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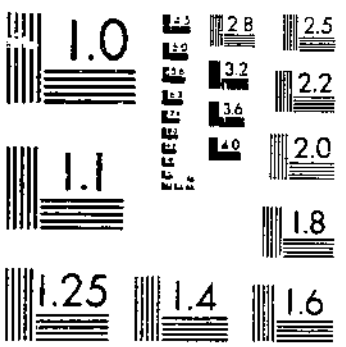

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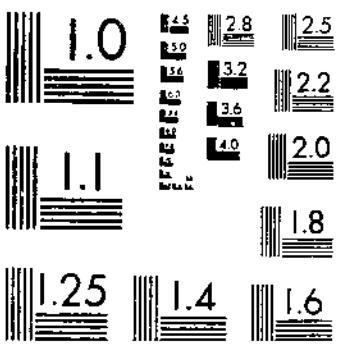

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TECHNICAL BULLETIN No. 11 NOVEMBER, 1927

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

THE PRODUCTION OF HYBRID PALESTINE IRIS CORMS

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INTRODUCTION

The purpose of this bulletin is to record, for the benefit of the prospective bulb grower, experiences extending over eight years with two groups of the genus Iris, which are best known as Palestine iris hybrids. These groups are distinguished by underground parts which are structurally neither typical rootstocks (rhizomes) nor typical corms (solid bulbs), but which partake of some of the characteristics of each and are usually referred to as corms. The two groups described include some of the most interesting and beautiful species of the entire genus, but as they are difficult to develop they are much less abundant in collections than the common flag iris of our gardens.

In horticultural literature these species are referred to two groups, Regelia and Oncocyclus,[1] the first being distinguished mainly by comparatively narrow falls in the flowers and the latter by wide ones. The first has a linear beard and the latter a diffuse one. Commonly, too, the rootstocks connecting the thickened portions of the underground parts or corms are long and thin in the Regelia (fig. 1) and very short in the Oncocyclus (fig. 2).

[1] Pronounced Re-jel'-la and On-co-cy'-clus.

These two groups are natives of the mountains of western Asia and are usually associated with the Palestine region. In the United States they seem to be best adapted to the climatic conditions of the milder sections of the Pacific coast. Stocks of these irises are generally rare and expensive. The most common species are the Mourning iris (*Iris susiana*), *Iris korolkowi* (fig. 3, B), and *I. stolonifera* (*leichtlini*) (fig. 3, A), the last two of which are the most easily grown of these species.

FIG. 1.—Long, lax underground parts of *Iris stolonifera*

A great deal of breeding between members of these two groups has been carried on, particularly in the Netherlands. This has resulted in a large number of very desirable hybrids possessing a variable combination of characters similar to the parents but much modified. The parent groups are noted for their peculiar subdued coloration and very striking venation in the floral parts. The hybrids are

more amenable to culture, and it is therefore possible for the nurseryman to work up stocks of them without the hazard that has accompanied the attempts at culture of many of the Palestine species.

FIG. 2.—Dense, congested underground parts of Mars iris

It is mainly with these hybrids that this bulletin deals, although reference is also made to some of the species from which they are derived, which are handled in precisely the same manner as the hybrids, but commonly with more difficulty. The hybrids are known as the Regelio-cyclus or Palestine iris hybrids, and most of them originated near Haarlem, the Netherlands, from the two groups of species native to the Palestine region.

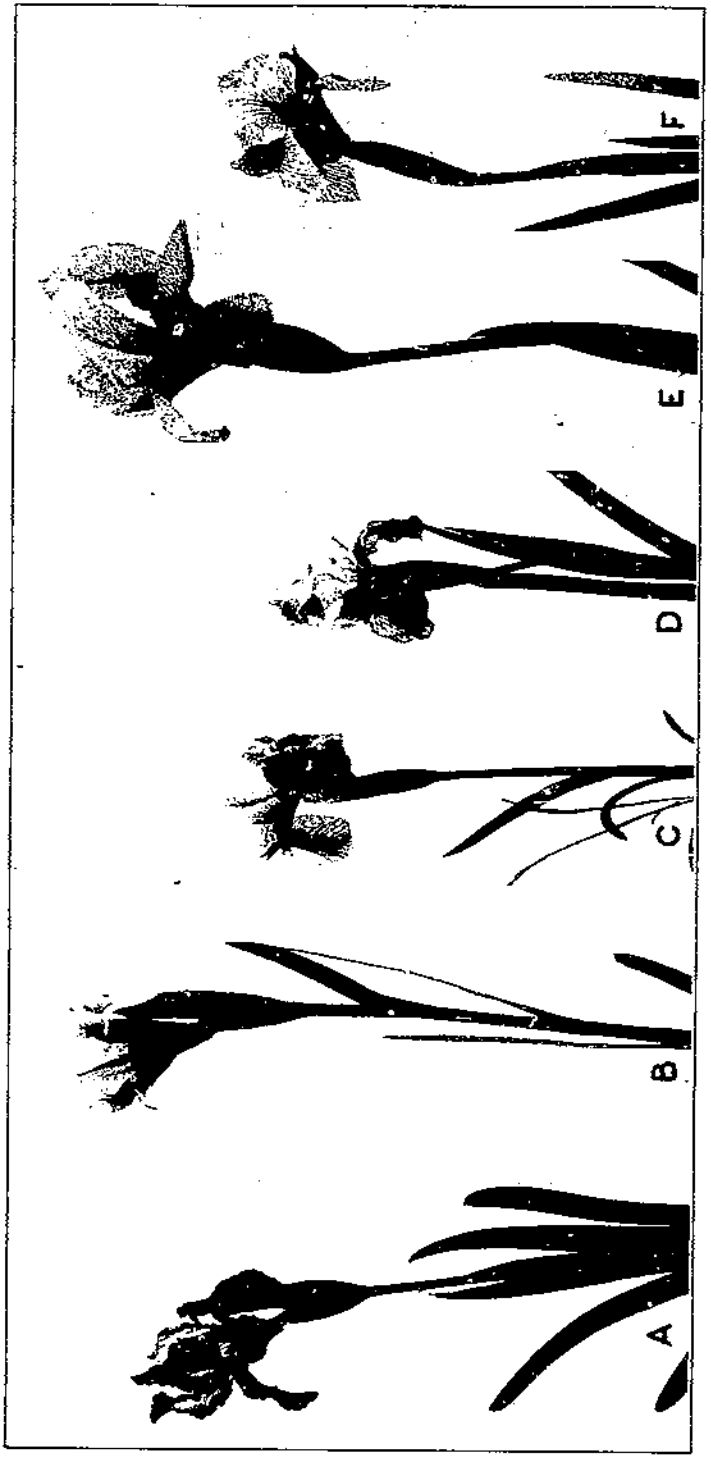

FIG. 3.—Iris species and varieties: A, Stolonifera; B, Korolkowi; C, Dido; D, Hera; E, Saturn; F, Psyche

THE CORMS

The corms of these varieties of iris consist in reality of a number of pseudocorms united by rootstocks of different lengths, varying with the group and species to which they are most closely related; those resembling the Regelia group having comparatively long corms, whereas the Oncocyclus varieties have comparatively short or even sessile and congested corms, which are sometimes difficult to separate. Each corm, of whatever variety, has in common with all irises a growing point for the next season's growth, well developed and centrally situated. On the upper and distal side are one to several buds, much less developed, which give rise the next season to new corms to take the place of the present large, well-developed one. This large corm gradually dies and disappears after it has flowered and gives rise to the new growth which is to blossom and continue the reproduction the next year. These features are well brought out in Figures 1 and 2. The main growing point is at the surface of the ground, but the lateral buds, which are slightly more deeply covered with earth the current season, will take their places at the surface the next year, when they reach full stature.

The feeding roots grow mainly from the outer and under side of the corm. These disappear to a marked degree during the hot, dry summer, so that there are only a few of the proximal ones that seem to be alive. Upon the advent of September rains, however, the development of a root system is very rapid. Instances have been seen in California in which the soil was a mass of roots within a week after an early September rain following drought since May.

PREPARING THE CORMS FOR PLANTING

The elimination of the old and useless portions of the corms is one of the most important points in the culture of these varieties, as it is even in some of the so-called flag irises. Under certain conditions it is really the controlling factor and, coupled with precocious autumn growth, has been the means of excluding the culture of the Regelia and Oncocyclus irises and their hybrids from regions having humid summers.

When the plants are divided preparatory to planting they consist of the corms described under the last heading, together with the older portions, 1 or even at times 2 years old, all perfectly sound. Decaying and dried shells of still older corms are also attached, especially if the plants have been undisturbed for several years.

All the dead portions should be rubbed off before planting the corms, but when the older solid corms have a live bud, even though the crown may have lost its function, good use can still be made of it for propagation. The bud will develop into a good mature plant in one or at most two years.

It will be readily realized that regions with dry summers are conducive to healthfulness in these plants, because of the opportunity for the callousing or healing over of the line of cleavage between these old decaying growths and the healthy new ones. In a humid region, however, the situation is very different. In moist soil there is little opportunity for the corms to heal, and the rotting of the older useless portions extends into the newer tissues to such a degree

that the plants soon fail from what is often referred to as "root rot," implying a disease origin. Under humid conditions, therefore, it is imperative that the corms be dug as soon as mature. The callousing will then take place perfectly on the shelves of the storage house.

How these variable root structures are to be divided for resetting will depend largely upon the grower's objects. All things considered, if he wants the best and most rapid reproduction, the division will be fine; that is, into individual corms with their several buds, which will develop into so many more corms the next season. It is believed that this is the best method of getting the most rapid reproduction. There is no real distinction to be made in these varieties between planting stock and mature stock, as there is in true bulbs and corms, such as tulips and crocus, for instance. The planting and the merchantable stocks are not distinguishable; consequently the proportion of planting and salable corms is a matter of adjustment between necessity of income, for instance, and quantity desired to plant for next year's increase.

Usually the corms can be broken apart easily, but in some of the varieties which most resemble the Oncocyclus group it is advisable to use a knife to cut off those corms closely attached or likely to be injured by pulling apart.

PLANTING AND CULTIVATION

At Chico, Calif., planting has been done consistently in early September, with the exception that the initial importation was not put in until late October. To handle these plants in early September it is usually necessary to irrigate in order to prepare the ground properly, and this has been done except in one instance when abnormally early rains put the ground in condition without it.

As soon as the soil is worked down and smoothed, the land is opened up for planting by plowing double furrows 3 feet apart. Usually a 10 or 12 inch plow has been run back and forth, thus opening up a dead furrow and throwing the soil in both directions. These depressions are then worked down with a garden rake so that the smoothed surface is about a foot wide and 3 or 4 inches below the natural level of the field. The corms are then set over this foot-wide space in a matted row or in two rows 6 inches apart. The covering is done with a rake or a hoe when the nature of the corms permits, but commonly they are of such a character as to be more advantageously buried by the use of a shovel, the soil being lifted and dropped on top of the plants to cover them properly without interfering with the placement.

Cultivation has always meant keeping the middles worked up with horse tools and the weeds pulled out of the matted rows by hand. The plants are shallow rooted, and consequently horse tools do more or less damage, especially when an attempt is made to operate too close to the matted rows of the iris.

On the Arlington Experiment Farm, Rosslyn, Va., near Washington, D. C., the plan of planting practiced has been entirely different. The planting has been delayed in autumn as much as possible. The two factors governing have been weather conditions and the condition of the planting stock. Usually the plants have been set in October, preferably as late in the month as practicable. The

planting here has been entirely in the conventional Dutch bed, 3 feet wide, alternating with 15-inch paths. The work on the planting is done entirely by hand. The paths are kept worked up with a wheel hoe and the beds are hand weeded.

The planting material has been placed much thicker in the Virginia situation than in California, for the reason that annual instead of biennial digging has been practiced. When the plants are cut to individual corms, these are distributed about seven to a 6-inch row across the 3-foot beds. This gives ample space for one year's growth. With the matted-row planting in California, the loading of the space to its capacity has not been a factor, and the plants are set 4 to 6 inches apart each way, which gives an abundance of space and permits a spread into the ample interrow areas.

On the whole, it is believed that the bed method, if properly handled, is more satisfactory, especially where annual digging obtains, for the reason that on a bulb planting there is always more or less injury from cultivating tools and animals, except with more care than it is usually practicable to give. Another factor of importance is the economy of space in the bed system. The writers are unable to recognize any advantage in the wide space between the beds except the opportunity to keep down weeds in them by horse cultivation. The spaces between the plants must be kept clean by hand, and it is not advantageous to cultivate closer than 3 inches to the rows. The production of corms of these plants is to be looked upon as an intensive job, where careful hand labor is an important factor in success.

SOILS AND FERTILIZERS

In California the culture of these irises has been on a medium black loam quite devoid of humus and badly impoverished by long cropping in grain and later in nursery stock. If handled at exactly the right time it works up good and friable, but during the dry season it is scarcely possible to get a plow into it. It is normally a productive soil for ordinary farm crops. Fertilization has consisted mostly of manure applied as a mulch during the dormant season and subsequently cultivated into the interbed spaces, the finer material being left between the plants.

In Virginia the culture has been entirely upon a coarse sandy loam overlying a heavy clay at variable depths. The area cultivated was originally swamp land reclaimed by being filled in from the dredging of the Potomac River. The land close to the end of the discharge pipe where the coarser material settled has been used for these cultures. The soil here is naturally very poor; consequently rather large applications of fertilizers have been considered necessary. Cover crops, stable manure, and chemicals have been used as has been deemed necessary, with no effort made at a quantitative record.

The only test of the value of lime was made at Chico, Calif. One year a heavy application of ground limestone was made across the plots six months in advance of the planting. An application of one-half ton to 100 feet square was broadcast and disked in without visible effect upon the growth of the plants.

THE DORMANT SEASON

The California location, with its very dry, hot condition from June to September, seems to be on the whole the better suited to the crop, but the floor of the Sacramento Valley at Chico could be improved upon for the plants. Although reveling in a good drying and baking during the summer, they find conditions here too severe for their best interests. Not only are they shallow rooted, but the tips of the corms are right at the surface when the season's growth is complete. This, coupled with the fact that it has seemed wise to hoe off and burn the tops as soon as dead, leaves the crowns exposed altogether too much; consequently a summer mulch has been resorted to. One season when this was neglected very severe losses took place owing to an actual killing of the main growing points of the corms. The lateral buds, however, which were only slightly covered, were not so severely injured.

Mulching material may vary. All that seems necessary is to protect the shallow corms from the sun's rays. Straw, strawy manure, and sheep manure fresh from the pens have been employed, all with good results. A furrow turned over the narrow beds at the beginning of the dormant season is fully as efficacious as anything. In autumn the soil is gradually worked back into the furrow, thus allowing the plants to come through and at the same time assisting in keeping down weeds.

HARVESTING AND STORING THE CORMS

The method of harvesting will depend to a large degree upon the planting. The narrow bed used in California on the heavy bakey soil is most satisfactorily dug with a spading fork or a potato hook. Attention should be called here to the practice of summer storage in the soil in this situation. If the digging took place as the plants died down, the soil would not be so hard. When, however, digging is delayed until nearly the end of the dry season, it is necessary to irrigate before digging. When this is done the corms should be lifted and dried off right away, because growth starts very quickly when water is applied at this season.

In the Virginia location the corms are dug and stored each year at the beginning of the dormant season. On the more friable soils of the Arlington farm, where the Dutch bed system is practiced, the conventional short-handled light spade, about 24 inches over all, is the most serviceable tool, the digger working on his knees on the dug-over space. The Dutch bed can also be dug very conveniently with a spading fork, the corms being taken out from the dug-over space. The spading fork has a decided advantage in the digging of some of the varieties which produce long rootstocks, because the rows have been largely obliterated, which makes it difficult to use a spade without cutting the corms.

The corms are shaken out by hand, as dug, to get rid of most of the soil adhering to them, and are placed in containers and removed to storage without delay. Under no consideration should they be exposed to the sun, for although they stand intense heat during the summer, the uncovered corms can not endure direct sunlight for any length of time. The surface moisture is dried off the corms in 24

to 48 hours, and they are then spread thinly on the conventional bulb trays and stored in a brick half-basement where the light is decidedly subdued.

The storage space should be dry and preferably cool. The greatest difficulty experienced in the Virginia location has been to delay growth in late autumn. The storage space here is well adapted to both tulips and daffodils after they are well dried, but it is hardly dry enough for these stocks, which must be held in storage much later in the season. Always more or less root and often top growth has occurred before the plants have been set out. This, however, has apparently not been pronounced enough to interfere seriously with the production of corms.

METHODS OF HANDLING CONTRASTED

In California (fig. 4) the crop has been handled on a biennial basis. Digging seems to be most satisfactorily done every second year. On account of the necessity of economizing the writers' time, the stocks are dug and put back again immediately. They are never out of the ground more than two or three days, and in normal seasons the digging is done close to the end of their dormant period.

At the Arlington farm in Virginia, on the contrary, digging is done every year in late June or early July, as soon as the plants die down. In this situation the handling is very comparable with that of tulips, except that the digging occurs a little later and the planting decidedly later in the season.

The reason for this difference in the handling of the iris in the two situations is found in the necessity of having the plants quite dry during their dormant season. If this is not accomplished they soon run out. Under conditions of more or less constant moisture in summer the corms are likely to rot, or when this does not occur they get too much fall growth, resulting in freezing injury during the winter. The aim should be, therefore, in the eastern United States or a similar climate, (1) to keep the corms dry on the shelves during the dormant season, and (2) to delay the planting in autumn so that there will be a minimum of top growth before winter sets in. The delaying of top growth is accomplished by avoiding dampness in storage, preventing excessive circulation of atmosphere, and reducing the temperatures as much as possible without actual refrigeration. In these investigations a brick half-basement has been used for storage.

In the California situation no storage at all was used. The corms are worked over in the shade of trees and put back into the ground within a day or two.

IDEAL CONDITIONS

The natural habitat of the species of the Regelia and Oncocyclus groups of iris is in the elevated regions of Asia Minor and combines warm, dry summers, rather moderate but not warm winters, and a good supply of moisture during the growing season from October to June. Portions of California most nearly duplicate these conditions.

Success can be had, as has been mentioned, on the valley floor of the interior valleys with a summer mulch, but the situation is not ideal. The culture has been attempted on the coast, but this situa-

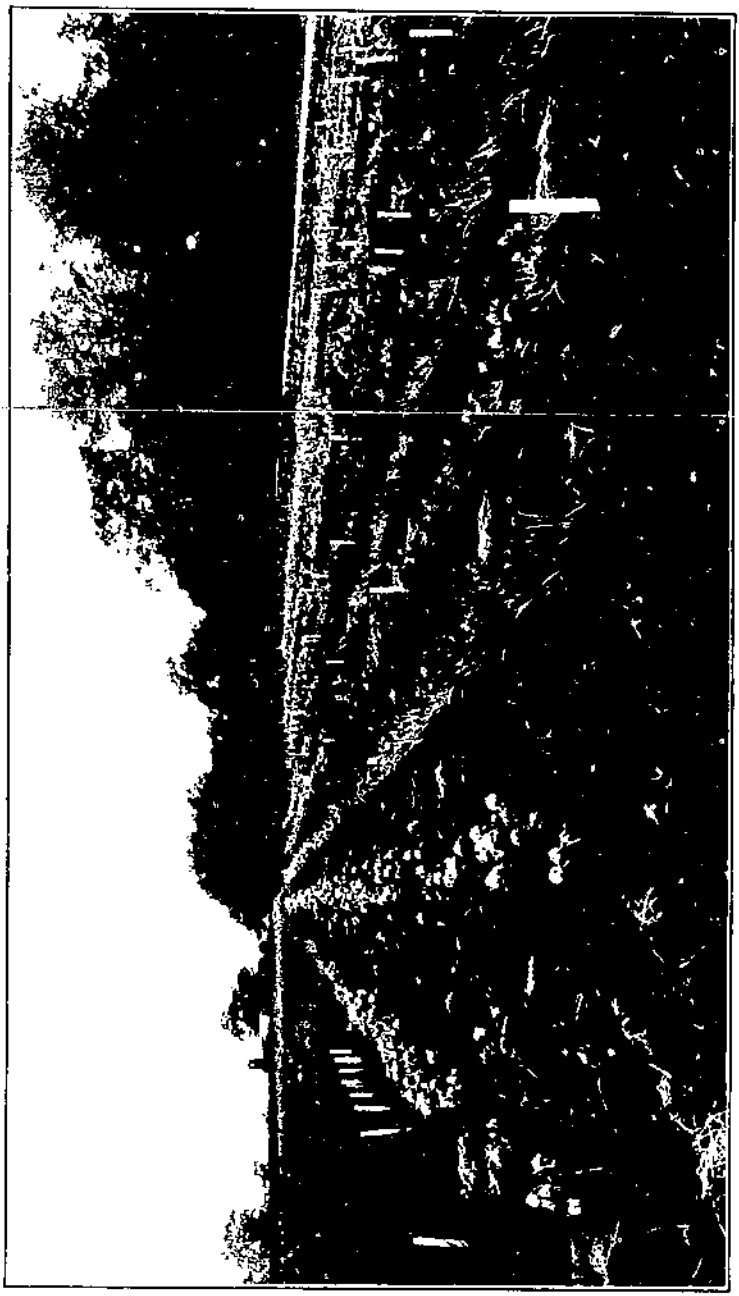

FIG. 4.—Regelio-cyclus iris planting at Chico, Calif.

tion does not seem to be ideal either, rust and spot giving too much trouble in the humidity prevailing there. It is believed that a locality in the mountains east of Chico, Calif., at an elevation of about 3,000 feet, would furnish a condition which would produce better stocks of these irises, provided one or two irrigations were supplied.

The Atlantic Coastal Plain is not suitable without resort to artificial methods. But it is interesting and important to know that by the use of such methods stocks not only can be maintained but actually can be profitably increased and enjoyed with practically the same handling as is usually advised for the common garden tulip. One unqualified success is chronicled by an amateur in southwestern Virginia, where a dozen corms under his care multiplied to a wheelbarrow load in a period of six years.

YIELDS

The better varieties of the Palestine iris hybrids grown at Chico, Calif., under the conditions specified in this bulletin, have increased about three and one-half times at each biennial digging period. It is thought that this does not represent by any means the best that can be done, because the handling and conditions were far from perfect. This point is further treated in another place.

At Arlington accidents to the plantings have prevented reliable counts, but it is believed that fully as good yields can be obtained there as at Chico, although the corms are not so large. They blossom very well, however.

SEED PRODUCTION

The production of seed is exceedingly variable under both Virginia and Pacific coast conditions, but particularly so in California, where, however, the seasons best adapted to growth produce the most seed. Good moisture conditions extending well through May, with less consequent injury from thrips, seem conducive to seed production. In the Virginia location an occasional perfectly developed pod is produced—with great irregularity so far as varieties are concerned—and this has caused the impression that careful fertilization would probably yield good returns, but no definite results have yet been obtained.

CULTURE FROM SEED

It is common knowledge that culture of these plants from seed is somewhat unsatisfactory in this country, and this probably accounts in a measure at least for the lack of attention given them. No new light has been shed upon the problem by these investigations except a confirmation of this already well-established experience. A few seedlings have commonly come up rather promptly, but the percentage has always been low, and the mortality of those that have come up has always been heavy the first year. One peculiarity of these seedlings is the comparatively large number of albinos among them. These have invariably been lost before the end of the first season.

So slow and uncertain in germination are the seeds of these groups of iris that those who work with them commonly plant under such

conditions that the flats or pots can be preserved a long time, even six or eight years, before being discarded. Experiments as to the results of planting before the seeds are dry and also of chemical treatment which will soften the seed coats are necessary.

CULTURE UNDER GLASS

The corms of these hybrid varieties of iris can be potted up for forcing in September and left out of doors in the heeling ground until there is danger of severe freezing weather. Light frosts will do no injury. Inasmuch as growth starts very promptly upon the addition of moisture to the dry corms, the pots and flats should not be buried.

From the heeling ground they can be placed in a cool house, to remain without addition of heat except barely enough to keep out frost until after the New Year, when the temperature may be run up to about 55° F. at night. They will blossom in February, are particularly attractive, and last well.

The species and varieties which have been successfully flowered under glass are Mars, Thetis, Korolkowi, Susiana, Stolonifera, Saturn, Andromache, Saga, Freya, Vera, Jocaste, Psyche, Zwanenburg, Una, Eurydice, and Eucharis.

ENEMIES

At the Arlington farm in Virginia, strange as it may seem, no parasites have been encountered; but on the Pacific coast two insects have been more or less troublesome.

APHIS

The tulip or iris aphid (*Anuraphis tulipae* Boyer) does some injury at times, but it is not difficult to get rid of. It can be exterminated either in storage or in the field by the proper use of the ordinary fresh tobacco products. The corms may be heavily dusted on the trays with plenty of tobacco powder for three or four weeks. If the corms are in small quantities they may be confined in paper bags with plenty of the powder or stems.

The corms used in the California investigations had this aphid on them when imported. They were subjected to a cyanide fumigation at Washington, D. C., which killed a great many, but in the next two or three years the insects developed to such an alarming extent that some of the varieties were nearly killed out. Spraying could not be resorted to, because the insects worked principally under the leaf sheaths where they could not be reached. They were finally eliminated as follows: The tops of the plants were hoed off as soon as mature and burned; a solution of nicotine sulphate 40 per cent, about 1 to 500, was then put on over the rows with sprinkling cans; after this a good dusting of tobacco powder was applied over the rows; then a mulch of old straw manure was put on and left for the summer. The planting has been dug twice since, but no aphids have been seen.

THRIPS

At times a great deal of injury is done by the thrips, and this insect is particularly bad during dry seasons like that of 1924. Even the flowers are attacked, and the leaves and sheaths are so affected that the plants die down prematurely, thus interfering with both the seeding and the development of the corms.

For the control of this insect Theo. D. Urbahns, of the State Department of Agriculture of California, recommends a spray consisting of 1 part 40 per cent nicotine sulphate to 1,000 parts water, to which is added 5 parts of a light miscible oil. The first application should be made early and succeeding ones in accordance with apparent need.

VARIABILITY OF SUCCESS

During the progress of these investigations the department has worked with about 50 varieties of irises in the groups under consideration. Some have behaved poorly; some have failed entirely. It is felt, however, that those forms which have not succeeded are not to be condemned for all California conditions, even though they are not given in the accompanying list. As an illustration might be mentioned the species *Iris susiana*, for which conditions have been too hot and dry; indeed, it is but seldom that it is seen doing satisfactorily. On the coast it rusts; in the open in the interior it suffers from heat and drought; but with abundant moisture and filtered shade in the Sacramento Valley it develops perfectly. Charon is a hybrid variety which in these experiments has failed entirely.

As with imported bulbs and corms generally, there is a great variation in the vigor and the general performance of stocks from different foreign growers, some seeming to be very much stronger than others.

MOST SUCCESSFUL VARIETIES

Not only has there been a great variation in the degree of success attained with the different varieties, but also there has been a variation in the behavior of single varieties from year to year, due mainly, it has seemed, to moisture conditions. On the whole, the appended list contains those varieties which have been the most successful over the period of the experiments.

Artemis.
Beatrix.
Dido (fig. 3, C).
Eucharis.
Eurydice.
Eva.
Flecta.
Freya.
Hebe.
Hecate.
Hera (fig. 3, D).
Hoogiana.
Isis.
Jocaste.
Kolyados.
Korolkowi varieties.
Mars.
Parthenope.
Psyche (fig. 3, F).
Saga.
Saturn (fig. 3, E).
Stolonifera varieties.
Thetis.
Una.
Vaga.
Vera.

Besides these should be listed the bearded iris hybrids Dilkush, Ipball, Nazarin, and Zwanenburg, which are evergreen even under the three or four months of intensely hot, dry weather of the Sacramento Valley. They are strong growers and succeed well under a great variety of conditions. They last longer without annual digging in regions having humid summers, but they finally run out and therefore do best when lifted each year in midsummer.

THE NEED

What is really needed in this situation is more attention to the Palestine hybrids by American iris fanciers.[2] It is considered that there is in these groups as great an opportunity for accomplishment as exists in any group of the genus Iris—unless it be the bulbous group, which, however, is not under consideration here. If a portion of the energy that is devoted to the improvement of the rhizomatous sections of the genus were diverted here, there is little doubt that vast accomplishments would result not only in giving us a nomenclature which would be satisfactory but also in the production of seedlings better adapted to American conditions than are those originated abroad.

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[2] The Department of Agriculture does not have stocks of these varieties for distribution. A few growers have a limited supply, but the main supply must come from the Netherlands and England under special permit from the Federal Horticultural Board, Washington, D. C.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

October 10, 1927

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