using pollen from Reath's A-199 (*Golden Era*) and/or A-198 (*Golden Experience*)]. Reath's *Alice in Wonderland* is also very effective as well. These three pollens have proved to be far more effective than any others in the intersectional cross. First generation hybrids such as *Alice Harding*, *Thunderbolt*, etc. will usually produce some seeds, but these are much less effective than the advanced generation hybrids mentioned above. Likewise, advanced generation backcross hybrids, such as *Zephyrus* and *Nike*, will also give some seed, but here again are much less fertile than the Reath hybrids mentioned above. For more information on effective pollen parents for the intersectional cross, see Pæonia V25, N2; V25, N3; V26, N2; V29, N3; V30, N1 and V31, N3. To collect the pollen, grab a small bunch of anthers between your thumb and forefinger and pull. If done at the proper time (with the flowers just starting to open), this should separate the anthers from the filaments, leaving just the filaments behind. Drop the anthers into a plastic 35 mm film can and repeat until all of the anthers have been removed. Close and label the can.

Step 2. (Dehiscing and Storing the Pollen) If there is a secret for success with the intersectional cross, I believe that it lies with obtaining viable tree peony pollen and maintaining it's fertility over a long enough period to complete all desired pollinations. Here are some tips for doing this:

Dehisce (bake-out) the pollen quickly and then keep it in a refrigerator at all times except when in use. To do this, spread the anthers on a small sheet of aluminum foil and place it under a 60-100-watt incandescent light for 1-2 days. Once the pollen has been released from the anthers, it can then simply be "poured" into a plastic 35 mm film can (the opaque black cans are preferable to the clear ones) by gently folding the foil in half. Next, add a few grains of rice to each container. The "cans" are then covered, labeled and moved directly to the refrigerator until needed. The pollen must be completely dry (but not dried-out) prior to storage if you expect it to remain viable for more then a few days. Although, you do not need to separate the pollen from the dried-up anthers, you should, however, remove any filaments that are still attached to the anthers as these will soon begin to rot and spoil the pollen batch. Various tests have shown that pollen degrades rapidly at high temperatures (85-100° F). Therefore, when working in the garden, keep your pollen cans out of the hot sun. I use a small 6-pack size insulated cooler to carry my pollen to and from the garden, any cans not in use are always kept in the closed cooler shaded from the sun.

Step 3. (Selecting the Seed Parents) Select herbaceous (lactiflora) varieties that have been shown to be effective seed parents in the intersectional cross. For lists of such parents, see Pæonia V25, N2; V29, N3; V30, N1 and V31, N3. At the top of the list of effective pod parents is the pink single lactiflora superseeder, *Martha Washington.* The variety has a real affinity for tree peony pollen and will set seed to almost all hybrid tree peony pollen.

Step 4. (Pollinating the Flowers) Open and strip-off the petals and anthers from the flowers of the selected seed parent 1-2 days prior to normal opening. Pollinate these flowers immediately. There should be little or no pollen on the anthers to get on your fingers or the stigma. If pollen appears on your fingers during stripping of the anthers, do not panic (see note on self-contamination at the end of Step 6). Check carefully for anthers struck between the carpels and remove them with a sharp tool being very careful not to damage the carpels. This is an extremely common occurrence (for example it occurs on practically every flower of *M. Washington*). If your eyes are not good, use a small magnifying glass to help find these trapped anthers. Contrary to popular wisdom, there is no advantage or reason to delay pollination. The stigma are receptive at this time or will be very soon. Using the tip of your little finger, transfer pollen from the can to the flower being careful to cover the entire stigma with liberal amounts of pollen. The stigma will not be sticky at this point, but the pollen grains will stick to them very nicely nonetheless. It is important not to allow the pollen cans to heat-up in the hot sun while working in the garden. Keep the pollen cans shaded and cool at all times and return the cans to the refrigerator as soon as possible after use. When possible, I do my pollinations in the early evening between the hours of 6:00-8:00 PM.

Step 5. (Bagging and Labeling) Label the stem and bag the flower immediately using a small (3 ½ x 6 ½ inch) paper envelope with one of the small edges cut off. Seal and expand the envelope to form a “mini-tent” and gently slip it over the pollinated flower. This constitutes the “bag”. Do not try to tie-off or seal or attach the envelope at the bottom. This will only trap in moisture and promote rot and decay. The envelopes can be removed after 2-3 days. This step is very important. If you pollinate early, before the self-pollen appears, and completely cover the stigma with fertile pollen, and then "bag" immediately, there is almost no chance for contamination to occur. So long as you do not contaminate your pollen source through careless handling or practices you will be all set. To avoid contaminating your pollen cans, use only a single pollen type at a time (i.e., only T.P. pollens). Make all your intersectional crosses first, then cover and put away your T.P. pollen cans (preferably back in the refrigerator or, at least, in a small portable cooler). Then, you can switch to herbaceous pollens for your other crosses. Be sure to lick and wipe your fingertip clean whenever switching pollens. Also, it helps to keep your fingernails cut very short to prevent trapping pollen grains under your nail. Don’t forget to remove the envelopes after a few days, otherwise rot will likely occur. As far as labels go, I use ordinary tie bands of different colors to identify each pollen used (for example, green tie bands = Golden Era, white tie bands = Alice in Wonderland, etc.)

Step 6. (Wait) Sit back and wait until the seeds are fully developed. This usually occurs around the last week in August or the first week in September here in New England (approx. 12-13 weeks after pollination). So, that's it. I hope this is all specific enough?

If you follow these procedures carefully, I am quite confident that:

- **you will get many true intersectional hybrid seeds,**
- **you will also get a high percentage of ruptured seeds,**
- **you will have few, if any, non-hybrid (pure lactiflora) seedlings among your progeny.**

Note on self-contamination: I believe that self-pollen (in crosses where pollen-bearing flowers are used as the pod parents) is not the major concern for contamination in many cases including the intersectional cross. In my experience, most peonies are relatively self-sterile, although probably not completely so. This includes many of the best lactiflora seeders such as plants like *Martha Washington* and *Miss America*. Numerous times, I have rejected flowers of *M. Washington* which had opened too far and were obviously contaminated with their own pollen prior to my arrival. These flowers were stripped and bagged (to avoid contamination to other flowers), but were not pollinated. Initially, I expected to find these pods loaded with seeds in the fall. However, this was not the case. Time and again, these stems were the only ones with completely empty pods. In subsequent years, I went ahead and pollinated some of these self-contaminated flowers and harvested many seeds, all of which turned out to be true intersectional hybrids. Nevertheless, it is best not to count on this, and to strip and protect all of your crosses meticulously. I should also point out here that my plants of *M. Washington* are in a separate location with no other lactiflora varieties anywhere nearby. This factor may be the most important of all in preventing contamination of my crosses.

Germinating the seeds using the indoor method

Step 1 Harvest seeds at an early stage, but not before they have turned fully brown. I inspect the seeds as soon as the pods begin to split-open on their own. If most seeds in the pods are brown, I harvest (cut) the stem and put it in water for a few more days inside the house. Any seeds which are loose (no longer connected to the pod) must be harvested and dealt with immediately. When all of the seeds have turned completely brown, remove the seeds from the pods. Once this is done you must attend to the seeds immediately.

Step 2 Carefully inspect all seeds and separate the ruptured ones. You must deal with these ruptured seeds without delay. Normal (unruptured) seeds should be allowed to "dry-out" for at least a few more days, if not a week or more. This will allow sufficient time for the tiny attachment point to "dry-off". There should be no rush to "start" these good seeds. Starting seeds too early offers no real advantage and will likely only increase your rate of loss. The ruptured seeds, on the other hand, can not be allowed to "dry-out", at least not until these seeds have been properly sealed. Since the endosperm is partially exposed, letting the seeds "dry-out" will only allow the endosperm to "dry-up" thus destroying the seed. If "started" at this point, most of these seeds will eventually rot, even when treated with a fungicide. (I use a spray with ~¼ to ½ teaspoon of Chlorox bleach in about a pint of water). If you want to save and try to germinate the ruptured seeds, you will need to seal them by following steps 2a and 2b below.

Step 3 Indoor Germination: Begin the germination process by placing the seeds in moist (not wet) long grain (not milled) sphagnum moss in plastic sandwich bags (I use the Ziploc type). I rarely place more than 15-16 seeds in a single bag. Gently press-out as much of the air in the bag as possible. Close the seal and leave the bags in the house at normal room temperature (~60-80° F).

Step 4 Check the bags after 5-7 weeks and many of the seeds will have already germinated. Replenish lost moisture in the bag by spraying several times with water/Clorox mixture (see above). Check the seeds about once a week thereafter.

Step 5 Transfer all germinated seeds (in bags with moist sphagnum moss) to a refrigerator (34-38° F) when the roots are ~ 1 – 1 ½ inches long. Do not wait for all seeds in a bag to germinate before moving seeds to the refrigerator. Some seeds will take weeks longer and by then, the roots on the early ones will be too long for easy handling. Don't forget to label all bags with the number of seeds, type and transfer date.

Simulated winter dormancy

Although the seeds have germinated, they still will not grow until they have gone through a dormancy period (cold storage) of at least 90 days. Most will require a minimum of 120 days, some even longer. This is an absolutely critical requirement. Development during the dormancy period occurs in several stages. First, a swelling (enlargement) occurs in the root close to the seed case. In time, this swollen area will develop a tiny split. Then, the area will turn pink and the split will become larger. Finally, the plumule will emerge from the split. The average refrigeration time is ~ 18 weeks. (see Vol. 25, No. 1, P. 4 for more details).

Step 6 After ~ 11-12 weeks in the refrigerator, open the bags and check the seeds for signs of root splitting. You will probably want a small magnifying glass to help you find these tiny splits.

Step 7 Remove seeds from the refrigerator at the first signs of stem (plumule) emergence. This will usually happen 2-3 weeks after root splitting has occurred. Once again, do not wait for all of the seeds in a bag to send up shoots. Transfer only those seeds which are ready to new bags with slightly moister sphagnum moss and leave at room temperature for several days (never more than about a week) prior to planting. Once removed from the refrigerator, all of the seeds should be oriented so that the roots are facing vertically down, since the plumule will always grow straight up (vertically). In this way, the emerging stem will grow away from the root and thus prepare itself for easy planting. This is done by laying the sprouted seeds sideways in the bag of moss so that they are all facing in the same direction and then turning the bag 90° so that it is standing on its side (small edge) with all of the roots facing down. At this point, you will need to lean the bags against something to keep them from falling over. Make sure that you don't forget about these seeds, because once they are out of the refrigerator, the plumules grow very rapidly and, therefore, these seeds will need to be planted fairly soon. From this point on, inspect these bags every <u>other day</u> and remove only those seeds that are clearly ready for planting.

Planting the seeds and growing the seedlings

Step 8 Plant in loose soil before the plumule becomes too long (less than about ½" is probably ideal). Plant with the tiny stem pointing up and (to the extent possible) the root facing downward or sideways, with the seed case and emerging stem just barely below the soil level. I use a mixture of potting soil (~½), milled sphagnum moss (~¼), with the rest (~¼) made-up of a combination of vermiculite, perlite and oak leaf mold. I do not add any fertilizer. I plant only one seed to each 4" plastic pot.

Step 9 Place pots under artificial "grow" lights such that the foliage is approximately 4-8" from the fluorescent bulbs. Raise the lights as plants grow to maintain this 4-8" distance. Gradually increase the duration of light from ~8 hours to ~16 hours and then back to 8 hours again as the season progresses.

Optional steps for dealing with ruptured seeds

Ruptured seeds are a very common occurrence with the intersectional cross. Generally, between 30-50% of your seeds will have ruptured seed coats. This is normal for the intersectional cross. In fact, if you don't have a relatively high percentage of ruptured seed, then something is probably wrong and there is a good chance that your seed batch is the result of a contaminated cross. In my experience, without special handling, only about 5-10% of these ruptured seeds will germinate, whereas, the average germination rate for normal (unruptured) intersectional seed is around 35%. After several years of experimenting, I have developed a simple but somewhat time consuming method of handling these ruptured seeds which increases the germination rate of these seeds to near normal levels. This method is described below.

Step 2a Sealing the Ruptured Seeds

1) Find a short piece of wood (like a 2" x 4")

2) Cover the top of the block with double-sided (double-stick) tape or use regular masking tape with the sticky side up by taping down the edges.

3) Stick the ruptured seeds to the tape with the ruptured area (side) facing up.

4) Mix-up a small amount of 5-Minute Epoxy by squeezing out short strips of resin and hardener onto a disposable plastic surface. Mix the epoxy with the wood end of a wooden Q-tip or similar small diameter wooden or plastic stick (such as a coffee stirrer or tooth pick). At this point you must work fairly fast. Use the epoxy to make thin seals over the exposed endosperms by transferring it to the seeds using the same stick used for mixing. Do not use too much, the epoxy will flow down over the endosperm and seed coat to form a thin uniform layer. Do as many seeds as you can before the epoxy starts to become tacky (~3-4 minutes). Do not try to do more than 6-8 seeds at one time. Once the epoxy becomes tacky, **stop!** Throw-out the epoxy and make-up a new (fresh) batch. Continue until all of the seeds have been sealed. Allow seeds to fully cure for at least 24 hours or more. If you missed a spot, you cannot fix it until after the seal has cured (at least several hours).

Step 2b Wait 1-2 days, then the sealed seeds can be handled like any normal seeds. Continue with Step 3 above.

Note: Before deciding that the above method for the handling of ruptured seeds is too much trouble, check my Website at <www.intersectionalpeonies.com> All of the seedlings with an "R" after the number such as IC-93-14R are from ruptured seeds. There are quite a few of these "R"-seedlings and some are among by very best. Every time I look at these beautiful plants, I am glad that I put in the extra time and effort to bring these ruptured seeds through the germination process.

Sources for Intersectional Peony Breeder Plants

Some have inquired as to where to obtain several of the breeder plants used in the intersectional cross. The advanced generation tree peony hybrids with fertile pollen (A-199/***Golden Era,*** A-198/***Golden Experience***, and ***Alice in Wonderland***) are available from Reath's Nursery where they were originated. The lactiflora variety ***M. Washington*** is available from Roger Anderson (Callie's Beaux Jardins) and also from Don Hollingsworth. Other herbaceous varieties used as seed parents (***Gertrude Allen***, ***Alice Roberts***, ***Miss America***, ***HP1-61***, and ***Carr East #2***) are available from Hollingsworth Nursery. The addresses for these sources are listed below.

Reath's Nursery
N-195 County Rd. 577
Vulcan, MI 49892
<www.reathnursery.com>

Callie's Beaux Jardins
W6658 Sunset Lane
R 4, Box 276B
Fort Atkinson, WI 53538
callies@ticon.net

Hollingsworth Nursery
RR 3, Box 27
Maryville, MO 64468
<www.hollingsworthpeonies.com>