H IPS

DWARF IRIS SOCIETY

BEGINNERS' MANUAL

for the Dwarf hybridizer

B E G I N N E R ' S M A N U A L

Written and published by MEMBERS OF THE DWARF IRIS SOCIETY

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Membership in the DIS is open to any interested individual. Membership is $2 individual; $3 family; and $5 sustaining. Dues may be sent to the treasurer, Mrs. Adda Ayres, North Spencer Street, Redkey, Indiana 47371. Membership entitles one to the annual DIS Portfolio, participation in the DIS Robin program, Secondary Robin Program, Seed and Pollen Exchange service, Dealers Price Service, Voting on Symposium, and counseling from officers or board members of the Dwarf Iris Society.

FOREWORD

This manual is being published by the Directors of the Dwarf Iris Society for the purpose of stimulating further interest in and study of dwarf bearded iris. We wish to welcome our new members and hope you will take an active interest in the society, the raising of dwarf iris, and will even join those of us who find hybridizing an interesting hobby. By doing so you will benefit most by your membership in our group.

To the prospective member-it is hoped that this publication will stimulate an appreciation of dwarf iris and a desire to join the society. You are hereby invited to join us.

Within the various chapters of this manual you will find much useful information. The section on the definition of a dwarf iris explains just what a dwarf iris is. The chapter on dwarf iris species explains the wild plants from which the plant breeders have been able to develop the many hundreds of varieties in nearly all colors of the rainbow. The value of each specie as a parent is discussed. Information about the locations in the world from which the wild plants were gathered supplies an indication concerning the probable adaptability to our various climatic conditions. The illustrations of these wild plants provide the information on growth characteristics.

The chapter on the mechanics of hybridizing explains in simple, easy to understand terms, just how to crosss pollinate the flowers to procure seeds, and thus possible new varieties.

Alexia, in her article, "The Breeder's Kit", discusses the plants which would be useful to a person desiring to start hybridizing.

Leona Mahood's article gives us the necessary information on the culture of dwarf iris from seeds. This is also an important part of hybridizing.

Walter Welch discusses the value of genetics in plant breeding and supplies a basic understanding of this important field of hybridizing. A list of books useful to increase this information is also given.

The sections on chromosome numbers and a glossary of abbreviated terms is likewise of value in increasing our knowledge and interest in dwarf iris.

The list of dwarf iris awards is useful in that we gain some information on the ratings of our current varieties.

It is my pleasant duty to acknowledge the many members whose efforts made this publication possible. Mrs. Alexia Gerberg, Mrs. Leona Mahood, Mr. Bennett Jones, and Mr.Walter Welch contributed the articles here-in published. Mrs. Leona Mahood assembled the material for publication, and Mrs. Jephthah Zuercher (Elsie) published the manual.

David L. Reath, president

WHAT IS A DWARF IRIS?

The first and most important requisite for a good dwarf iris is that it should be dwarf. This includes not only stature, but size of bloom in proportion to height, slender and neat stem, and a dainty and delicate ensemble of all its parts. In other words a true miniature.

The next requirement is earliness of bloom; the extreme lateness would be blooming with the chamaeiris varieties such as Sound Money and Tony, and earlier blooming is preferable as Atroviolacea.

Types of bloom similar to the best of the tall bearded varieties are desirable, but of course in small size in proportion to the plant. Very definitely, large blooms are undesirable. As the flower is viewed from above, flaring or horizontal falls are a distinct advantage.

One of the distinguishing marks of dwarfs is the terminal buds, singly or in a cluster of two or three buds; therefore lateral branching is a disqualification for show purposes or awards.

Because dwarfs usually send up numerous stalks, often as many as six or eight from a single rhizome in the pumila species, these plants are very floriferous, despite the fact that they lack branching. This is nature's way of compensating for lack of branching. This characteristic of plentiful bloom should be insisted upon as a necessary requirement.

There is seldom any difficulty with hardiness, as dwarfs are inherently practically immune to winter damage, although performance will vary somewhat with varieties. Dependable performance, consistent from year to year is of prime importance.

Fragrance is a particularly desirable characteristic for a good dwarf, adding great charm to its other dainty qualities. As we hover over them the strong scented aroma rises to delight our fancy and stir our imagination.

Some of the outstanding faults of the old varieties are tucked or incurved falls, coarseness, narrow hafts, and open standards. As mentioned above falls should be flaring or horizontal. Width of hafts is a matter of adaptness ot the flower. Too wide hafts and falls can become a coarseness, indicating that we can have too much of a good thing.

Ordinarily people prefer domed and closed standards, but open standards are typical of I. arenaria and its hybrids, and we must accept these, at least for the present. Further development will no doubt correct this to the point when these open standards will be recognized as a fault.

D W A R F   I R I S   S O C I E T Y   S T A N D A R D S

DWARF BEARDED SECTION -- Species, forms and hybrids of I. chamaeiris, I. pumila, I. pseudopumila, I. attica, I. reichenbachii, I. balkana, I. mellita, I. arenaria, I. subbiflora; including the various subspecies, and other early blooming iris having most of the characteristics of typical Dwarf Bearded Iris. Advanced generation hybrids of Dwarf Bearded and other bearded iris, which have predominating characteristics of Dwarf Bearded Iris; described as early blooming period, normal height seldom attaining 12 inches, unbranched stems bearing one to three blooms in a terminal cluster.

STARTING WITH DWARFS

Walter Welch

What does a new member want to know? Well, mostly everything; but it must be presented to him in an orderly and consecutive manner, not getting the cart before the horse as we may say.

Of course, he can study books and the bulletins, which will give an outline of the situation, but this without some practical knowledge is often only half understood. If I were starting out fresh today, the first thing I would do, if I were really serious, would be to join a robin. Not that I am encouraging every member to join a robin, for not every member wishes to go so deeply into the subject, but rather enjoys owning and growing a few dwarfs until they are gradually drawn into the interest by association.

The next thing, as quickly as possible, is to obtain a good collection of varieties and species. The varieties will show what are the current achievements to date, as a sort of measuring stick of quality, and also provide the breeding material to work with. The species are of vital importance, not only as basic breeding material, but for study of characteristics and types of dwarfs. Fundamental knowledge of dwarf iris is based upon a familiarity with the different species. You should know each species so well that you can go into a garden of seedlings and determine the approximate parentage of the various hybrids by looking at them. You should be able to determine at a glance in what classification it belongs, and whether it is an arenaria hybrid, or a pumila or mellita derivative, if it has aphylla or chamaeiris parents in its background. Only by growing and studying these basic species can you acquire this knowledge.

The beginner is usually uncertain about what varieties to purchase among the many varieties now available. My suggestion is to use the Dwarf Iris Symposium as a guide to your requirements.

At this point you are now anxious to begin growing some seedlings. You stand before your dwarfs and wonder what to cross, "for a good dwarf". A beginner always thinks in terms of a good dwarf, any kind. Of course, an experienced breeder first determines what specific kind of a color or pattern or type he wants, before thinking of what to cross. Then having decided this he selects the proper parents to achieve his goal. Certainly we should have an objective before making a cross.

But at this stage for a beginner, making such a decision is a difficult matter, so first I recommend that he do some exploratory work; that is start by selfing and intercrossing the pumilas. This may produce an outstanding new form of the pumilas; it will certainly give a lot of valuable future breeding materials, and teach you about the inheritance in pumilas.

At the same time save all of the pumila pollen you can, put it in a dry place in a cool room, and use it on the later blooming dwarfs and even on talls if you wish. You should put pumila pollen on as many of the white chamaeiris as you can find: things like Fairy, Fiancee, Whitone. In fact, you can put pumila pollen on practically everything available, which will give you different lines to work with in the future. Most beginners start by intercrossing the ordinary chamaeiris varieties, get disappointing results, then start all over again by using other species. When I advise against intercrossing the chamaeiris varieties I do not wish to imply that progress and improvement in this type of dwarfs is improbable, but I will say that rewards in the other types will come more quickly and more easily than from this complex species, which is more fitted to the talents of the expert.

After your first crop you will have advanced sufficiently to know something of what you want from your breeding. You may decide on developing whites, or reds, yellows or blacks, blues or pinks, or anything else. By this time you will know how to select the proper parents to obtain your desired goals, with some knowledge of genetics and inheritance behavior.

In the field of genetics it is not absolute necessity that you go too deeply into this, although the more you know the better will you understand the proper materials to use and what to expect from them. But you should attempt to learn about dominance and recessives, and how they work; about inhibitors, and the way segregation occurs. This can be quite easily learned by studying a small booklet called "Practical Plant Breeding," by W.J.C. Lawrence. I think you can get this from C. W. Wood, Copemish, Michigan, for about $2, or you can borrow it from our Loan Library for one month's use.

Don't expect to learn about genetics at the first reading. And don't let a few technical names frighten you. Read this book over once, then start at the beginning and read one chapter over and over until you think you understand it properly. Then take the next chapter and do likewise. You will be surprised how soon these names become ordinary words and how well you can understand technical matters. After you have mastered this little book, if you feel you wish to go further you can take "The Genetics of Garden Plants" by Crane and Lawrence. This goes into more detail and elaborates upon the different subjects.

From here on you won't need much guidance, except to use the ordinary facilities of the Dwarf Iris Society. That means keeping informed of the progress through the Portfolio, through contact with other members at meetings, visiting your local Test Garden, in correspondence with headquarters or your Sectional Supervisor, or in your robin. Remember that at all times we are happy to offer advice on your breeding problems, or to furnish any other information which you may desire. There is no necessity for any beginner in the dwarfs to feel appalled at the magnitude of the problems involved in breeding dwarfs. Despite the fact that the dwarfs are the most diversified and complex group of irises known today, yet because of their almost unlimited range of colors and patterns and their yet unexplored condition, the attainment of easy rewards is the most dependable expectancy.

DWARF IRIS SPECIES

Walter Welch

I. CHAMAEIRIS

I. chamaeiris was first described by Antonio Bertilini in 1837. The name is derived from a Greek word meaning "on the ground." It is interesting to note that chamaeiris is mentioned by Sir Francis Bacon (1561-1626) in his essay "Of Gardens." It is native to the coastal areas in Southern France and in Northwestern Italy. Chamaeiris has various synonyms or subspecies names; among them are I. italica, I. olbiensis, and Dykes includes I. virescens and I. lutescens. It is certain that this complex shows a quite wide variation in size and form; the Bertolini type being the smallest, (around 6 inches high) whereas I. italica often grows up to 12 inches high.

I. chamaeiris is the largest as well as the latest blooming of the true dwarfs. Generally speaking, we consider the average normal height of this species and its horticultural derivatives as around 8 inches.

Its leaves remain quite green during the winter; the stalk usually rises above the leaves supporting a single terminal bud, but rarely it will produce two buds in a terminal cluster, due probably to environmental conditions such as climate, season, culture, etc. Chamaeiris always has its ovary at the bottom of the stalk, with spathe valves more green and rounded and close wrapping, showing only a slight keel on the outer valves.

As to colors in the chamaeiris forms, they are mostly blue-purple and red-purple, or medium to pale yellow, with an occasional near-white form. The patterns run in beautiful selfs and bitones, with occassionally a faint border on the falls. Beards are predominantly yellow, but often beards of violet, blue or white are found on contrasting petal colors, which add variety and are most effective.

I PUMILA

When we come to I. pumila we are dealing with the recognized "King of the Dwarfs." In the botanical classification I. pumila is distinguished as representing the "type" of the Dwarf Iris group, as this section is titled the "Pumilae Section."

I. pumila was collected and described by Linnaeus in 1753, and the location was Austria. It is the only species which has never been questioned or its status disturbed by subsequent botanists. The name is derived from the Latin pumilas, meaning dwarf, diminutive.

I. pumila has the largest distribution area of any known iris, extending from Austria, down the basin of the Danube through Hungary, Rumania, Bulgaria, down onto the island of Crete, and over into the Ukraine, Donets, and Kuban basin and the Crimea in Russia.

Certainly with so wide a range with its possibilities of variation, we could expect a rather interesting diversity of forms as it progressed into distant lands, and different environments, and this actually occured. Up in Austria we find more coarse forms, with wider and longer leaves, with shorter bloom stocks; and over in Russia the daintiness increases, with shorter and more narrow leaves, longer and more slender stalks, and bloom smaller and more narrow in the segments. Then the Servian and some of the Rumanian forms show a still different overall variation, the whole plant larger in all of its parts and apparently a better grower for some climates. Yet for a species of such wide spread populations, the general similarity is surprisingly close.

I. pumila is particularly distinguished by its short and almost non-existent stem, with the ovary practically sitting upon the rhizome, and with its long perianth tube rising to support the flower, which is as high or higher than the leaves. This height ranges from about three to five inches though most are about 4½ inches high. Some of the Serbian forms will average to five or six inches. And from reports on a few Russian forms we know, really not enough for a decisive opinion, some have been found having a stem an inch or more in length, which is in contrast to the Western group of pumila. The bloom is in nice proportion to the plant, the whole presenting a dainty ensemble that makes it a veritable bouquet.

The rhizome of pumila is highly prolific of bloom stalks, in that we often find up to eight of these stalks expressed as tiny side fans on a single rhizome, and each with its own terminal bud. A clump thus becomes a solid mass of bloom and eliminates the necessity of, and compensates for, the lack of branching. Pumila is shallow rooted, thus requiring frequent replanting and a good garden soil to do its best. The spathe valves are closely wrapping the stem, are rounded with a slight keeling on the outer valve, the valves showing a scarious or onion skin texture at its upper tips, often reddish. But they are neat and rather inconspicuous.

The ovary or seed pod is quite distinctive in pumila. It is rounded and pointed, looking much like an acorn; it is variable in size from one half to over an inch in diameter and plainly shows the seams which outline its three compartments. On the inside of the pod are three sections making a complete division in the upper half of the pod, but in the lower half the walls are open into each other. No other iris is known to have this distinctive character, except its close relative I. attica, which some think may be the immediate parent of pumila, and I. chamaeiris,which is apparently a hybrid involving either I. pumila or I. pseudopumila, both of which are very close relatives, and hence derived this characteristic from pumila. The walls and outer shell are thin and papery when ripe, of a dull warm grayish color resembling parchment.

The flower also has a distinctive character. The standards are arched and just short of meeting at the top, the tips reflexed or turned outward, in typical forms. Most of the species tend toward tucking or a reflexed condition of the falls. The segments as they rise from the perianth tube show a definite triangle or vase-like form to where the falls turn abruptly outward, in contrast to the gradual curve that is apparent in other iris.

But it is in color and pattern forms that I. pumila demonstrates that it is the "King of the Dwarfs." No other species can boast of as many variations and combinations of as many colors and petterns as I. pumila. With four basic color factors, violet, purple, yellow and white, we have obtained a range from black through the violets, to blue, purple, reddish, lavender, orchid pinks, greens, browns, blends, yellow to orange, ivory or white. With the spot pattern we get amoena, variegata, neglecta, and numerous combinations and variations, in addition to clear self patterns, bitones and bicolors as pinnacles.

Beards are of special interest in the pumilas. The yellows have only white beards, always. When I write of beards, I mean the part which shows out on the falls, for this is the only part which shows any variation. All pumilas have yellow to reddish-orange down inside the flower. But on the anthocyanin colored flowers we have dark violet, purple, lavender, blue and white beards. No yellow beard is known at present in pure pumila.

Pumila is the only species in iris that has a true violet-blue color, and apparently it is one of the components in the violet factor, for in breeding violets we get vlues. Another fact which indicates that it is a different anthocyanin from the other irises, is that the anthocyanin inhibitor does not suppress pumila blue, but it does suppress the blue of talls.

I. ATTICA

Here is probably one of the great-grand-daddies in iris history, if not in evolution. It is undoubtedly the progenitor of I. pseudopumila and could easily be the daddy of I. pumila, though it also could have been derived from a common source with pumila.

The fact of its diploid composition in relation to its tetraploid relative, I. pumila, and its low number of chromosomes, would indicate its prior existence. In fact, it is probable that it covered a much greater area in prehistoric days and was covered and destroyed by the glacial period which pushed all vegetation further south in its path.

I. attica Bois. and Heldr. 1859, is probably the most limited in its native habitat range of any iris species, being found in only a comparatively small area in Greece. Until rather recently it had never been known in America. The first specimen known here was given to me by Mr. A. C. Herrick of England. A year later I received two more forms from Mr. Darby of England,and then Dr. Randolph sent me four new forms which he had collected in Greece. All of these were counted by Dr. Randolph and found to have the expected number of 16 chromosomes. Attica is a diploid form with a basic number of 8 chromosomes.

As for color and pattern forms, it seems to have approximately a similar range, except for our expectation that a tetraploid has the advantage of a large number of combination effects and thus augments the variety of effects. But with one exception, however; this is the blue of pumila. So far we have been unable to find a blue attica.

Another difference in attica is that it has an entire color beard, that is, one color its entire length, which is in contrast to pumila which always has a bicolor beard. Also attica has entire yellow beards. For instance in pumila a yellow flower always has a white beard, whereas in attica it can be either white or yellow.

Other minor differances between pumila and attica are the sicle shape leaves which are more pronounced than in pumila. Of course, attica being a diplid, we expect it to be relatively smaller in all its proportions. Otherwise attica appears to be simply a smaller edition of I. pumila.

It is unfortunate that so far we have had difficulty in growing crops of seedlings, as they are not as easy to pollinate as pumila, with fewer seed, and less germination. I find this true of all diploid forms in comparison with tetraploids. But with the less number of seedlings I have grown, I find about the same kind of inheritance that we know for pumila. Therefore, for most breeding purposes, we find pumila much more beneficial. Yet for experimental work, the diploid form has all the advantages of requiring fewer seedlings for obtaining ratios of inheritance and for diagnostic purposes.

I. PSEUDOPUMILA

I. pseudopumila was collected by Vincenzo in 1827, and was described as native to Sicily and Southern Italy. It had apparently never been in this country until Dr. Randolph collected it and brought it to America. At that time he sent me two forms, one from the island of Sicily, and the other form from Southern Italy. Both were so very different in character that it is difficult to conceive of such variability within one taxonomic unit.

My notes from the San Martino form says: Standards greenish yellow. Falls purplish spot with border. Overall height $8\frac{1}{2}$ inches, ovary 4 inches up the stalk, perianth tube 4 inches. Standards open; falls tucked; slender stalk; wide pointed leaves, not curved; greenish yellow beard. It bloomed with chamaeiris.

The other form was low growing and prostrate, except for the bloom stalk which was 8 inches high. The leaves were extremely sickle shaped as I. mellita, and rather wide.

When we think of pseudopumila, it is natural that we should compare it with attica and pumila whichapparently are very closely related. But in the typical form it is so different from either that one can hardly realize that they could be so different.

For instance, the seed pod is halfway up the stem, which would suggest that it is a hybrid from some species having the ovary at top of the stem, as both attica and pumila have their pods at the bottom of the stem. The shape is also different. Instead of being rather rounded, it is longer, up to 3 inches at times, quite large, resembling somewhat the shape of I. chamaeiris. The pod wall is thick and meaty. It has one terminal bloom, no branching. The former came from San Martino, the latter from Apulia, Italy.

Later I received other plants, in other than the variegata pattern. One was a violet form, another was in yellow. One of these in particular was interesting in that it comes from the Adriatic Coast near Zadar, Yugoslavia, which is considered outside of pseudopumila territory. Cytological tests of the chromosomes of this Zadar plant show that it has 16 chromosomes which are very similar to those of the known I. pseudopumila. Dr. Randolph reports that it is much smaller than the type locality form. This suggests the possibility of its being a connecting link between I. attica and the taller forms of pseudopumila native to southern Italy.

In looking at this Zadar form I fail to distinguish anything about it that would place it in the pseudopumila group. It has the look of I. attica in every way. Even its Karyotype, according to my idea, lacks the evidence to regard it as a pseudopumila. Dr. Mitra states that in both species all chromosomes are subterminally constricted, but that in attica the No. 1 chromosome is submedian, wheras in pumila it is median. This alone seems to be the sole evidence for calling it a pseudopumila rather than an attica. Mitra further states that in the Zadar form the satellites occur on chromosomes 2, 3, and 7, the same as in I. attica,; whereas in other pseudopumilas they occur on chromosomes 2, 6, and 8. On the basis of the shape of just one chromosome it has been claimed tha I. pseudopumila extends its territory over into Yugoslavia.

Dykes states that if it were not for its distribution, pseudopumila might be looked upon as a hybrid of chamaeiris x pumila, for it is practically a large chamaeiris with a long perianth tube. This describes it quite well; however, it is quite different from both chamaeiris and pumila in most of its characteristics.

Then the question appears, in consideration of its being so close in relationship to attica and pumila, with chromosomes homologous to both, and with the same number and kind of chromosomes, where did it get that chamaeiris look--That big seed pod, that ovary half way up the stem, that late blooming with chamaeiris, etc. We know that aside from possible mutations, it is possible for one species to cross with another to produce a hybrid, and perhaps acquire certain new characteristics; and then,by the loss of univalents or chromosomes without partners, these odd elements will become lost and the species will revert to its original number of basic chromosomes, but may retain the new acquired genes or factors. This may be the answer to pseudopumila.

I find pseudopumila is probably the least adapted to the conditions here in the Midwest, of any of the species. I have difficulty in growing it, and it appears to be especially susceptible to rhizome rot. This explains why I have been unable as yet to grow more than a very few seedlings from it. It is possible that it may be better adapted to some areas where pumila is more difficult to grow. It should be tested for such environments.

I. MELLITA

Here we have the "delightful iris," from the Latin mellitus, meaning delightful. It was collected and described by Victor Janka von Bules, abbreviated Janka, in 1874. I. mellita resides in that area above attica and below pumila, away from the Mediterranean and extending from the Albanian area, through the Balkan zone and over into Turkey along the Black Sea.

Mellita is another species which we have not explored fully, leaving much to be desired in the way of offering a full description of its inherent capacities. We have, however, had some collected forms to grow and study. The plants we know here are usually of a smoky red-purple or a smoky blend of purple and yellow, although Dykes says that clear yellows are found in the Turkish area.

Mellita is a little plant, seldom growing over four or five inches, and its most conspicuous character is its sickle shaped leaves. The leaves are rather coarse and deep green; the spathe valves are long, all green sharply keeled and coarse, resembling some additional leaves. From these spathe valves rise two buds on slender wiry perianth tubes which extend well above the half prostrate leaves. As with pumila the ovary is at the base of the stem down among the leaves. The shape of the ovary resembles that of pumila.

The flower of mellita is highly distinctive, easily recognizable by anyone who has once seen it, and it is quite strong in dominance, being apparent in its hybrid progenies. The standards are about twice the size of the falls, more cupped shaped than arched, leaving them quite open at the top, and they are wide. The falls are always abruptly tucked, even folding back to the perianth tube. The texture and substance is noticeably thin and papery, but in spite of this appearance, the flower is able to stand unusual wear and handling. The beard on the purple form is an electric violet or blue, really brilliant, while on the so-called yellow forms it is always white. Mellita always has what we call an entire beard, that is it is one color its entire length. It also is distinctive in that the beard is soft and meager, like cat fur that has matted down. Mellita always has purplish veins radiating from the base of standards and rather conspicuous on the falls, particularly on the haft which shows over a white area around the beard.

There is another form called I. rubromarginata, which is evidently just a varietal form of I. mellita. It gets its name from a red margin or edging to its leves and on the tips of the spathe valves. Strangely this red margin is most clearly visible during heavy growth in spring and in the fall, whereas during the hot summer months it seldom is very moticeable. The leaves as a whole seem to be darker than on the forms without the red edge.

I. rubromarginata was collected by Baker in 1875 from the locality near Thrace. The fact that it grows right along with the mellita forms in the same populations would indicate that it is merely a normal segregate in the mellita composition.

Genetically mellita is a diploid with 24 chromosomes. Hybrids of diploid talls x mellita have been studied and found to produce 12 bivalents at meiosis, indicating that the chromosomes are homologous with those of talls. This makes it a useful plant for bringing down some of the TB characters into the dwarfs.

A word about culture is not amiss here, for many people have difficulty in growing mellita. To do well it should be separated and transplanted every year, in sufficient time to become well established before winter. It requires rich soil with good drainage to do its best. The soil should be a sandy loam, mixed with peat moss and compost. It should be kept moist until well established. After seeing a natural planting in a woods on a steep slope and half shade doing so very well, I have concluded that such a condition is the ideal situation for growing this species.

I. REICHENBACHII

I. reichenbachii (Heuffel-1858-Balkana) is the name applied to a group of iris that covers a large area in south-east Europe and which Dykes called the Balkan representative of I. chamaeiris because of its similarity in form. He further states it is known under various names, as bosniaca and serbica for the yellow forms, and balkana for the brownish purple forms.

Dykes stated that reichenbachii is readily distinguished by its rounded sharply keeled spathes. He also states the flowers are either a clear yellow or more delicate texture than the flowers of I. chamaeiris, or of a brownish-purple like those of I. mellita.

The plant I received from Gerald Darby of England appears to meet the proper descriptions. My notes on it are as follows: Height 9 inches, standards 2 inches high, 1 $\frac{1}{2}$ inches wide. Falls 1$\frac{1}{2}$ inches long, 1 inch wide. As you may note the standards are much larger than the falls. Standards are arched, falls tucked abruptly. The beard is violet-purple with no yellow down inside. Small white flash at haft, standards smoky-violet with deeper veining, falls same but one shade lighter, style arms as standards. No spot on falls, white pollen. Ovary at top of stalk, both valves sharply keeled, herbaceous. Spathes are distinctive for their shape, being flattened rather than rounded as Dykes describes, very short and compact, oblong or elliptical. Perianth tube $\frac{1}{2}$ inch, two blooms in the terminal. Tallest leaf 5 inches x $\frac{1}{2}$ inch, pointed and tends to sickle shape. The stalk is stiff and almost woody, with strong bract showing.

I. SUBBIFLORA

I. subbiflora, Brotero, 1804, is probably of the least interest to us and may be least known of all the dwarf iris species. It is native to the coastal region of Portugal and Spain and apparently is a close relative to I. chamaeiris. It has 40 chromosomes.

I received some seed from Jean Stevens of Australia and from these I grew 8 plants, all of which have bloomed here for about four years. All are almost identical in color, which is a very dark violet self, with a bright yellow beard. The height varies considerably, ranging from about 7 inches to 12 inches. Dykes says it comes in a dark black-blue, a deeper color than he has seen in any other iris. He also say s it may come in purple or a yellowish-white, but I have noted no such colors among my own seedlings.

Actually I see little difference between I. subbiflora and I. chamaeiris except possibly in size. The former is a little larger, but otherwise it comes very close to chamaeiris type. There is no doubt, at least in my mind, that I. subbiflora is simply a different stage, or we might say a different geographical group or population, in the stream of evolution of chamaeiris. It is not nearly as differentiated from chamaeiris as is the Russian pumilas from the Austrian forms, or as the different variations of I. pseudopumila.

There existed quite a bit of misunderstandings about this species among the earlier collectors. It has been called biflora, I. Lisbonensis, and I. subbiflora rather carelessly until Dykes finally helped to clarify the matter.

It appears that subbiflora performs wonderfully in southern California, and Mr. John Tearington is highly enthusiastic about its fine qualities. Thus far we know far too little about it, but for its dark color alone it has potentialities for our breeding program.

I. ARENARIA

I. arenaria, Waldst und Kit. 1802, comes under the general heading of I. flavissima which is recognized as the representative type, but both much alike in general character except for size. I. flavissima is the largest, with I. arenaria the smallest. I. bloudowii and I. mandshuria are intermediate in size.

A peculiarity of this group is that the different forms jump vast areas of space to appear in widely widely separated populations. Arenaria appears in Hungary, in Transylvania, and then over in the southern Russian territory as the form I. Bloudowii, then into Manchuria as I. Mandschuria. I have never seen Mandschuria, but have grown the other forms.

Arenaria is among the tiniest of the dwarfs, growing to around 4 inches high, with narrow grassy leaves, slender stalks, with ovary at the top of the stem, the spathe valves neat and rounded, looking inflated and often scarious at the tips. Usually two buds arise from the spathes in a terminal cluster, which bloom at different periods a few days apart, resulting in waves of blooming, but the flower is short lived, lasting only one day. On hot days it is over by early afternoon. On a cloudy day blooms will not appear, as it only opens in sunlight. As the flower declines it gradually twists into a screw-like formation.

It comes in only one color, a bright buttercup-yellow, with yellow or orange beard. This is a plastid or carotene pigment, with no anthocyanin or flavonals, and is apparently pure breeding for yellow. This suggests arenaria is a homozygous species for color.

It seeds itself regularly, so that in all cases if yousave open pollinated pods you will get true arenaria seedlings. In fact, I know of only one case in which arenaria is known to have produced a hybrid as the pod parent. This was an arenaria x aphylla hybrid grown by Dr. Hertha van Ness of Germany. This hybrid is rosy-lavender self with blue beard, and shows the characteristics from both parents.

A strong characteristic of the flower is its open standards, with wide and rounded horizontal falls. The bud is a bronzy-brown before opening, and this color shows on the underside of the falls after opening. The pod is pointed at both ends, opening on the side when ripe and of a papery substance when dry.

Even as a pollen parent it is difficult with most species excepting I. chamaeiris. It will cross readily with chamaeiris to produce a hybrid which is sterile. We have two seedlings of pumila x arenaria, the first and only ones of their kind, called Pumar Alpha and Puma Beta, bred by Jay Ackerman. These are nice small plants, very robust, with tiny yellow flowers which are sterile.

Yet we find quite a large number of chamaeiris-arenaria hybrids such as Tampa, Keepsake, Tiny Treasure, Bonya, Mist O' Pink, Promise, Bricky, Cup and Saucer, Glow Gleam, and a very old one called Ylo by Miss Sturtevant.

Its habit of self pollination has evidently been a factor in keeping its gene pool clear. And therefore, considering the handicaps involved, it is advisable to open the bud before the flower opens, take off the stamens, and pollinate the flower and then close the flower and cover to avoid contamination.

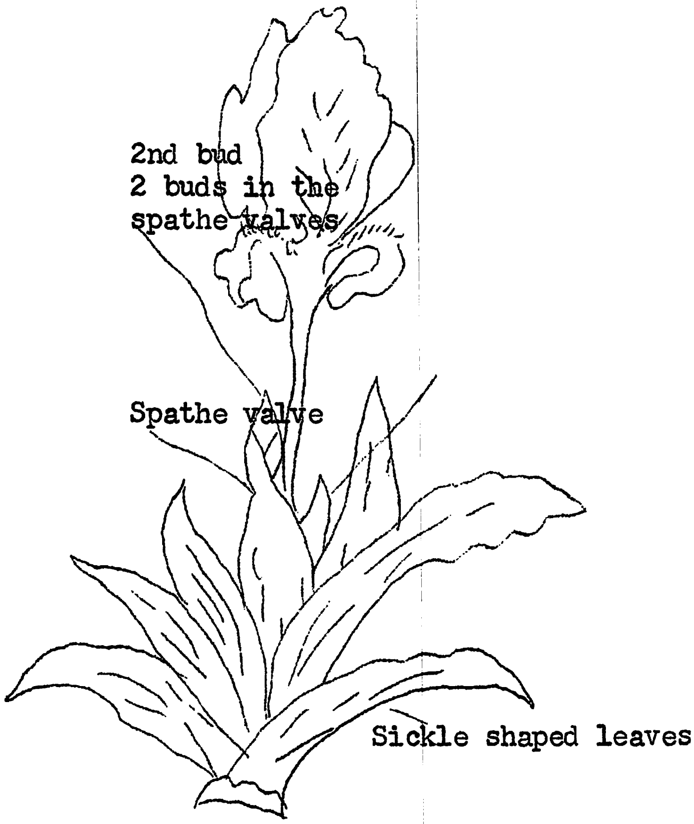
Bloudowii, although considered a form of I. flavissima, is of an entirely different character than arenaria or flavissima. Its bloom is more thick and stiff, more coarse in every way, as is the stalk and leaves. It lacks the finish or daintiness of arenaria. It appears to be harder to grow and I have difficulty keeping it alive.

All of this group are diploids with a complement of 22 chromosomes, or two sets of 11 chromosomes. It has been claimed by most authorities that arenaria is a form of I. regelia, this conclusion based on the facts cf its creeping stoloniferous roots and the aril or white spot on the seed. Yet, on the other hand, we find more characteristics that resemble the dwarf section than favoring the regelia group. For example, its early blooming, its small size, its wide, rounded horizontal falls, its clear yellow color and lack of anthocyanin colors, its absence of dark beard and brown signal on falls, its lack of crossability with other iris groups, and finally its chromosomal differences.

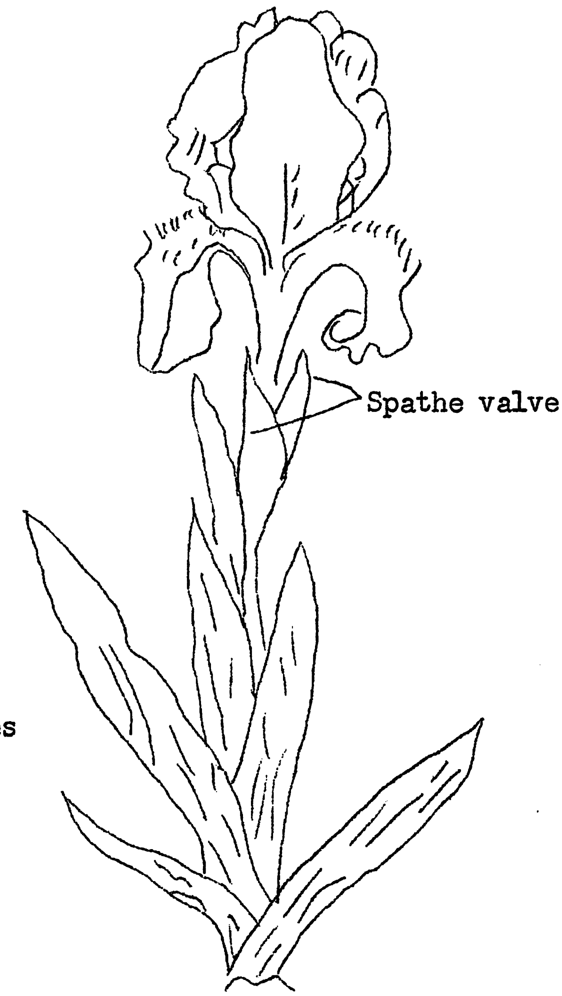
Simonet found the chromosomes of arenaria and flavissima so different from regelias that he removed them from the Regelia Section and put them into the Psammiris of Spach, a group in between the Pogon iris and Regelia of Dykes. However, in spite of any possible argument as to classification,we do know that Bryant Fitch crossed arenaria with the regelia Korolkowii and obtained a small hybrid about 6 inches tall showing the brown beard and brown signal spot over a near white base color that is very beautiful. However, it is entirely sterile, which it should not be if arenaria is a regelia form.

One thing I should mention here is regarding germination. The seed of arenaria should be planted immediately upon ripening, for if they are allowed to get hard and dry out, they will not germinate the following spring, but will wait for two years to appear. For this reason handling arenaria seed is rather difficult. For that matter, I find many reports of growers finding it hard to keep arenaria alive. Here I have no difficulty.

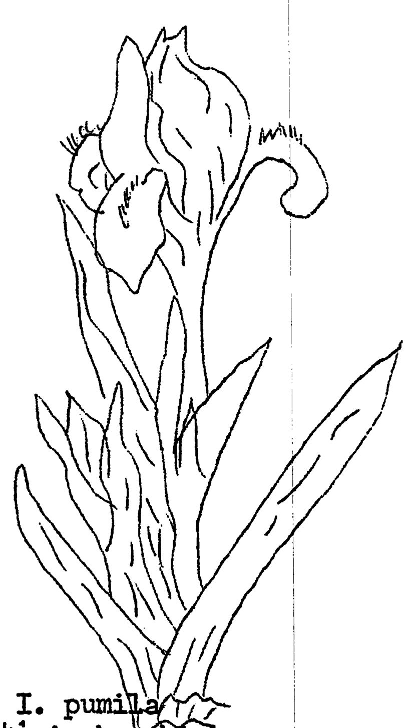
I grow it in open rows in the field, in a rich sandy loam, in full sunlight, and give it no thought. But each year I lift it, separate and transplant it, early enough that it gets established before winter. It tends to die down in late fall so that it appears to be almost dying, but each spring it grows and blooms profusely and is entirely hardy. A bit of compost mixed with the soil will do wonders for performance.



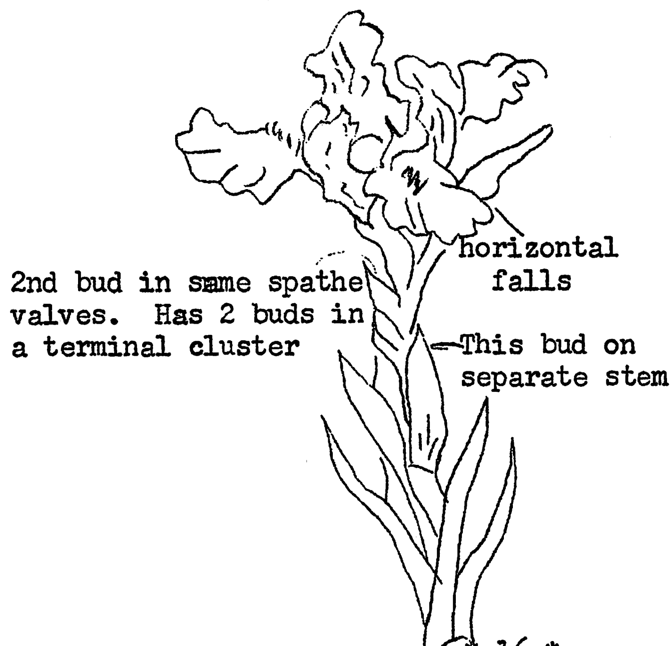
I. mellita 4 to 5 inches high
ovary at base of stalk



I. chamaeiris
8 inches



I. pumila
$4\frac{1}{2}$ inches high
1 terminal bud
ovary at base of stalk

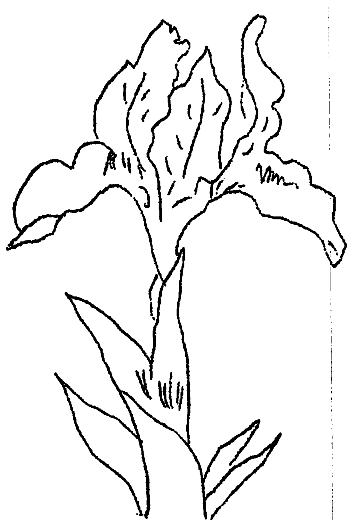


I. arenaria
4 inches

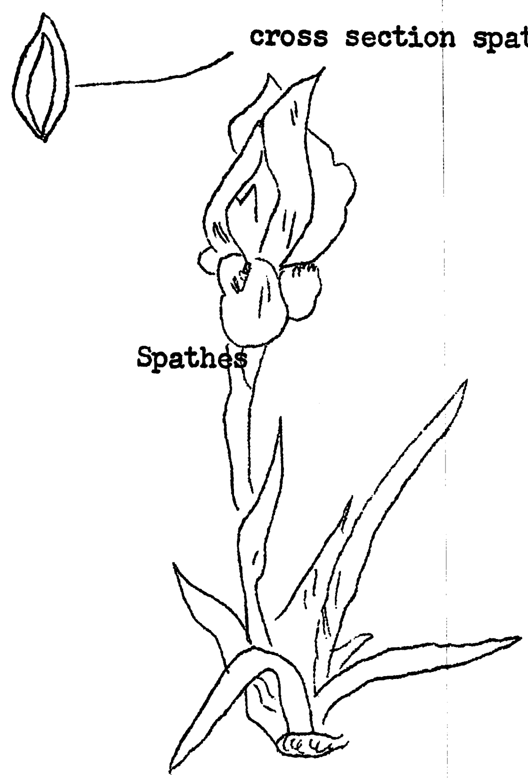
I. 43F Pseudopumila
Falcate leaves, prostrate

I. 43 1 Pseudopumila
$3\frac{1}{8}$ inches high

I. - 36 l. Pseudopumila
San Martino, Sicily
8-9 inches high

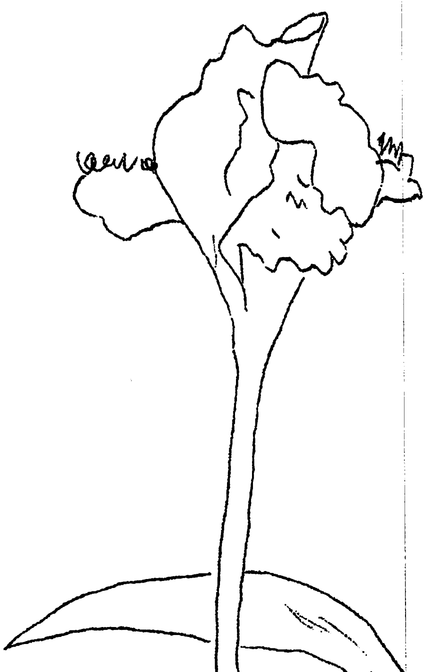


I. attica, Greece
$3\frac{1}{2}$ inches high



I. balkana

I. pseudo-pumila
San Martino



I. Cretica -- note long, slender
perianth tube like I. mellita
and sickle shaped leaf.

I. pseudo-pumila
Italy -- violet

THE CULTURE OF DWARF BEARDED IRIS

Bennett C. Jones

Dwarf bearded iris are long-lived perennials that require a minimum of care. They will grow in a wide variety of soils and climates, persisting even in neglect. With some attention to care, however, they will thrive and provide in their season the widest array of color possible from any one family of plants.

Begin with the most recently introduced varieties the budget will allow in order to take advantage of recent improvements in form, color and color patterns. A few well-chosen varieties of merit will be more satisfactory in the long-run than so-called "bargain collections." Collections offered by reputable dealers, however, are an excellent way to begin with dwarf iris.

Sun, drainage and good soil are three requirements that must be met, and, fortunately, they are not difficult to provide in most gardens. Irises are sun-loving plants; they must have at least half a day of it if the plant is to thrive and produce large numbers of flowers. Iris do not like wet feet; they will not do well in soggy soil. Tile drainage or raised beds will be required when bog conditions are present and it is wished to grow iris. The normal watering given the perennial border will be right for dwarf iris, which are often used as an edging to the border.

Soils vary widely even within a small garden and a good gardener knows that any plant performs according to the soil in which it grows. It is folly to buy the finest plants but neglect the soil in which they are to be grown. The basic improvements to soils are the addition of compost, peat moss or very well-rotted manure to sandy soils, which will aid in the retention of food and water. With heavy soils, one of the above plus sand will aid in drainage, soil structure and productivity. Quantities of material to be added will be governed by the soil at hand. Aim for a friable, easily worked soil to a depth of twelve inches for dwarf iris. It is advisable to add fertilizer at the time of soil preparation, thoroughly mixing it in at the time. One half pound of 5-10-10 fertilizer for each four by ten foot area may be used as a guide.

Order and plant dwarf iris early so that a good strong root system may develop as an anchor against heaving after hard frosts.

To plant, in prepared soil, scoop out a shallow hole large enough to receive the roots spread out fan-wise from the rhyzome. Form a cone or ridge, set the rhyzome on the ridge, spread out the roots, cover with soil and firm well. In heavy soil, the top of the rhyzome should just be covered. In light soil it may be covered with from one quarter to one half inch of soil. Water well and keep the soil moist so that new roots will flourish.

Maintenance of established plantings consists of a top dressing of fertilizer as the plants begin to grow in spring -- a teaspoonful of 5-10-10 spread in an eight-inch wide band around the clump. Removal of flowers as they fade will provide a neater garden picture. Another top dressing of fertilizer after the flowering season to aid in new growth is advisable. Weeding and watering as needed will complete the care for the growing season.

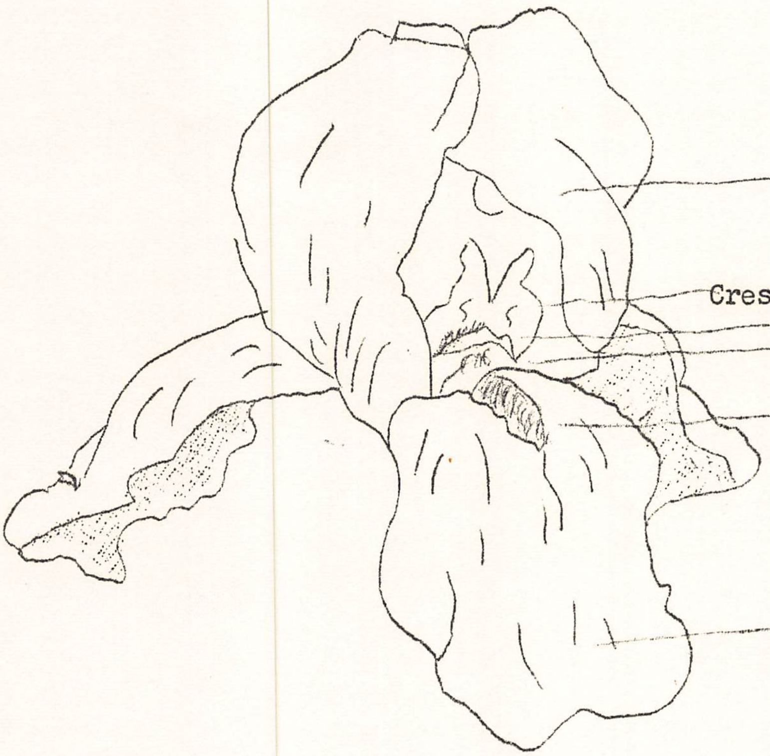
In time, when the clump has reached good size, there will be little bloom in its center area. It is time, then, to dig, discard the center area rhyzomes, replenish the soil, and replant the strong, healthy rhyzomes taken from the outside.

MECHANICS OF HYBRIDIZING

Walter Welch

There is an old proverb which says there is no accounting for tastes. People grow flowers for various reasons, and some might ask, why should I grow seedlings when there are so many nice flowers already available for the garden? That is a logical question for the gardener who is content to grow the usual things that everyone else has, and is easily satisfied to have just flowers. But there is a different kind of gardening, one which offers the advantages of excitement, imagination, adventure, the exploring of new fields, the attainment of perfection, the creation of new forms of beauty, the challenge of the experimental and research workers delving into the unknown. Once you experience a taste of this infinite endeavor, you never return to plain ordinary gardening.

So you hear so much about this hybridizing that you become curious and want to try your hand at this game of pollen spreading. But you know nothing about it, you have no near friends to show you the way, and you are just a little shy in asking people to show you how to pollinate.



You will note in the illustration above the location of the stamen or male organ which contains the pollen. Also the stigma which is the female organ, where the pollen is deposited. The stigma lies below the crest as a sort of shelf which is exposed by lifting up the crest with the fingers.

To proceed with the pollination you must have a pair of tweezers. I use a pair of mechanics tweezers which have long blades and blunt pointed ends, rather than the usual splinter tweezers which have a hook on the ends.

With these tweezers reach into the flower and snip off the stamen of the pollen parent. Take this over to the plant which is to be pollinated and while still holding the stamen with the tweezers in the right hand, you draw the stamen across the surface of the stigma, thus depositing the pollen upon its sticky surface. To accomplish this you take hold of the crest with the thumb and forefinger of the other hand, lifting up and back, which uncovers the stigmatic surface, which now appears as a sort of extended shelf. That is all there is to it; the job is done.

It is the usual custom, and I advise it, to take off all three stamens of the mother pod parent, which helps to avoid contamination of your pollination. Also to discourage bees and insects which often contaminate a cross, I suggest breaking off all three falls fairly close to the base. And for important or experimental crosses you should protect your crosses by slipping a paper bag over the flower or covering in such a way as to avoid insects reaching the flower. However, just for ordinary work most breeders seldom take the trouble to cover the flowers.

It used to be thought that it was necessary to pollinate all three stigma of a flower, but we know now that this is unnecessary. Pollinating one stigma is sufficient.

Another matter often misunderstood is that one pollen grain goes down the perianth tube, to reach the ovule, and makes contact with one ovule, which becomes fertilized to produce one seed. The number of seed in the pod will therefore depend on how many pollen grains reach the ovary and fertilizes how many ova. Some persons have the erroneous belief that one pollen grain will pollinate the entire lot of seed.

When you consider this fact you will understand that a number of seed in a single pod can have several different parents. A bee will visit many varieties and the pollen he carries soon becomes a mixture. As he enters the flower this pollen is brushed off onto the stigma and naturally pollen from different varieties will reach the ovary and produce seed. I find that pollen from different species or varieties will move at different speeds down the perianth tube, due to relative compatibility, etc. For example, if you put arenaria pollen onto a chamaeiris, and a bee brought other chamaeiris pollen later, the chamaeiris pollen might reach the ovary first, or you might get both arenaria and chamaeiris seedlings in the same pod.

There has always been some controversy as to the time it takes for pollen to take, as it is called. This is variable, depending on many things. But ordinarily the question is in regard to the time elapse before rain or other conditions maight spoil a pollination. Usually if the weather is favorable at the time of placing the pollen upon the stigma, and both pollen and stigmatic surface is right, your pollination is safe from damage by rain after three or four hours ordinarily.

What are some of the things which affect the so-called fertility of iris? Often it isn't a matter of fertility but rather conditions at the time of pollination. We all know that cold and especially damp weather is detrimental to success. The surface of the stigma is a sticky substance which receives the pollen and starts germination. Any dampness, whether from rain or foggy atmosphere tends to damage this substance and make it impotent. You will also find that during hot and dry weather you will get few takes. I have had a whole week in which hardly one pod was formed. Under this condition I advise making your crosses early in the morning as soon as the flower opens. The old saying of keep your powder dry also applies to pollen. Wet pollen cakes and even after drying it is seldom potent. With dwarfs, especially, because they bloom early when the weather is unpredictable, it is advisable to take off the stamens and save them in the house thus having pollen ready and available for future use and later blooming flowers. With dry pollen and a good sticky stigmatic surface, you will get easy takes of your crosses.

Another thing which has often been controversial is whether it makes a difference which way the cross is made, that is which should be the pollen parent. And some persons contend that one parent such as the male will determine the color, etc., while the female will give the shape, etc. This is untrue.

It has been stated by authority that with parents having the same number and kind of chromosomes, there is no difference which way the cross is made, but if the parents are differentiated in the numbers or kinds of chromosomes it may make a difference. Therefore, if you are crossing pumila x pumila or talls x talls, it makes no difference which way the cross is made, but if you are crossing tall x pumila or mellita x pumila, the seedlings may show a difference from the reciprocal cross.

With these few directions to guide you, there is no reason why the novice may not make his crosses and enjoy this different kind of gardening, as hybridizing is not an exclusive privilege for the experts today.

BREEDER'S KIT

Alexia Gerberg

The wealth of dwarf iris stocks today is in startling contrast to that of fifteen years ago. Most species were scarce, or unavailable; the varieties in commerce were of chamaeiris origin, rather drab, and their possibilities limited in color and pattern. The incorporation of blood of other species, chiefly I. pumila, has transformed dwarf iris into garden subjects of great variation and charm. A prospective breeder can now find most dwarf species and an increasing volume of worthy varieties. His problem is not to locate, but to choose from many, the the basic species and varieties needed for foundation stock-species encompassing their full range of factors, and varieties which represent the best to date in one or more details of color, pattern, plant proportion, health, etc. But how to make a choice!

The beginner often feels more frustration than inspiration, in viewing the multiple dwarf offerings in catalogues, and the wilderness of pedigrees in the Check List is forbidding. Choices of our creative breeders as to species, and a listing of quality varieties according to type, can be guide posts until the breeder himself takes over, through his own experience with these stocks. Walter Welch has been leader of leaders in this development of a whole class of iris. In the earliest years, when stocks were few, the directions he gave to his collaborators are those he has followed in his own monumental work. If we look at the record, we find that the strategy he laid out then has been highly productive of fine varieties. Walter listed as the "breeder's kit," the few pumila clones then known, arenaria, mellita, and a few of the better chamaeiris then in commerce. His plan was to self and intercross the pumilas and to sib and back-cross these seedlings; to intercross any or all of the species -- chamaeiris to pumila, to arenaria, to mellita; to cross pumila to arenaria, and to tall-bearded; to sib, self and back-cross the hybrid seedlings. The intercrossing or selfing of chamaeiris varieties was not encouraged since this approach had been thoroughly worked in the preceding half century, and for a beginner would not be rewarding.

The strategy outlined in the early fifties is still tops for the breeder of dwarf iris. Let's look at some varieties now available, and note how they have resulted from one of the above procedures. Listings below include species underlined, and varieties of quality grouped by type of origin. They are valuable in the "breeder's kit" for pedigree study, as a standard to be excelled, and as a source of genes for experiment or improvement since all are more or less fertile; the few near-sterile groups are good garden subjects, and useful for study, and for experimental procedures. Comparison of the iris in each group with detail in the Dwarf Iris Society Check List, will give the beginner some grasp of the interpretation of pedigrees.

SPECIES, AND VARIETIES SUPERIOR IN EACH TYPE OF ORIGIN

I. pumila species
- Carpathia
- Cretica
- Sulina
- Nana
- Hanselmayer
- Vindobona

Varieties from [illegible] intercrossing pumilas
- Atomic Blue
- Blue Spot
- Flashlight
- Greenie
- Morning Fresh
- My Daddy
- Orchid Sheen
- Red Amethyst
- Rosy Carpet
- Spring Joy
- Wee Blue
- White Mite

Other dwarf species
- I. balkana
- I. mellita
- I. reichenbachii
- I. bosniaca
- I. subbiflora

Diploid species related to I. pumila
- I. attica
- I. pseudopumila

I. chamaeiris types
- I. chamaeiris Correvon
- Balkana
- Burchfield
- Elegance
- Endymion
- Fiancee
- Harbor Lights
- Little Jewel
- Little Elsa

chamaeiris-arenaria hybrids (near sterile)
- Bricky
- Bronya
- Buster Brown
- Butterball
- Keepsake
- Mist O' Pink
- Promise
- Tampa

I. chamaeiris types (cont)
- Marocain
- Moongleam
- Orange Glint
- Silver Elf
- Sound Money
- Stylish
- Rose Mist
- Tony
- Tiny Tony

chamae-pumila hybrids
- Black Top
- Bright Spring
- Butch
- Garnette
- Grandma's Hat
- Green Petals
- Honey bear
- Hullabalu
- Nigrette
- Red Overlay
- Violet Night

and the older
- Alinda
- Azurea
- Violet Gem

Lilliput x pumila
- Ablaze
- Dizzy Dame
- Dream Stuff
- Chicken Little
- Orchid Flair
- Red Gem

Lilliput x chamaeiris
- Bright White
- Crispy
- Fashion Lady

<u>I. mellita hybrid</u>
- Lavender Dawn (Sterile)

<u>arenaria -pumila hybrids</u>
- Pumar Alpha (sterile)
- Pumar Beta "

<u>chamaeiris aril</u> hybrids
- Beauty Spot (sterile)
- Fallen Leaf "

TB -pumila hybrids (Lilliputs)
- Baria
- Dale Dennis
- Fairy Flax
- Green Halo
- Green Spot
- Happy Thought
- Knick Knack
- Lilli Bitone
- Lilli Richtone
- Lilli Yellow
- Lilli Var
- Lilli White
- Little Rosie Wings
- Merry Maker
- Red Lilli
- Tinkerbell

Other quality dwarf iris
- Blazon
- Blue Frost
- Blue Whiskers
- Burgundy Velvet
- Cherry Spot
- Dirty Face
- Dream Child
- Gay Lassie
- Glow Gleam
- Heart's Content
- Little Blacksmith
- Little Mohee
- Path of Gold
- Polka Dot
- Sparkling Eyes
- Veri-Gay

If the beginner studies each type group, comparing with the Check List, pedigrees become more intelligible. Couple this with completion of a few crosses of the types listed, noting characteristics each seedling has inherited from its parents. Such concrete facts make formal pedigrees come to life. With the dispelling of confusions, a game more exciting than any detective story begins to open up. It is but a step farther for the observant breeder to demand of himself that the unique seedling in the cross be of the parentage recorded. When we make this step to a routine giving our crosses 100% protection from contamination, we gain stature and assurance in our work. But for every breeder, the first urgent concern is for an adequate "kit" of stocks, primarily for genetic source materials, as a basis for experiment and improvement.

GROWING DWARF BEARDED IRIS FROM SEED

Leona Mahood

It is important to keep careful records of your breeding work, starting when you do the pollinizing. When the cross is made, attach a label on which you have written the number of the cross; then write this number in your record book along with the parentage, i.e. cross # 10 (Sulina x Cretica), always listing the pod parent first.

Stringed price tags are quite satisfactory for the taller dwarfs. However, because the pumila pod sits on top of the rhizome at ground level, such tags often become badly soiled or water damaged, and the string may rot through. More durable tags may be made of plastic, cut from detergent bottles, etc., and attached with plastic string. Writing in ordinary pencil weathers well.

As the pods ripen and begin to open they should be gathered, keeping each pod separate and its tag with it. The seed may be left in the pod for further ripening. Drying in an airy location will help to prevent mold; however, mold is not harmful. The seed may be planted any time from September to early November.

A frame or raised bed is best for seedlings since the tiny grass-like foliage is easily lost. Seed flats, pots or cans may be used for small batches of seed. Plant the seed in rows 2 or 3 inches apart, and 1 inch apart in the row, about ½ inch deep. Make a chart of the seed bed listing the numbers of the crosses, and number of row or rows where each cross is planted. Cold is required for germination and seed flats should be left outside for the winter.

Early in the spring the tiny green shoots will begin to push up. Now the bed must be kept moist; drying out can be fatal to germinating seed. Some of the seeds may not germinate until the second spring or even later, therefore it is best to hold the seed bed containing seed of important or experimental crosses over to the following spring.

When the seedlings are about three inches tall, they may be transplanted to a permanent bed, the plants being spaced eight inches apart. The soil should be kept thoroughly cultivated and given sufficient moisture during the growing season.

Bone meal worked into the soil below the small plants is beneficial. In two or three weeks fertilizer should be watered in around them, followed by one more application later in the season. The following spring most of them will bloom and be husky young plants.

HOW MUCH GENETICS DO WE NEED?

Walter Welch

Let me say at the start that this article is for the beginner; and therefore we admit its shortcomings, its implied simplification, and its deliberate omission of many qualifying matters pertaining to the subject. Once we have learned the general rule, we can take up the exceptions later.

We shall omit all mention of the history, the personnel, or the course and advances in theory, and right from the start get down to basic and practical matters. It will be necessary for you to remember a few technical names to avoid lengthy repetitions of definitions and descriptions.

I shall not attempt to argue the necessity or desirability for a breeder to know some of the fundamentals of genetics. Most successful breeders have used the principles of genetics in their work, often without knowing or admitting it; yet they gained this knowledge the hard way, through experience. It is my idea that a little knowledge of the laws of inheritance at the start can save a lot of futile work and lost time.

When boiled down to its essence, the laws of inheritance are founded upon the structure and fuctioning of the cells of a plant. Therefore, the first thing to learn is the structure of the cell, and then the next, to study its manner of working.

I usually describe a cell as resembling an egg, with its yoke, its white matter, and the shell enclosing all. This compares with the nucleus, the cytoplasm, and the cell wall respectively.

The nucleus is the part of the cell which gets the most attention, for this is where the brains or the trigger action for the cell workings is originated. A nucleus is composed of a number of tiny bodies called <u>chromosomes</u> which look much like little worms. The number of chromosomes in a nucleus will vary with the different species and various hybrid forms; for instance I. pumila has 32 chromosomes, mellita has 24, and attica has 16. So we can often identify a doubtful plant by counting its number of chromosomes.

It is stated that a chromosome, if we could see it in detail, would look like a string of beads. It is described as each bead being what is called a <u>gene</u>, pronounced "Jean." You cannot see a gene, even under a microscope, but we known them only by their action or effect.

Each gene acts upon or governs a certain characteristic in the plant. For example, one gene may be responsible for beard color, another for flower color, another for plicata markings, some for height, season of bloom; in fact everything about a plant is controlled by the action of the various genes. Sometimes one gene may govern a character, in other cases a number of genes in combination does the work. But we can assume that the entire genetic system, working as a whole, is responsible for the functioning of the plant.

When we consider that a large number of genes are located on a single chromosome, to cover all of the different characteristics of the plant requires a great number of genes, perhaps several thousands, and several chromosomes. The number of chromosomes necessary for representing every gene for every character in the plant is called the basic number. This is one set of chromosomes. For example, the basic number for I. pumila is 8 chromosomes; 8 chromosomes is also the basic number for I. attica and I. pseudopumila. But pumila has four sets of these chromosomes, a total of 4 times 8 equals 32. While attica has two sets; a total of 2 times 8 equals 16 chromosomes.

We indicate these different numbers of sets of chromosomes as diploid, (dip-loyd) for two sets, triploid (trip-loyd) for three sets, and tetraploid (tet-ray-ployd) for four sets of chromosomes. Remember these sets of chromosomes for we will use them a lot in our further calculations. As you will understand, two sets of chromosomes would indicate tat each gene as well as each chromosome is duplicated, and in a tetraploid with four sets, each gene and each chromosome is represented four times.

Now here is the point where we have described the structure of the cell, If you have understood everything so far, we are ready to go on to the working of this cell.

The first cell of a plant is in reality the seed. This seed germinates and starts growing. What is growing? Growing is a matter of cell division and multiplication. This cell division is a rather complicated procedure in which the individual chromosomes split lengthwise to make two identical chromosomes from one. Then each chromosome pulls apart from its partner, then recedes to opposite ends of the cell, a wall forms between them which divides the whole cell into two cells, each with the original number of chromosomes. In this way we get two cells from one, four from two, and they go on doubling the entire life of the plant until it is fully developed. This is the way growth is achieved in plants. If you wish to know what this process of cell division is called, it is mitosis (my-toe-sis).

So the plant goes on with its regular growth and when the proper time comes, it flowers and produces pollen and ovules. Either a bee comes along and pollinates the flower by carrying pollen and depositing it on the stigma of a flower, or man may do it in a similar manner. Then fertilization occurs and a new seed is formed. Thus the cycle from seed to seed is accomplished.

Of all the workings of a plant, this point right here is the place where things occur which determine the destiny of the next generation of seedlings. This occurs when the pollen and ovules are formed.

I described briefly the manner of cell division in the plant. We now have a different kind of cell division called Meiosis (my-o-sis). When a plant wants to produce gametes (gam-eats), that is pollen and ovules, it produces special cells which perform in a special way. Let us try to visualize two sets of chromosomes functioning in a diploid plant by describing two of its duplicate or identical partners. These two chromosomes being alike in every way, they will pair, or we will say they are homologous. A chromosome will not pair with any other chromosome except its own partner. That is chromosomes #2 will not pair with any other chromosome in the two sets except the #2 chromosome of the other duplicate set. So all of these partners line up in the center of the cell, close together, and this is called pairing. Immediately after this, the pairs separate, and retire to opposite ends of the cell. The cell divides to form individula "half cells' each with half of the contents of the original cell. In this each half cell or gamete, or pollen grain, whichever you want to call it, contains one set of chromosomes. Be sure to remember this; it is important. The gamete contains half of the regular plant cell. In pumila this gamete would contain 16 chromosomes or two sets of 8 chromosomes. The gamete, whether pollem or ovule, gets half of the original cell.

When you pollinate a flower this half cell pollen meets with the half cell which is the ovule, and fertilization combines the two half cells to produce one full cell again.

So we reach another mile post here, and pause to get our bearings. The above explanation covers the fundamental workings of the nucleus and its effects upon the rest of the cell which results in the life and propagation of the plant. But from here on we begin to see the way in which variation and alteration of succeeding generations of a plant can occur. This is where you come into the picture and manipulate the forces of nature to your bidding, of course within proscribed limits.

The strange phenomena of segregation is one of the most amazing facts of life. To explain this is rather difficult, and probably the best method is to illustrate just one character in inheritance. We will assume that a gene which we shall indicate as (B) governs blue color in the flower. Suppose this is the species I. attica with two sets of chromosomes. Therefore, in this plant the blue gene is represented as BB. These are partner genes and they will pair together, then separate and go to opposite ends of the cell,and each gamete will receive one (B). That is normal segregation. But in the long course of time down through the ages, at some time a mutation occurred, and it changed this blue gene to a white, or vice versa, for this is an illustration and not concerned with which was first, the blue or the white. Hence we have two partners, but of different colors. Mind you, this white gene is s still a blue gene fundamentally except that it has mutated, which has changed its color. So these partners we call alleles. They are what we call alleles in the same allelic series, in this case the blue series.

But this change will affect the results of segregation from now on. This plant used to be a combination of BB, and now it is a combination of Bb. Note the capital letter B represents the blue gene, while the lower case b represents the white gene.

So now when the cell divides, one gamete will get B, the other b. Depending upon what kind of ovule it may meet in fertilization, if B meets with B we get a plant with BB. Or B can meet with b, and we get Bb. Or perhaps b meets with another b and we get bb. Therefore, we can now have three kinds of genetical material, namely BB or Bb or bb.

Of course we have names for these different composition plants. The BB plant is called homozygous for blue; homo meaning one or the same kind, and zygous from the word zygote which is a technical name for the cell that is the result of the union of two gametes in fertilization. In short, it is the seed. And of course the bb plant would be homozygous for white, as both of its genes are the same white, with no blue genes present. But the plant having the Bb composition is called heterozygous; hetero meaning different; therefore, a heterozygous plant has cells with different kinds of genes for the character.

There is no doubt that in breeding we use the functioning of dominance and recessive inheritance more than any other knowledge. Even the most ordinary breeder has some knowledge of this inheritance, and yet not all will use the term properly or understand its meaning fully.

In the above explanation of segregation I used the letter B to designate the gene for blue color. I purposely used the capital letter which is customary for indicating the dominant color. And you probably wondered why I didn't use the letter w to indicate the white gene. That was becasue there are other white genes in the genetic system of a plant and if we used w for both, we could not distinguish which one was intended. So we use the lower case of a dominant, as b to indicate that this particular white is in the allelic series of the blue factor.

But what do we mean by dominance? Well, we can understand that a BB plant would be blue because both its genes are blue, and a bb plant will be white because both its genes are white and no blue genes are present. But when we have a Bb plant with both blue and white genes present, this plant will be blue. So we call this condition as blue being dominant over white, for although the white was present, the blue covers the white so that the flower is blue. Thus blue is the dominant color and white is its recessive color. And whenever a plant contains one gene or one <u>dose</u> for blue, that plant will be blue, though it may be a paler blue than when two dosss of blue were present.

After we understand the performance of segregation and dominance, we can begin to use it in a practical way in our breeding operations. We can readily understand that if we cross a blue with a blue, both homozygous for blue, we would obtain all blues in the progeny. Likewise in crossing white with white would give all whites. But when you cross heterozygous plants with different kinds of color genes, we get a progeny with certain numbers of both colors, and when we compute these numbers we arrive at what is called <u>ratios</u> of inheritance.

	B	B
b	Bb	Bb
b	Bb	Bb

	B	b
B	BB	Bb
b	Bb	bb

	B	b
b	Bb	bb
b	Bb	bb

By using a diagram called the Roman Square we can illustrate just how these ratios work out. In the left hand square we have a BB plant on top, with its two gametes indicated as B and B. To the left of this square is marked two gametes of the bb plant; in other words, this is a cross of a blue with a white plant. By bringing down the B and across with the b gamete, we find within the respective divisions or small squares the composition of each seedling. Thus you can see that in this cross of blue x white each seedling receives a Bb composition. Hence all of the seedlings are heterozygous for blue; because each contains a dominant B blue gene, all are blue. There the ratio is 1-0.

Now let us cross these heterozygous forms as Bb x Bb. In this diagram you will note that there is one BB, two Bb, and one bb. Thus the ratio here is 1-2-1, or as is often indicated as 3-1, because there are three blues to one white. The only way you can know the BB plants from the Bb blues is by breeding, that is selfing them, because the BB plants will breed true for blue and the Bb plants will give both blues and whites.

This last square is probably the most important of the three, especially for experimental work; for this is what is known as a <u>test cross</u>. This is the recessive bred back to the heterozygous. As you can see, here half the plants are white and half are heterozygous blues, that is two bb and two Bb respectively. So this ratio is indicated as a 1-1 ratio.

There is just one more thing that I wish to illustrate, and I will end this lecture. Ordinarily in inheritance we must figure in terms of one character at a time, for genetically most factors function as independent units. Yet any experienced breeder knows that there is always the whole genetic system to be considered, for in spite of our apparent assuredness, there are many interactions between different factors that we as yet know little of the relationships.

But here is an instance that will come up often in your work. As an example we know that blue is a dominant color in iris. We also know that yellow is a dominant color, but each are independent from the other, in fact these genes are on different chromosomes. And to further complicate matters, each has its own recessive white form. We can readily understand that with independent factors, both can be present in the same plant. So what happens when two dominants are present? The answer is that both give expression simultaneously according to their capacity. If the blue is deep enough to hide the yellow, it covers it just as with its own recessive, yet you wouldn't say that blue is dominant to yellow. They have a different word for that; it is epistatic. In this case, the blue is epistatic to yellow and yellow is hypostatic to the blue. This is always in relation to two separate and independent characters, whereas dominance is in relation to its own partner gene.

So if you know what characters are dominant and recessive, and how they will segregate, you have the basic knowledge for most of your breeding work. Not all characters are dominant or recessive. For instance height and season of bloom are what is called incomplete dominance. These are usually intermediate between the two parents. I am sure that after you learn the basic knowledge here presented, you will want to go further into this interesting and exciting study.

CHROMOSOME NUMBERS

The list of chromosome numbers of dwarf iris varieties continues to be rather limited, although we have been able to add a few counts which were made available since the publication of the first Dwarf Iris Society Check List. Dr. L.F. Randolph, editor of Garden Irises, has kindly granted us permission to publish chromosome counts of dwarf iris recorded in that publication. A majority of the counts appearing in this list are from that source, although a few are from other sources.

List on next page:

SOMETHING ABOUT OUR DIS ROBINS

The purpose of joining any flower society is obviously to receive some benefits from that society. Association with others having a mutual interest in that flower may be the motivating interest. To these members attendance at meetings and access to various services offered by the society may be important considerations. Most members probably receive their chief benefit from the society's publications. Members of DIS may share all these benefits. Spring, and often fall, meetings are held in the four areas of the DIS. Slides are available to members for meetings for a nominal fee. A library of dwarf literature and material for scientific study is also available from Mr. Welch. The Portfolio is published annually. To get full advantage of your DIS membership, use all the services of the DIS.

One small item that I have not mentioned is, perhaps, one of the most important of these services. I refer to the DIS Robins directed by Walter Welch.

What is a Robin? A Robin is a group of ten members in a correspondence association. When you join a Robin you will receive a batch of letters in one envelope, one from each member of the group. You put in your own letter and mail all to the next person on the Route List immediately after your name. When the letters have reached all members and returned to you, take out your old letter and put in a new one and mail them on again. This goes on indefinitely, or as long as you wish to remain a member.

In the Robins you will make new friends, you will discuss your problems with other members, and you will learn more and quicker than you can by any other method. Most of the experts in the DIS received most of their knowledge through the discussions in these Robins, and I may say that practically all our DIS judges received much of their training through this medium.

The main advantage of a robin is that you are able to ask questions which particularly meet your needs. Ordinarily you can sit by and wait in the hopes that the bulletins will eventually discuss these matters, but here you don't wait; you get the answers at once, and besides you personally participate in the discussions. It becomes more of a personal matter.

If you have an idea that a Robin is just a means of exchange of gossip and visiting, you are wrong. Naturally some personal exchange of personal matters will occur, because these are your new friends, but we try to keep to the subject as much as possible. Also you may think you, being a beginner, cannot keep up with advanced members. We specialize in beginners. But let me say that Robins are for experts as well. Most of the dwarf notables in this country and abroad are members.

The truth is that with the robins you are getting an equivalent of several extra bulletins every year, and these at no extra cost.

CHROMOSOME NUMBERS

Alba 40

Alinda 36

I. arenaria 22

Atroviolacea 36

I. attica 16

Attica Farnes 16

Aurea Maculata 40

Austrian V. pumila . 32

Azurea 36

Balkana 40

I. balkana 46

Belvedere 32

Biflora 36

I. blodowii 22

Blue Band 36

Blue Beard 40

I. bosniaca 24

Bride 43

Bright Spring 36

Carpathia 32

I. chamaeiris 40

Coerulea 36

Compacta 40

Cream Tart 31

Cretica 32

Curiosity 40

Cyanea 40

Endymion 40

Excelsa 40

Fallen Leaf 31

Fior del Mondo ... 30

Floribunda 40

Florida 40

Formosa 40

Graminea 40

Geen Sprite 32

Hanselmayer 32

Hullabalu. 38

Inchalong 38

I. italica 40

Jean Siret 40

Keepsake 31

Libra 44

Little Elsa 40

Little Jewel ... 40

Lutea 40

Macrocarpa 36

Marocain 40

I. mellita 24

Mist O' Pink ... 31

Moongleam 40

Morning Light .. 32

Nana 30

Nest Egg 42

Niobe 40

November 40

Nugget 40

I. olbiensis 40

Orange Queen 40

Primus 36

Promise 31

I. pseudopumila 16

Pseudopumila Zadar .. 16

I. pumila 32

Pumila Munich 32

I. reichenbachii 24, 28

I. rubromarginata 24

Rupert 40

I. scabiosa 24

Schneekuppe 40

Silver Elf 44

Socrates 40

Sound Money 40

Statellae 44

I. subbiflora 40

Sulina 32

Sweetseri 38

Tampa 31

Tiny Tony 40

Tiny Treasure 31

Titania 40

Tony 40

Violet Gem 36

Ylo 31

DWARF IRIS AWARDS

Variety	AIS Awards HM	AIS Awards Caparne	DIS Awards ASM	DIS Awards Blue Ribbon	DIS Awards Walter Welch Award
Ablaze (Welch 1955)	56		56	57	
Alaskan Ice (Roberts 1960)			64		
Alinda (Cook 1946)	53				
Already (Warburton 1961)	63		63		
Angel Eyes (Jones 1958)	59	61	59	60	61
April Morn (Welch 1952)	52	54	54	55	
April Sun (Brown 1962)			63		
Atomic Blue (Welch 1960)	62		61	62	64
Atroviolacea (Todaro 1856)	51	52			
Beauty Spot (Marx 1947)	49	53			
Bee Wings (Brown 1959)	61	63	64		
Bimbo (Grapes 1954)	56				
Black Baby (Sass 1955)	58	62	58	59	
Black Top (Welch 1959)	61		61	62	
Blazon (Welch 1952)	52	55	54	55	56
Blue Band (Cook 1950)	52		54		
Blue Doll (Warburton 1958)	59		61	63	
Blue Frost (Doriot 1956)	57	59	57	58	59
Blue Spot (Welch 1953)			55		
Blue Whiskers (Welch 1959)	61		60	61	
Bricky (Welch 1956)			57	58	
Bright Spot (Welch 1955)			57		

	HM	Caparne	ASM	Blue Ribbon	Walter Welc Award
Bright White (Welch 1957)	59		58	59	
Brownette (Roberts 1956)			61	64	
Burgundy Velvet (Simonson)			59	63	
Buster Brown (Zickler 1954)	55		55	56	
Butterball (Zickler 1954)	56		56	57	58
Cherry Spot (Welch 1954)	56	60	56	57	60
Chicken Little (Jones 1959)	61		61	62	
Claire (Brown 1958)	61		59	61	
Cradle Blue (Brown 1959)			60		
Cradle Days (Brown 1959)			60		
Cup and Saucer (Welch 1951)			55	56	
Cute Capers (Brown 1960)	63				
Dirty Face (Welch 1954)			57		
Dizzy Dame (welch 1961)	63		62		
Dream Child (Welch 1954)	56		56		
Dream Stuff (Mahood 1963)			64		
Drop O' Blue (Brown 1960)	63				
Drop O' Lemon (Muhlstein 1959)	59				
Ducky Lucky (Jones 1959)			60		
Enamel Blue (Welch 1958)	61				
Fairy Dell (Jones 1961)	63		62		
Fashion Lady (Welch 1956)	58		57	58	
Flashlight (Welch 1957)			59		

	HM	Caparne	ASM	B R	Walter Welch
Flaxen (Doriot 1954)			56	57	
Fortissimo (Welch 1957)	59				
Garnette (Robinson 1955)			58		
Gay Flirt (Roberts 1961)			64		
Gay Lassie (Welch 1955			57	58	
Glow Gleam (Welch 1958)	62		61	62	
Graminea (Bonnewitz 1920)	40				
Grandma's Hat (Mahood 1955)			58	60	
Hanselmayer (Welch 1955)	55		55	56	
Heart's Content	61		60	61	
Honey Bear (Mahood 1955)			57		
Hullabalu (Welch 1956)	58		57		
Inchalong (Cook 1953)	54		56	58	
Irish Doll (Brown 1962)			63		
Jet Petite (Jonas 1957)	58				
Keepsake (Cook 1936)	38				
Knick Knack (Greenlee 1959)	62		63		
Lilac Girl (Simonson 1963)			64		
Little Blacksmith (Jones 1957)	58		58		
Little Elsa (Muhlestein 1947)	48				
Little Joe (Welch 1955)	57		57	58	
Little Mohee (Grapes 1953)	54		56		
Little Villain (Welch 1953)	54		56		
Magic Flute (Beattie 1962)	63				

	HM	Caparne	ASM	BR	Walter Welch
Moon Gleam (Marx 1947)	49				
Moppet (Simonson 1957)			58		
Morning Fresh (Wlch 1959)			60	61	
Mumbo (Zickler 1954)	57		57		
Nancy Maria (Brown 1959)			61		
Olive Eva (Christenson 1950)	51				
Orange Glint (Welch 1953)	53		54	55	
Orchid Flair (Mahood)	60		61	62	63
Orchid Sheen (Welch 1962)	63		62	63	
Pastel Dawn (Welch 1957)	58		60	64	
Path of Gold (Hodson 1941)	51	57		54	55
Perky (Welch 1950)	61		60	61	62
Primus (Welch 1950)	50	51			
Polka Dot (Jones 1961)	63		62	63	
Promise (Cook 1952)	52		54		
Pumar Alpha (Ackerman 1956)	58		57	58	
Pumar Beta (ackerman 1956)	58				
Red Amethyst (Doriot 1954)	56		55	56	
Red Gem (Welch 1955)	56		56	57	
Remnant (Cook 1955)	56		56		
Rosy Carpet (Grapes 1956)			58	63	
Sawtooth Range (Grapes 1957)	59				
Sky Patch (Cook 1955)	56		57		
So Fair (Welch 1963)			63		

	HM	Caparne	ASM	BR	Walter Welch
Sound Money (Sass 1935)	36	50			
Sparkling Eyes (Welch 1953)	54	56	55	56	57
Stint (Cook 1955)	56				
Stylish (Welch 1951)	52		54	55	
Tampa (Cook 1936)	38				
Tear Drops (Beattie 1957)	58		59		
Vari Bright (Mahood 1962)			63	64	
Veri Gay (Welch 1953)	54	58	55	56	
Violet Gem (Cook 1946)	50		54		
Violet Night (Welch 1954)			56	59	
Wee Blue (Welch 1958)	59		59	60	
Wee Admiral (Marx 1947)	49				
White Elf (Doriot 1957)	58		58	59	
White Mite (Welch 1958)	59		59	60	

GLOSSARY
Abbreviations and Definitions

ACAULESCENT. Stemless or apparently stemless

ALLELE (al-le'-le). One of an alternative pair or series of genes.

ALLO-TETRAPLOID (al'low-tet'ta-ploid). A hybrid plant with four sets of chromosomes, dissimilar and usually differentiated in pairs.

AMOENA (am-e'-na). A pattern having white standards, a different color on the falls, usually violet, with white border edging the falls.

AMPHIDIPLOID (am'phi-dip'-loid). A A hybrid plant with four sets of chromosomes, usually called a tetraploid, but which has each pair of a different structure or relationship, and which may or may not be partially homologous. Often called a double diploid.

ANEUPLOID. Having one or a few chromosomes more or less than the balanced diploid, triploid, tetraploid, or other polyploid number.

ANTHER (an'-ther). The part of the stamen which contains the pollen.

ANTHOCYANIN (an'-tho-cy'-an-in). A sap soluble pigment in a cell which is responsible for violet, purple and blue colors.

ARIL. The small white collar surrounding the helium or region of attachment to the capsule of seeds of oncocyclus and regelia irises.

ASEXUAL. Literally, without sex; as applied to plants, propagation by subdivision of rhizomes, bulbs, or other vegetative means without the sexual union of germ cells.

A.S.M. Abbreviation for the Award of Special Merit of the Dwarf Iris Society.

AUTO_TETRAPLOID. A plant having four similar or identical sets of chromosomes, which are homologous.

BACKCROSS. A cross of a seedling with one of its parents.

BALKANA (ball-kay'-huh). A balkan species of the reichenbachii group.

BEARD. A collection of close set hairs, of a particular color, on the upper portion of the fall.

BICOLOR. An iris with standards of one color and falls of a different color. An amoena or variegata, for example.

BITONE. An iris of one color, but with a different tone on the standards and falls.

BIVALENT. (bye'vail-ent). A group of two homologous chromosomes pairing together at meiosis.

BLEND. A combination effect of two or more different colors, usually purple and yellow, to give a blended effect.

BLENDING INHERITANCE. Absence of dominance, the hybrid being intermediate between the two parents.

BLOUDOWII (blou-do'vi-eye). A subspecies of I. flavissima.

B.R. Abbreviation of the Blue Ribbon Award of the Dwarf Iris Society.

BOSNIACA. (bozz-ny'-a-cah). A diploid of the I. reichenbachii group.

CALYX. The sepals or falls of the iris flower.

CAPARNE AWARD. Highest award in the Dwarf Iris Class of the AIS.

CAROTENE. A plastid pigment responsible for most of the yellow color of iris flowers.

CAROTINOID. Any of a class of yellow and red (lycopine) pigments found in plants.

CAULESCENT. Having an evident stem above ground.

CHAMAEIRIS (kam'-i-iris). Species of dwarf iris.

CHROMOSOME (kro'-mo-some). One of the elements or bodies constituting the nucleus in a Somatic Cell, each of which comprises a large number of genes which are arranged like beads upon a string, each gene concerned with the expression and development of some heritable character. The number of chromosomes together making up a nucleus is designated as the chromosome number of that particular plant and this amount is uniform in every cell throughout the plant. Abbreviated "chro"

COROLLA. The showy parts of a flower betwenn the calyx and the style--the standards (petals) of an iris flower.

CROSSING OVER. The interchange of segments between homologous chromosomes.

CULTIVAR. A cultivated variety, as distinguished from a botanical variety, which has originated or is important only in cultivation.

CYTOLOGY (sigh'-tol-o-gy). A branch of biology treating of the structure of the cell and functions of its parts.

DIPLOID. A plant or animal having two sets of chromosomes.

DOMED. Standards of an iris flower when rounded and closed.

DOMINANCE. The ability of one character or color to cover up or neutralize the expression of another character, each of which is alternate in inheritance and allele to each other, as dominant vs. recessive.

EGG. The female gamete located in the embryo sac of the ovule.

EMBRYO. The rudimentary plant within the seed, usually developed from the fertilized egg or zygote.

ENDOSPERM. The part of the seed which surrounds and nourishes the embryo.

EPISTASIS. The masking of one character by another (nonallelic dominance) as contrasted with hypostasis which is the failure of a character to be expressed due to the masking effect of some other character. In their relation to each other non allelic characters may be epistatic, or both together may exhibit a blending effect.

EUPOGON. True bearded irises with a beard consisting of multicellular hairs in contrast to pogon (onco and regelia) irises whose beard consists of unicellular hairs.

F1. The first filial generation, the first generation offspring of a cross

F2. The second filial generation resulting from self-pollinating or sib-crossing the F1.

FALCATE. Curved like a sickle.

FALLS. The three segments of an iris flower that occur as the extended and down-hanging petals, actually the sepals. Abbr. F.

FERTILIZATION. The impregnation of the ovule by the meeting of pollen and egg cells in the ovary.

FILAMENT. Stalk of the anther.

FLARING FALLS. Falls held horizontally or nearly so.

FLAVONES AND VLAVONOLS. A sap pigment within the cell that is closely allied to the anthocyans. All are derived from the same basic materials, Although invisible, it functions to modify the expression of the anthocyans.

FLORIFEROUS. Flower bearing, usually implying a free-blooming condition.

FORM. May refer to the shape of a flower, or to a particular kind of plant, as a color form of a species.

GAMETE (gam'-eat). A special fertilization cell produced by a plant, commonly known as pollen or ovule, which meet in fertilization to form a seed and eventually a new plant. Each such germ cell is really half a cell, which when combined with the half cell from the other parent, becomes a full cell again. This union produces the zygote or first living cell of the new plant.

GAMETOPHYTE. The generation or part of the life cycle following meiosis, which produces the gametes or germ cells, as contrasted with the sporophyte generation which begins with fertilization and ends with the formation of spores at meiosis.

GENE.(jean). The smallest section of a chromosome separable from another one by crossover or exchange and considered as a unit of inheritance. Each gene functions in the control or development of some particular character.

GENETICS. The science of heredity.

GENOTYPE. Relates to the type of genes or the genetic constitution of a plant as opposed to the phenotype which is the visual expression of the plant. However, the genotype governs the phenotype almost exclusively.

GENUS. A unit of classification consisting of one or more similar species

GERM CELL. A cell capable of participating in the process of fertilization from which a new individual ordinarily is produced(Same as gamete).

GERMPLASM. The material basis of heredity, the living substance of the cell concerned with inheritance.

HABITAT. The locality or place where a plant grows.

HAFT. That part of the falls of an iris that lies adjacent with the beard, and is often lined and striated, which we call haft markings.

HAPLOID. Having the reduced or half-humber of chromosomes. The body cells have the unreduced, somatic number, the gametes the haploid or reduced number.

HEREDITY. The property or capability of inheriting the characteristics of parents and ancestors.

HETEROPLOID. An organism having more than the basic number of chromosomes characteristic of a species or genus, either an even (polyploid) or uneven (diploid) number.

HETEROZYGOUS (het'-er-o-zy'-gus). Hetero meaning different, means a zygote or fertilized cell which has different kinds of genetic material, therefore it is not true breeding.

HETEROZYGOTE. An individual with unlike alleles.

HEXAPLOID. A plant or animal having six sets of chromosomes.

HILUM. The scar marking the place of attachment of the seed to the seed pdd.

HOMOLOGOUS (huh-moll'-uh-gus). A pair of chromosomes which, due to close relationship or identical structure is capable of pairing, and regular division and distribution,

HOMOZYGOTE. An individual with alleles which are alike.

HOMOZYGOUS. (ho'mo-zy'-gus) Homo meaning one or the same, refers to the zygote having only one kind of genetic material, as a diploid having two identical genes at the same loci on two pairing chromosomes; therefore it is pure breeding because it doesn't have any other kind of gene for that particular character. Thus a plant having the full complement of yellow genes, and no other color genes, is homozygous for yellow.

H M Refers to the Honorable Mention Award of the AIS

HYBRID. The offspring from two parents which are specifically distinct, as opposed to closely related parents. Thus a cross between different species is a hybrid.

HYBRIDIZATION. The crossing of two genetically different individuals.

HYPOSTASIS. The masking of one character by another-nonallelic recessiveness (see epistasis)

INBRED. An individual, line or strain produced by inbreeding.

INBREEDING. Repeated self-pollination, sib-crossing or intercrossing of closely related individuals.

INDIGENOUS. Native to a particular country or region.

INHIBITOR. In genetic usage, a gene which inhibits the action of another gene, as the development of anthocyanin color.

KARYOTYPE. Refers to the analysis of the morphological characteristics of chromosomes, such as size, shape, relative length, etc.

KEEL. A projecting longitudinal ridge, as the midrib of the spathe in certain iris species.

KEELED. Ridge like the bottom of a boat.

LILLIPUT. A first generation iris hybrid of pumila dwarf and tetraploid tall bearded parentage.

LINKAGE. The genetic association and consequent inheritance of two genes which act as if inseparable, usually because they are located on the same chromosome; or when on the same chromosome are located towards either end rather than in the middle, and thus are seldom separated by the crossover. The result is that the two characters are usually inherited together.

LYCOPENE. The pigment possibly responsible for tangerine pink color.

MEIOSIS (my-o'-sis). The functioning of a plant whereby it produces gametes. This is accomplished by a special process which involves pairing, exchange of factors, and finally division of the cell into germ cells containing half of the complement of a somatic cell.

MELLITA (mel'-li-tuh). A dwarf species iris.

MICROSPORE. The cell resulting from the reduction divisions (meiosis) in the anther and from which the pollen grain develops.

MITOSIS (my-tose'-is). The division process by which two cells are formed from one, enabling growth of the plant. It involves producing a cell wall to divide the cell, each side containing half of the contents of the whole cell, then splitting of the individual chromosomes forming two from one, which restores the full quota in each half; thus each half becomes a whole again.

MONHYBRID. The offspring of parents differing in only one Mendelian character.

MORPHOLOGY. Biology relating to the form and structure of a plant.

MULTIVALENT. An Association of more than two chromosomes in meiosis.

MUTATION. A change in the structure of a gene technically but a mutant effect can be accomplished through alteration of the arrangement, acquirement or loss, or other abberation in a chromosome. A mutation is heritable, as opposed to an environmental expression.

(n). An abbreviation or code used by geneticists to express the number of chromosomes. As in Talls, (2n-24) and (4n-48);(n-12) would represent the basic number of chromosomes or one set of chromosomes.

NATURALIZED. Introduced from another country and established naturally in a new environment.

NEGLECTA. A pattern in iris, having blue standards, with deeper blue falls, or the spot pattern with blue border like standards. Blue Spot is an example.

NUCLEUS. A central mass within a cell, made up of chromosomes, more or less suspended in the somatoplasm.

OUTCROSS. A cross to an individual not closely related.

OVARY. The ovule-bearing structure at the base of the flower which develops into a seed after fertilization.

OVULE. The egg-containing organ within the ovary of the flower, which develops into a seed after fertilization.

PAIRING. An action occuring during meiosis, where homologous chromosomes mate or align themselves together prior to the reduction division. It is one of the sequences which occur in the process of forming gametes.

PEDICIL. Supporting the flower, often called the perianth tube. It is also used as any stalk, as the stalk of an anther.

PERIANTH. The collective term for the petals and sepals (standards and falls of the iris flower).

PERIANTH-TUBE. The slender tube of the iris flower connecting the ovary with the separate perianth parts (sepals and petals).

PETAL. One of the inner series of perianth parts (one of the three standards of the iris flower.)

PETIOLE. The stalk of a leaf.

pH. A symbol used in designating acidity or alkalinity. A pH of 7 indicates a neutral condition; lower amounts indicate acidity; higher amounts indicate alkalinity.

PHENOTYPE. The type that is expressed visually, as opposed to the genotype which indicates the genetic type of a plant.

PISTIL. The female reproductive structure of the flower, including,in the case of the iris flower, the ovary, style-branch and stigma.

PLASTID. Plastid pigment is the granulated or solid coloring material in the cell, in contrast to the sap soluble anthocyanin pigments. Yellow, the tangerine pink, and green chlorophyll of the leaves are plastid pigments.

PLICATA. (pli-cay'-tah). A pattern in iris having standards and falls of one color, usually white though it may be yellow, with a stitching or dotting of another color around the edge of both standards and falls.

PUMILA (pew'-mi'luh). A dwarf iris species.

RECESSIVE. A gene or factor which is receding or latent when present with its dominant gene. It may be present but remain invisible. The dominant genes and recessives are alleles and alternate inheritance, A recessive shows only when in a homozygous condition; therefore, it is pure breeding.

REFLEXED. Bent abruptly downward and inward; the falls may be noticeably reflexed.

REICHENBACHII (rye-ken-bach'e=i). A dwarf iris species.

RHIZOME. A modified creeping or underground stem, often enlarged to serve as a storage organ, and with shoots and buds developing from the nodes.

RUBRO-MARGINATA. (roo-bro-mar-jin-aye'tuh). A dwarf iris species of the I. mellita group.

SCARIOSE. Thin, dry and membraneous, like an onion skin.

SEED. The ripened ovule, containing an embryo and various surrounding structures.

SEGREGATION. The process of distribution of genes and factors to the gametes, which results in variation in the progenies of seedlings. The disassociation of characters from each other in the formation of the germ cells. This involves the inheritance of alternate alleles, dosage, linkage, and recombination of different genes.

SELF. This term is used in two ways. It means a self pattern where the whole flower is of one color or tone, or can mean self-pollinating a flower, which is putting the pollen back onto the stigma of the same flower.

SEPAL. A unit of the outer series of perianth parts, one of the three falls of the iris flower.

SESSILE. Without a stalk.

SET OF CHROMOSOMES. This indicates the basic number of chromosomes. It includes the entire number representing the factors of every character of a plant, necessary for its functioning and expression. A diploid has two sets of chromosomes, that is each chromosome is duplicated, and a tetraploid has four full sets. Thus the basic number of 8 chromosomes for attica and pumila represent one set of chromosomes.

SPERM. A male gamete or germ cell.

SIB. This is a term used by breeders to indicate a sister cross.

SOMATIC CELL. From soma meaning body, thus a body cell of a plant.

SPATHES. This is the spathe valves or the envelope which encloses the flower in the bud stage. The bloom arises from spathes which then remain partly open below the flower. They are two in number, called the outer and inner spathes.

STAMEN. The male organ of a plant consisting of a filament and anther.

STANDARDS. The three upright segments of an iris flower; the true petals The three extended and downward segments are called falls. Abbreviated S. and F., respectively.

STIGMA. The female organ upon which we deposit the pollen.

STYLE. The stalk or base supporting the stigma.

STYLE CREST. A projection of the style-branch.

SYNAPSIS (sin-ap'sis). The act of homologous pairing.

TAXONOMY. Pertaining to the botanical classification of species and plants according to their relationships and physical characteristics into their respective schedules.

TEST CROSS. A cross to double recessive, in contrast to a back cross which is a cross of an F1 with either parent.

TETRAPLOID. An organism having four sets of chromosomes.

TRIPLOID. (trip-loid') . An organism having three sets of chromosomes.

TRIVALENT (try'vail'ent). A group of three chromosomes pairing together at meiosis.

UNIVALENT. (you'ni-vail'ent). An unpaired chromosome, remaining at random because of lack of a homologous partner.

UNREDUCED GAMETE. Where failure of the reduction division occurs at meiosis, resulting in the gamete containing a full cell quota, instead of the normal half cell quota.

VARIEGATA. A pattern in iris expressed as yellow standards, reddish falls, or falls with a spot and border of yellow. This pattern is conspicuous in I. attica, I. pumila, and I. pseudopumila.

VARIETY. A cultivated plant which has been given an identifying name (i.e. a cultivar), or botanically, a group of individuals within a species that differs sufficiently from the rest of the species population to be distinguished and given a Latin varietal name.

ZYGOTE. (zy-goat). A fertilized egg. The union of pollen and ovule at fertilization produces the first living cell of a plant. Also the individual developed from it.