Chromosomes and the Miniature Dwarfs

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At the moment there does not seem to be any concentrated, well-planned directional breeding program toward the development and expansion of the miniature dwarf iris class. In the not too distant past there were many involved, much discussed, researched and promulgated theories of MDB breeding—but none of these established a firm and dependable basis from which the progress of MDBs could successfully be continued. This is because, along the way, no one seemed to recognize the fact that mixed-up chromosomes are nearly always infertile chromosomes and in order to continue the extrapolation of a breeding line there must be fertility.

Iris pumila, a 32-chromosome tetraploid, has been the type and ideal for MDBs. It has the tiny size we want, it has the widest color range in the dwarf category, and it is very fertile both within its group and in outcrosses to other species. But *pumila* does have some unsatisfactory characteristics; and so breeders have used it for its attractive qualities as a basis for obtaining varieties that they consider improvements for the class. But *pumila* is too floriferous. An established clump is a sheet of blooming color. The individual flower is completely lost in the mass. You might as well grow mesembryanthemums (who ever heard of a blue mesembryanthemum?), but then, mesembryanthemums have one fault of *pumila* in reverse. It is cold tender whereas *pumila* does well only where it gets cold weather in winter. There are other, "rock garden" type plants that would be better examples—but you get the idea.

Obviously none of them can really substitute for *Iris pumila,* but one of the reasons that iris attract so much of our enthusiasm is the unique structuring of the flower. If this is concealed in a mass of bloom, then the uniqueness is lost. So breeders have been outcrossing the pumilas to other iris species in hopes of retaining its own very fine qualifications in varieties that more nearly approach their ideas of how a dwarf iris plant and flower should look.

And they have been successful—to a certain extent. Crossing *pumila* with the 40-chromosome species and hybrids gave wonderful results and these new dwarf hybrids were very popular when they were distributed. Breeders got very busy crossing the 40-chromosome types with the 32-chromosome pumilas and after a short period, with the new 40-chromosome standard dwarfs. Results were terrific—until they realized that sterility had reared its ugly head.

These new hybrid MDBs are naturally in the chromosome range half way between the two parents—at the 36-chromosome level. They are not triploids but they breed like triploids. It is almost impossible to get them to breed together. Crosses back to *pumila* and into the 40-chromosome range produce seedlings, but the chromosome pattern of these hybrids are even more fractured. There is another group of breaded iris hybrids that this situation resembles: the intermediate bearded class, which is obtained from crossing the tetraploid tall bearded with the 40-chromosome hybrids and species. As with the 36-chromosome MDBs, these 44-chromosome intermediates are mostly sterile when intercrossed but will be more productive in back crosses. However, the resulting progeny will be unpredictable as to classification because of the hybrid nature of the parents. Such hybrids can be beautiful on their own but are a fact in themselves and as progenitors of a new line are very nearly worthless.

The 40-chromosome iris are an anomaly. This count appears in a group of closely related species of which *Iris chamaeiris* [*I. lutescens*] is the best known. They are of obvious hybrid origin—way back when—their chromosome patterns consisting of 4 sets of chromosomes making them tetraploid but of unequal chromosome numbers: one pair containing 8 chromosomes each and the other pair, 12 chromosomes each. They are called allotetraploids—or unbalanced tetraploids (heterozygous) [The better term is "amphidiploid" —*Ed.*]. The balanced tetraploids or autotetraploids (homozygous) have 4 regular sets of chromosomes, i.e., *pumila* (8, 8, 8, 8), with tall bearded iris and *Iris aphylla* (12, 12, 12, 12). How these allotetraploids combine at mitosis we are not sure. Some have theorized that the two pairs of 12 chromosomes combine as do the two sets of 8 chromosomes, which seems logical. However, pink color occurs at the 40 chromosome level and the theory is that it takes autotetraploidy to initiate this color. In spite of all this the 40-chromosome level works—it is generally and completely fertile—barring the occasional plant that has its own ideas about sex.

It has taken Mother Nature a good many millenia of trial and error to evolve the Genus *Iris* to what it is today and to establish the chromosome levels best adjusted for productivity. It would seem reasonable of us to study this situation and use the information in directing our hybridizing efforts. The fertile chromosome levels in tetraploid bearded iris are: 32 (*pumila*), 40 (*chamaeiris* and standard dwarf hybrids), and 48 (tall bearded and *Iris aphylla*). All three of these iris types have members that fall into the MDB class, at three chromosome levels, and all are interfertile, so we have a much better base to work from than most other hybridization lines begin with. If we can create hybrids that correspond to one of these chromosome levels we will have arrived at the point where we can successfully breed a race of fertile MDBs.

One possibility is to work at the 32-chromosome level, but there is only the one species with that chromosome count so there is no way we can do any out-crossing and remain at that level. There have been other groups of iris that have been bred from a single species, the Japanese Iris, for instance (they have nothing in them but *Iris ensata* (*kaempheri*). But it took them 300 years to get the Japanese iris to where they are today. Have you got that much time?

Iris aphylla is very limited in color, flower form, and any number of other things that make it an unlikely candidate for the 48-chromosome level.

The 40-chromosome level holds the most, and just about the only shining hope. Appearing in seedling beds of standard dwarfs, which are half *pumila* and half tall bearded, are small iris that seem to be influenced by the size factor (acting curiously like a recessive in this case) of the iris pumila.

Some of these selections retain the size necessary for the MDB category. Add to that the interest inspired by the wide color and pattern features of these small varieties, which must be coming down from the SDBs, and we have an important new source of MDBs at the 40-chromosome level. A few of these have reached the market, won awards, and are available: 'Buttercup Charm', 'Curio', 'Dainty Belle', 'Garnet Elf', 'Penny Candy', 'Small Gem', and 'Three Cherries'. Five Caparne Award winners appear in this list.

Happily another source of 40-chromosome MOBs has turned up. Crossing the 48-chromosome *Iris aphylla* (selected small forms) with smaller tall bearded or border iris, and then crossing the seedlings of that cross with *Iris pumila,* will result in some 40-chromosome MDB-size iris. 'Prodigy' (the original) and

its two children, ‘Libation’ and ‘Gizmo’, and some more recent ones are the precursors of this line, and there is already one Caparne Award among them.

Now we have two sources of 40-chromosome MDBs to work with—one that adds the dwarfer froms of *Iris aphylla*. Logically we are on a more solid foundation to begin a forward looking and progressive line of MDBs. The procedure is to intercross all of these and select for smallness from the offspring, select the smallest and continue interbreeding. A great many seedlings must be grown and severe selection must be the rule for these seedlings will vary greatly in size of plant (leaves and stems too tall) and flower (too large). Eventually by selection and breeding for small size the future progeny should be less variable in this particular respect, while retaining all the wonderful colors and patterns combined from various sources. But don't get so excited about doing these crosses that you do nothing else. There is a great deal of fundamental work that should still be done right here at the beginning to build the firm and varied foundation essential for a stable and productive class of dependable MDBs.

Continue to watch and select MDB types from SDB breeding. Also return and make more crosses of *Iris aphylla* and small-flowered tall bearded or tetraploid border Iris, using every pattern and color available in the tall/border group with the *aphylla.* Search out aphyllas with as little color as can be found: cream, white, pale blue. I used the variety ‘Thisbe’ because of its pale, nondescript color, thinking that would yield to other colors more quickly and the thesis worked out. Use also the deep violet forms, but this color is less amenable to change in the hybrids. You may come up with some acceptable MTBs at this stage, and those with the smaller flowers should be crossed to *Iris pumila*—all colors. Save the pollen of *pumila* in the refrigerator until the TB/*aphylla* seedlings bloom, which will be during the late Intermediate and early tall bearded season. You’re all set if you can find good friends in climates that are later than yours, as I was fortunate enough to find. Wilma Greenlee and Alta Brown made most of my crosses in this work possible by supplying pumila pollen at the right time.

What we need are some young breeders with basic interest and continuing determination who will methodically work these lines. If you can’t possibly consider yourself belonging to this younger generation, don’t let that stop you. Success is still possible and your work may add one step to the “stairway to the top”—and your mark in the “grand scheme”. There may even be some selections along the way that are good enough to market. Unfortunately, breeding dwarf iris is not rewarded with much in the way of money. The only recompense, if the breeder is successful in his efforts, is FAME—for what that is worth.