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Edited by

Hamilton P. Traub

Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY  
Box 2398, Stanford, California

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## FOREWORD

PLANT LIFE for 1947, a general edition, is devoted to gladiolus and the Netherlands Bulb Industry. We are indebted to W. M. James for a stimulating article on the winter- and spring-flowering *Gladiolus* species, a subject of major interest to gladiolus breeders. The illustrations are especially noteworthy. The readers will be much interested in the two historical articles on the Dutch Bulb Industry contributed by our good friends, Dr. A. J. Verhage and J. F. Ch. Dix. These articles will fill in the knowledge gap left by the Nazi blackout from 1940 to 1945.

Hamilton P. Traub  
Harold N. Moldenke

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When taking photographs of amaryllids, an effort should be made to include the whole plant—*stem*, if any, *leaves*, *scape* and *flowers*. Separate views of the *bulb* and *roots* are also valuable in some cases. These remarks do not apply to cut-flowers.

NOTES ON WINTER- AND SPRING-FLOWERING  
GLADIOLUS SPECIESW. M. JAMES, *California*

A review of the origin and history of the present *Gladiolus* hybrids; a survey of the findings in the genetics and cytology of the genus, combined with the description of some of the lesser known species furnishes the foundation for an inquiry into possible future developments. Although the genus is best known by the modern hybrids, their culture and management will not be discussed to any extent because it has been so well described and is easily available in a variety of publications.

There are many definitions of the term species (5), no one of which is entirely satisfactory. Linnaeus, in developing the present system of plant nomenclature considered the species as a static unit. Early taxonomy was developed solely with this conception and only on a morphological basis. With the development of genetics and cytology there was a definite tendency to include physiological and geographical characteristics in determining plant classification. Today when defining a species, many taxonomists emphasize genetical more than they do morphological characteristics.

A detailed description of the mechanics of heredity may be found in any book on genetics. The chromosome count has proven very helpful in the study of *Gladiolus* species and has been especially useful in hybridizing.

In 1935 Dr. Ronald Bamford (3a and 3b) published the chromosome number of thirty-five species, eight species hybrids, twenty-one winter flowering hybrids and sixty summer flowering commercial varieties. This confirmed the few previous reports and showed the genus to have a heteroploid nature with a basic chromosome number of fifteen. He shows that: the South African species are diploid with thirty chromosomes; the tropical and East African are diploid with thirty chromosomes, tetraploid with sixty chromosomes or hexaploid with ninety; and that the Eur-Asian species are polyploid with from ninety to one hundred eighty chromosomes. The winter flowering commercial varieties are diploids, triploids or tetraploids and the summer flowering kinds examined were all tetraploids.

There are some two hundred species in the genus (1). A few occur in Asia Minor, the Mediterranean region and tropical Africa, with the majority in South Africa. The Eur-Asian forms were known to the Greeks and Romans. Cultivation of three of these, namely *G. segetum* Linn., *G. communis* Linn., and *G. byzantinus* Linn., was started in Europe during the Middle Ages. These three and forms selected from them were the only gladiolus grown in gardens until the beginning of the Eighteenth Century. About that time some of the South African species were sent back from the Cape Peninsula by the

early English and Dutch settlers. The scented ones were cultivated as much for that quality as for the beauty of their flowers.

However, they did not receive much attention for improvement of the genus by hybridization did not start until the beginning of the Nineteenth Century. Although some of the records may be questionable, apparently twenty-four species have been used to date in the development of our present horticultural forms (6). It is interesting to note that these are all natives of Africa.

The first hybrids on record were raised by Dean Wm. Herbert, who started working with them about 1807 and continued until his death in 1847. His work was scientific rather than horticultural and none of his hybrids have continued to the present time nor were they used in developing the modern varieties.

*Gladiolus Colvillei* was the first commercial hybrid and was introduced by the originator, Mr. Colville of Chelsea, England, in 1823. Although there is some uncertainty and a little controversy, the parents were probably *G. tristis* var. *concolor* and *G. cardinalis* (Plate 1). Both of these species are diploids with thirty chromosomes. The cross proved somewhat variable, one sport being described in 1860. In 1872 *G. Colvillei* var. *albus*, with colored anthers, appeared simultaneously in two Dutch nurseries. Later a variety of this appeared with white anthers.

*Gladolius ramosus* was probably the next hybrid of any importance. The date of introduction is unknown and there is considerable uncertainty as to its origin. However, it is known to have been in cultivation in England in 1835. There is a possibility that it was a hybrid between *G. cardinalis* and *G. oppositiflorus*, although there is considerable evidence that *G. oppositiflorus* was not known until later and possibly *G. blandus* was the other parent. This cross was a distinct advance and was used for hybridizing and cultivated extensively for many years but these hybrids are not being grown to any extent at the present time.

In 1839 a seedling obtained from Colville's Nursery bloomed and was named *G. insignis*. Its parentage is unknown. These three hybrids are classed as early-flowering because they bloom only in the spring. The first two are diploids with thirty chromosomes and the third one is probably the same.

All three of these and their hybrids were extensively cultivated by the middle of the Nineteenth Century. Although their popularity declined after that, they are still grown to some extent commercially. They do not have any connection with the present horticultural forms of summer flowering gladolius.

In 1837 a new line of development of the gladolius was begun. It proved to be the foundation for the modern commercial forms. There is some doubt as to the parentage and origin of the first individual in this group. In 1841 Louis van Houtte introduced *G. gandavensis* and it is generally believed that it was the product of a cross between *G. psittacinus* and *G. oppositiflorus*. This original hybrid has been reported as still being grown as late as 1916 at Verrieres, in Paris.





Plate 1

*Gladiolus cardinalis elegans*



Plate 2

*Gladiolus alatus*

In turn other hybrids were introduced in Europe and America as *G. Lemoinei*, *G. nancianus*, *G. Childsii*, *G. Kelwayi*, Groff's Hybrids and *G. Kunderdi*. These races did not maintain their distinct characteristics because intercrossing was done to such an extent that individual identity was lost and they are all referred to now as the large-flowered hybrids.

In 1902 another distinct development in the modern commercial forms was made by the re-introduction of *G. primulinus*. This Rhodesian species was crossed with the large-flowered forms. These crosses produced considerable diversity because of the great variation in the hybrids, and new forms are still being developed because of the *G. primulinus* addition.

The parents of the modern hybrids were diploid (*G. oppositiflorus* with thirty chromosomes) and hexaploid (*G. psittacinus* with ninety chromosomes) and the result of their union was a tetraploid with sixty chromosomes. And *G. primulinus* is also a tetraploid, which probably explains the ease with which new hybrids were obtained by its use.

It is interesting to note that the parents of the so-called early-flowering forms are from the Cape District in South Africa and are winter or spring blooming. The parents of the present popular commercial varieties are from the eastern part of South Africa and from Tropical Africa. They bloom in summer or fall. And it is also interesting that so few of the known species have been used to produce the remarkable advance and variety shown in our modern hybrids. The variation in color, form, size, and fragrance of the other South African species makes them extremely interesting to work with. Even the foliage of some species varies greatly from the familiar "sword" shape of the garden hybrids.

The fragrance varies in kind and intensity. Because of the differences between people in the sense of smell (4), it is convenient to classify these kinds of fragrance as sweet, such as we find in lilliums, hyacinths, freesias, etc., or spicy, such as that found in pinks and carnations.

In the 1930's the writer grew several of these lesser known South African species to flowering size and was able to do a little hybridizing with them. The brief descriptions which follow are by the writer and are from observations made from those plants grown in Santa Barbara.

*G. alatus* Linn. (Plate 2) is a jaunty little plant known as Kalkoentje (Little Rooster) in the Cape District. The flowers are not very big, but appear large in comparison to the rest of the plant. The stems are six to twelve inches tall with from four to six flowers. The flowers are an orange red, sometimes called flame, and have a very different shape than do those of the commercial forms. There are three broad upper segments and three narrow lower segments. The middle upper segment is at first fully hooded, later reflexing at its apex. These appear bright with their "flame" color. The three longer, ribbon-like lower segments turn downwards and are greenish yellow, except for their "flame" colored tips. *G. alatus* extends from virtually the Cape

itself to the dry lands immediately south of the Orange River. The color varies considerably in different localities from the bright "flame" of the type to a so-called pink which is actually more of an old rose. The flower has a delightful fragrance resembling that of apple blossoms if a little imagination is used. It is variable in strength in individual plants and not perceptible to many people. It blooms in late spring and is very attractive in table arrangements.

*G. brevifolius* Jacquin is rather common in the southwest of the Cape Province. Flowers are small, vary in color from pink to lilac and are very sweetly scented. One of the few kinds which bloom in early fall with the foliage appearing later on.



Fig. 1. *Gladiolus callistus*

*G. callistus* F. Bolus (Fig. 1) has a decidedly distinct form of flower. The flower stem is two to four feet long, occasionally with one or two branches and with nine to twelve flowers which vary in color from white to light lavender. The general appearance of the flower is cup-shaped, about two and one-half inches in diameter growing partially erect on the stem. The upper segment is slightly wider and longer than the lateral segments. The three lower segments are about the

same size and shape as the upper lateral ones. It blooms in spring and is well worth growing. The "sweet" fragrance of the flowers is not strong enough to be an asset.

*G. carmineus* C. H. Wright, is another one flowering in the fall with foliage appearing later. The blooms are large in comparison with the rest of the plant and are a bright, intense pink in color. There are generally five to six blossoms on an eighteen inch stem.

*G. crassifolius* Baker is a summer blooming species found mostly on the eastern side of South Africa where there are summer rains and more or less winter drought. Interesting principally because of its habit of growth. The five or six leaves are very crowded, rigid, and one and one-half to two feet long. The flower stem is the same length with many rather small, more or less campanulate, reddish flowers which vary in color considerably.

*G. gracilis* Jacquin (Plate 3) is a sweet scented dainty species blooming in the winter. The two or three leaves are grass-like, twelve inches long and not prominent. The three to six flowers are borne on a stem sixteen to twenty-four inches long. They are somewhat narrowly trumpet shaped and vary in color from a yellowish form with little blue to a bluish form with little yellow. Found in Cape Colony.

*G. grandis* Thunberg is an early summer flowering species rather common in the Cape Peninsula. The few leaves are twelve to eighteen inches long, slender and grass-like in appearance. The attractive flowers are comparatively large, broadly funnel shaped, and brownish in appearance. They are borne three to four on a slender stem eighteen to thirty inches long and have a strong, spicy fragrance at night.

Night fragrance is not exactly correct as this scent is soon noticeable if the flowers are cut any time of day and placed in a darkened room. Dr. McLean (8) reports that Dr. Bogert has determined that this odor is produced by an unstable cinnamic aldehyde, or a closely related compound. This aldehyde is easily decomposed by light containing ultra-violet rays.

*G. hirsutus* Ker-Gawler has several varieties. It is found in the southwestern part of the Cape Colonies. Not particularly attractive in itself, but the plant seems vigorous. The twelve to twenty inch flower stem is hairy throughout its length. The color varies somewhat, but is mostly a bright pink a little on the cerise side. It has a very strong, pleasant sweet fragrance.

*G. odoratus* L. Bolus blooms in early autumn before the foliage develops. The flowers have a brownish appearance at a little distance. Actually there are many small reddish purple dots on a dull yellow background. There are four to fourteen flowers on a twelve to sixteen inch stem. The spicy fragrance is continuous night and day and is the strongest encountered by the writer.

*G. recurvus* Linn. (Plate 4) is fairly common throughout the Cape Peninsula and varies in color from a yellowish white to a clear pale blue. It has a delightful, strong sweet fragrance. Stems are twelve

to twenty-four inches long with from two to six flowers. The bluer forms are very attractive. Blooms in early spring.

*G. splendens* Baker is a native of Cape Province and is found in the mountains at about 1600 feet altitude. The corm is very small, almost non-existent, with many wiry roots and it seldom makes cormlets or offsets. The leaves are many in a dense tuft and are about twenty four inches long. The flowers are large, broadly trumpet shaped and have a bright scarlet-red color. It blooms in late summer and is exceptionally attractive.



Fig. 2. *Gladiolus tristis* as a cut flower.

*G. tristis* Linn. (Plate 5, and Figs. 2 & 3) and *G. tristis* var. *concolor* (Baker) have been grown in Santa Barbara, California, and vicinity for many years and also have been grown in Great Britain since the middle of the eighteenth century. It sometimes becomes almost naturalized in a garden which is not cultivated too intensively. The flowers are creamy white with varying amounts of brownish or



Plate 3

*Gladiolus gracilis*



Plate 4

*Gladiolus recurvus*



purplish markings. The variety *concolor* has no markings. Both have four to eight flowers on two to three foot stems. The leaves are grass-like in appearance and have a cross section resembling a Moline Cross (Fig. 3). The strong, spicy night fragrance is very agreeable. It is almost uncanny the way the fragrance will gradually permeate several rooms in a dwelling when a bunch of flowers are brought in towards evening. *G. tristis* and the variety *concolor* are rather common in the southern part of the Cape Province. There is a yellow form in the mountains farther east.

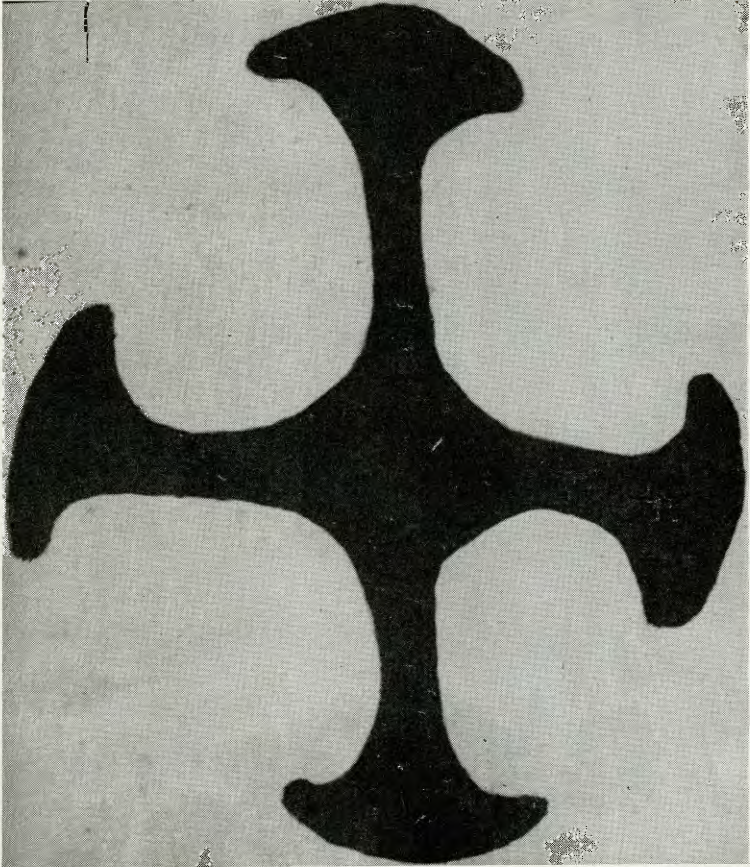


Fig. 3. *Gladiolus tristis*, cross-section of leaf; original was  $\frac{1}{4}$  to  $\frac{3}{8}$  inch in diameter.

*G. viperatus* Ker-Gawler is probably a synonym of *G. orchidiflorus* Andr. It is found on the west side of South Africa from the Cape to Namaqualand. Known locally as the green Kalkoentje. It is shaped like *G. alatus*, but is taller. Has greenish blooms marked brown and a strong sweet fragrance.



*Gladiolus tristis* as grown in California.

Plate 5

*G. Watermayeri* L. Bolus is another of the smaller gladiolus with a flower shaped like that of *G. alatus*. Blooms in early spring with a strong sweet fragrance. The color is cream or light yellow with crimson veining.

*G. watsonius* Thun. (2) seems to have been a headache for the taxonomists, as it has also been known under five other names: *G. revolutus*, *G. recurvus*, *G. praecox*, *Antholyza revoluta* and *Homogiosum Muttoni*. The writer has not determined the preferred name, so will use the term *G. watsonius* because the seed was received under that name. The center of the three upper segments is definitely hooded. The two lateral upper segments and the central lower segment are about the same size and are arranged with about equal angles between them. The two lateral lower segments are smaller than the upper center one and extend sideways. The flower has a triangular appearance. This shape and a bright orange-scarlet self color make the flower very attractive. It is found in Cape Colony.

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These fourteen species are less than half, and the most interesting and unusual, of those flowered and observed by the writer. All of them were found to be diploids with thirty chromosomes by Dr. Bamford (3a and 3b). He has pretty well established the chromosome counts for the genus *Gladiolus*. If the entire genus was re-examined on the basis of a broader conception of what constitutes a species, there might be some changes. The taxonomists are uncertain about *G. watsonius* on a morphological basis inasmuch as it has been known under several names. *G. alatus* has several color variations which are found in separate localities with one carrying a varietal name. *G. Watermayeri* is similar to *G. alatus* in many respects and they have the same chromosome number. Isn't it possible that *G. alatus* and its color forms and *G. Watermayeri* are only geographical variations of the same species? *G. tristis* has a variety *concolor* and a yellow form. And there are others which may be only geographical forms instead of separate species or named varieties as at present.

The brief description of these winter and spring flowering species was intended to point out several characteristics it would be desirable to incorporate in the summer flowering horticultural forms. This will not be easy. In the first place some of those with the most desirable characteristics proved to be very difficult to grow in Santa Barbara. The wrong pH may have been partly responsible. Most of these species are from lime free districts and both the water and soil have a high lime content in Santa Barbara. All are intolerant of poor drainage, although some (*G. cardinalis* and *G. primulinus*) grow under the edge of waterfalls and *G. tristis* grows along stream banks. All seem to be very susceptible to *Bacterium marginatum*. This was controlled very well by soaking in a solution of bichloride of mercury (1 ounce to 5 gallons of water). In using this disinfectant it is well to remember that protein and many kinds of dirt will precipitate or inactivate it and more salts must be added to the solution, after it has been used, to bring it up to proper strength or a fresh solution used for each group

of corms treated. The organic mercury compounds, such as Semesan, are just as effective when properly applied. However, the organic forms are held in suspension rather than in solution and are not very practical unless all husks are removed from the corms and the mixture kept agitated during the treatment. Four hours is probably sufficient. Up to twelve hours in the solution did no harm. [*Mercury compounds are poisonous and due caution should be exercised in handling them.*]

They will cross with the summer-flowering tetraploids, but the result is a triploid and for practical purposes is sterile (Plates 6 and 7). Dr. Bamford has been able to make certain crosses with the triploids, but it generally took many attempts and then he had considerable difficulty germinating the seeds resulting from these crosses.

The reported origin of the summer flowering horticultural forms was a hexaploid-diploid cross between *G. psittacinus* and *G. cardinalis* or *G. oppositiflorus*. It is probable that this could be repeated with other diploids, but there are several difficulties involved. Getting the flowers in bloom at the same time is very difficult with some of the species. *G. psittacinus* blooms only in the fall and most of the diploid species mentioned bloom in late winter and spring. Several storage methods tried would not keep the pollen alive long enough to be of any use. By holding the corms in cold storage and then growing them under glass where temperature, light and moisture could be kept under control, it should not be too difficult to get them in bloom at or near the same time.

Sporadic attempts to add the fragrance of some of the species to the garden forms have proved discouraging. *G. tristis* crosses with them readily, but the resulting hybrids are sterile from a practical viewpoint and are always scentless.

Some one hundred years ago Dean Herbert crossed *G. tristis* and *G. recurvus*. The resulting hybrids had a slightly modified *tristis* form and only the *recurvus* fragrance. He called this cross *fragrans*. It was propagated for some time, but eventually disappeared.

Starting in 1925, Dr. Forman T. McLean made this same cross (9, 10). Extensive work with hybrids F-1, F-2 and a backcross F-1 X *tristis* gave some clues to the problems involved and a definite indication of the genetic principles of the inheritance of fragrance in these two species. Studies of some 2200 individuals indicated that the *recurvus* fragrance was dominant and dependent on two factors, either or both of which may be heterozygous and that the *tristis* fragrance is recessive and also dependent on two factors, one of which must be homozygous while the other may be heterozygous providing the *recurvus* fragrance is not present.

All species crosses made with *tristis* by the writer were without the *tristis* night fragrance in the first generation. An F-2 generation of *tristis* X *callistus* had one plant with light lavender flowers shaped like those of *tristis* and with the strong night fragrance of *tristis*. *G. tristis* X *G. watsonius* had very little *tristis* fragrance even in the F-2 generation. However this second generation did produce a few plants with



Plate 6

*Gladiolus tristis* X *Senorita* (triploid)



*Gladiolus alatus* X *Sarabaud* (Triploid); flowers about 2 inches across; color similar to that of *Sarabaud*.

flowers the shape and size of *tristis* that were a bright orange-scarlet self color. Even though there was no fragrance, the flowers were decidedly attractive. *G. hirsutus* carried its fragrance strongly in the F-1 generation, although little was accomplished with this cross because weather conditions at blooming time made pollinating and seed growing almost impossible. Neither *G. alatus* nor *G. Watermeyeri* showed any of their fragrance in the F-1 generation of several crosses. *G. viperatus* with a strong day fragrance gave similar results.

Although the winter and spring flowering species cross readily, it is better to grow them under glass for hybridizing. The species just discussed were all grown out of doors in the open ground and many a cross could not be made because of foggy or rainy weather. And many a seed pod which was growing nicely when first examined would be a soggy mass a few days later because of damp weather. And all attempts to mature the seed by cutting the stem after the ovary had started development and putting it in water under cover were failures.

The best approach to developing fragrance in the garden forms would probably be to produce a hybrid with a dominant fragrance from the fragrant diploid species and then change it to a tetraploid by crossing with a hexaploid. Enough work along this line has already been done and recorded to indicate some of the difficulties which would be encountered and the methods most likely to succeed.

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## THE DUTCH BULB INDUSTRY, 1940 TO 1945, AND ITS PROSPECTS

DR. A. J. VERHAGE, *President*  
*General Bulbgrowers' Society of Holland*

When in 1939 the war between England and Germany broke out, the Dutch Bulb Industry still was in a difficult position. The years of crisis after 1929 had considerably weakened the position of the Industry but in the years prior to the war it was on the road to recovery. This is evident, indeed, from the fact that in 1930 the acreage in the Netherlands planted to bulbs had increased to about 23,000 acres, and the export value amounted to about f. 46,400,000. Soon there was an over-production, and in 1933 a culture restriction was introduced which reduced the acreage to about 17,000 acres. This crisis clearly was due to the fact that in 1932 the export value of bulbs from the Netherlands had decreased to f. 19,200,000. After that the export as well as the export value constantly increased. In 1938, the last normal year before the war, upwards of 52,000 tons of bulbs were exported, valued at about f. 31,300,000.

Table 1. Export of Dutch bulbs from the Netherlands, 1938

Countries	Weight in Kilograms (Kgr.)	Value in Dutch Guilders
United States of America, Canada, New Foundland, Cuba, Mexico and Central America .....	8.225.645	5.076.687
United Kingdom, Eire, Gibraltar, etc. ....	28.278.862	16.725.502
Germany, Austria, Hungary, Czechoslo- vakia .....	4.325.826	2.674.313
France, Belgium and Luxemburg, Switzer- land, Italy, Spain, Portugal, Rouman- ia, Bulgaria, Greece, Turkey, Yugo- Slavia, French Morocco and Tangier, Algeria, Tunisia .....	4.186.549	2.461.391
Soviet-Russia, Poland with Dantzic, Es- thonia, Lettonia, Lithuania and Memel	352.037	220.981
Sweden, Norway, Denmark, Iceland, Fin- land .....	5.882.520	3.615.743
Asia, Africa, South America, Australia ....	917.032	550.507
Total .....	52.168.471	31.326.124

Examining the export figures (summary in table 1) it appears that Great Britain has been the principal purchaser of the Dutch bulbs which

need not surprise us as this flower-loving people highly appreciate the beauty of this Dutch product. Great Britain bought in 1938 about 28,000 tons with an export value of about f. 16,500,000. Other important purchasers were the United States of America who bought about 6,500 tons with a value exceeding f. 4,000,000; Canada with 1,500 tons with a value of about f. 1,000,000; Sweden and the other Scandinavian countries who together purchased approximately 5,900 tons with a value of f. 3,600,000; France, Belgium and Luxemburg, Switzerland and other countries speaking Romance Languages, and the Balkan States who jointly received nearly 4,200 tons with a value near to f. 2,500,000; Germany purchased approximately 3,900 tons in 1938 with a value upwards of f. 2,400,000.

When in 1939 the war between Great Britain and Germany broke out, the shipping season was well under way. Great Britain at once stopped the import of Dutch bulbs. This was considered unavoidable in connection with an effective war effort. In response to the export difficulties the Dutch Government in the autumn of 1939 decided to decrease the acreage planted to hyacinths and tulips.

When on the 10th of May, 1940, our country was taken over so treacherously, the bulb Industry had been reduced to a size of about half or  $\frac{2}{3}$  of that in pre-war years. During the war and the German occupation, the situation remained unchanged although the Netherlands authorities in this period of occupation took far-reaching measures to raise the production of food-stuffs to as high a level as possible. That even during this period the acreage planted with bulbs decrease only slightly (7% decrease for daffodils) has been attributed to the fact that bulbs are grown principally in parts of Holland in a special kind of soil that is little suited for the production of food-stuffs. Moreover, the continuation of bulb culture offered the advantage that a number of laborers could be thus employed and so were withdrawn from the German war-machine. This was premeditated. It should be pointed out that this offered the most important opportunity for laborers to "dive" in order to thus withdraw themselves and escape the hard fate of being sent out to be put to work in Germany. This often entailed serious difficulties to the bulb growers individually, but thanks to their organized activity, the resistance could not be broken during the entire duration of the Nazi occupation.

Circumstances during the war were most difficult for the bulb industry. A serious shortage of artificial manure as well as of stable manure prevailed and other materials also were practically unobtainable. Nevertheless, the bulb industry was able to continue although under great difficulties. In the realms of combating diseases and the raising of new varieties, most noteworthy results were obtained in the years of Nazi occupation. When the war was over, it may safely be said that the bulb industry through a compulsory export of its products to Germany (which did not assist in any way the war action) and hard work, despite the dangers of war, came out of the ordeal with a higher quality product.

In the autumn of 1944, when it became obvious that the end of the war was drawing near, it was decided (in concert with the reliable Dutch authorities) to extend the area planted to bulbs—increasing tulips by 30%, and hyacinths and daffodils each by 15%. At that time in our country, shut out from the rest of the World, we were of the opinion that after the war large sales opportunities would present themselves. So, when finally the liberation became a fact, a most optimistic spirit prevailed in the bulb Industry. The disabled state of things in the country made communication with foreign countries difficult and it was not until August before cables from America could be replied to. Bulbs used to be sold abroad by traveling salesmen from the beginning of January to the end of April, and it is comprehensible that the abnormal sales-season, together with the difficulties of communication just before the shipping season, affected disadvantageously the quantities exported. Yet, in 1945, the exporters succeeded in shipping about 4,000 tons of bulbs to America. The most important market, Great Britain, alas, was far below normal. After discussions had been carried on between the British and the Netherlands Ministers of Agriculture concerning the export of bulbs to Great Britain, the British Government granted an import quota for bulbs which led to an export upwards of 4,000 tons to that country.

The prospects for the bulb industry are in great measure connected with the trades' policy which in the near future will be applied in our markets. It has already become evident that our products still are much appreciated in all the countries to which we could ship our bulbs after the war. The policy of fixed quotas which to an important extent is a result of the poverty in Europe, however, sets limits which even the best and most appreciated product cannot overcome. If this policy of fixing quotas which in general is impeding the international nursery trade in Europe will be maintained, the sale of our product will meet with considerable restrictions. Opposite to the European trades' policy is that of America, and that of the countries of the Southern Hemisphere, that also are important for the sale of Dutch bulbs. These countries do not operate on a quota basis.

In the campaign for reopening the markets, the firm intention of the Netherlands Government not to allow any more exports which could lead to a disturbance of the price-level on the markets of the purchasing countries, is playing an important part. The economic life of the Netherlands will be regulated in accordance with a fixed policy and the Bulb industry too will live up to this policy. The measures already taken before the war are being maintained. Then inland minimum-prices were fixed, below which the growers were not allowed to sell. By adding a minimum-margin for exporters-profit, foreign minimum-prices are arrived at. As far as we know, no speculation has occurred under that system, but measures have now been perfected, and it is no longer possible to offer bulbs abroad below the minimum-export prices, to be fixed by the industry as a whole under the approval of the Government.

A number of new measures have been taken to ensure the application of the system, such as the centralized collection of the claims against the foreign customers, and the fixing of minimum export prices also for miscellaneous bulbs. It is evident that these measures will protect the foreign customers against price speculation on their markets and the measures for output restriction will prevent overstocking the foreign markets. It clearly appears from the above that it is the firm will of the Dutch Bulb Industry to follow a new course in its export policy, and that, viewed from the trade angle, few objections can be raised against an import of this commodity that satisfies many needs on the markets. That such needs prevail, we certainly need not make clear to British readers. As early as the first year of our liberation, it became evident that the English public still highly appreciates our products.

During the war, many rumors were spread about the damage caused to the Netherlands bulb farms. It is quite evident now that these rumors were exaggerated, but still it is of interest to consider what damage the Nazi measures for their defence have caused to the bulb cultures. That such damage has occurred is obvious if one realizes that these cultures were situated in or near the periphery of the areas that the Nazis had chosen on which to build their Atlantic "Wall." As a matter of fact, about 700 farms have suffered damage from this construction. The cases of serious damage are fewer than was first reported, but yet many working-plants and buildings were demolished, and many areas have become unusable owing to tank-traps, barbed-wire entanglements, "asparagus" anti-tank, bunkers and similar obstacles. The affected growers for the most part succeeded in removing their bulb cultures to grounds situated somewhat more inland. Although the damage is considerable, it did not affect greatly the production. Abroad it has often been feared that inundations would cause damage to the bulb cultures. The areas utilized, which in general were situated on a relatively higher level, escaped widespread inundations in the western part of Holland, but water was raised constantly higher and higher, and consequently it was feared that our cultures might ultimately be flooded. If the liberation had come a month later, this no doubt would certainly have happened. But the liberation came just in time, not only to prevent mortality from hunger, but also to save the bulb cultures from inundation.

When writing about the awful hunger during the winter of 1944-1945, we may add that in that period tulip bulbs were a much appreciated human food. The surpluses that were taken out of the market at minimum prices were being sold at prices fixed by the Government. Many people owe their life to these tulip bulbs. It should be noted also that even in war time the surpluses were not worthless. During the whole occupation period tulip and crocus bulbs have proved to be a most valuable element for coffee substitutes, and daffodils and hyacinths,

the first after certain pretreatments, constituted a most appreciated forage for our live stock. The following analyses (Table 2) may enable our readers to judge the nutritive value of these bulb products that played such an important role when the scourge of war was upon us.

Table 2. Nutritive values of Dutch bulbs, daffodils, tulips, hyacinths, etc.

Kind of bulb	Proteins	Fatty sub- stances	Carbo- hydrates	Crude fiber	Ash	Mois- ture
	%	%	%	%	%	%
Daffodils	2.5	0.3	29.6	1.8	1.3	64.5
Tulips	3.8	0.2	34.2	1.6	1.0	59.2
Hyacinths	2.4	0.1	24.3	1.0	1.0	71.2
Gladiolus	3.0	0.2	25.4	1.4	1.3	68.7
Crocus	5.2	0.3	42.2	2.5	1.1	48.9
Dutch Iris, mixed						
<i>White Excelsior</i> and						
<i>Imperator</i>	3.9	0.3	28.4	1.8	1.8	63.8
Dutch Iris, <i>Wedgewood</i>	2.6	0.5	30.2	1.3	1.8	63.6
Anemones, mixed	8.2	0.5	65.0	6.1	4.7	15.5

The enemy has now been repulsed again, and although the occupation period has left us with a difficult road ahead, yet we are energetically engaged in the work of restoration. We realize that mistakes that have been made in the past will have to be avoided in the future. For that reason a conscious export policy is being pursued and all measures are being taken to furnish the very best quality bulbs only, and to guarantee their arrival in first class condition. We are counting on the good will of our allied friends to give us the chance to rebuild our country so hard hit during the war.

## DEVELOPMENT OF BULB-CULTURE IN THE NETHERLANDS

J. F. CH. DIX

### DEVELOPMENT OF BULB-CULTURE

The great is born out of the small and so it was with Dutch bulb-culture. When in 1554 Busbequis, the Emperor Ferdinand's ambassador, saw for the first time tulips in flower between Adrianople and Constantinople, he could not have imagined that from these tulips and some other bulbous plants, some centuries later a grand culture and a very important trade of international significance would develop in Holland. Four centuries passed away, but during the first three centuries the bulbs played their part principally in amateur circles. Even in the famous "Tulip Speculation," in the 17th Century, the trade did not make any progress; on the contrary, after that period the trade in tulips declined for a time.

The hyacinths too became known in the 16th Century; the daffodil probably was native to Holland, but these plants also reached their international significance later. Other bulbs and tuberous plants had also assumed commercial importance later. Those, who are acquainted with

modern bulb-culture and know how much knowledge of soils, fertilizers, etc., is required, are not surprised at this. So, in 1850, three centuries after the import of the first tulip bulbs, the planted area did not exceed 300 H. A. (about 750 acres).

However, this rather small area is easily to be explained. At that time the growers applied themselves to the raising of varieties, the more the better, but only in very small quantities. In the case of tulips, the object in view was to raise from the self-colored mother bulbs sports with striped or flamed flowers. The growers then propagated these vegetatively.

In 1860 the planted acreage was about 300 H. A.

In 1900 the planted acreage was about 2,500 H. A.

In 1932 the planted acreage was about 10,300 H. A.

In 1933 the economic crisis made its appearance and the export of the harvested bulbs was no longer possible. The Dutch Government, on request of the growers took drastic action—the cultivated area in tulips, hyacinths and narcissi was greatly reduced,—for daffodils, 50%, for hyacinths and late tulips, 35%, and for early tulips, 20%. With the outbreak of the war in 1939, the area was once more decreased by 50%, except for narcissi.

### BULB EXPORTS

It is of interest to note that the United States of America, Canada, Newfoundland, Cuba and Mexico, imported hyacinths from Holland as indicated below:

In 1934, 14,021,000 bulbs  
 In 1935, 16,563,000 bulbs  
 In 1937, 19,204,000 bulbs  
 In 1938, 18,902,000 bulbs  
 In 1939, 20,725,000 bulbs

For early tulips the quantities were:

In 1934, 19,678,000 bulbs  
 In 1935, 20,480,000 bulbs  
 In 1936, 22,083,000 bulbs  
 In 1937, 21,739,000 bulbs  
 In 1938, 19,707,000 bulbs  
 In 1939, 19,920,000 bulbs

Late tulips, including also Mendel- and Triumph-tulips, were imported in the following quantities:

In 1934, 61,005,000 bulbs  
 In 1935, 66,318,000 bulbs  
 In 1936, 77,269,000 bulbs  
 In 1937, 88,546,000 bulbs  
 In 1938, 90,960,000 bulbs  
 In 1939, 107,010,000 bulbs

Daffodils were imported in the following quantities:

In 1934,	5,373,000	bulbs
In 1935,	6,011,000	bulbs
In 1936,	5,576,000	bulbs
In 1937,	8,812,000	bulbs
In 1938,	6,086,000	bulbs
In 1939,	12,082,000	bulbs

### IMPROVEMENT OF VARIETIES

Already before the war the improvement in varieties was considerable, and as will be shown further on in this article, brilliant results have been obtained in spite of the fact that improvement during this Century was carried on only with great force of will. In the case of tulips, the Mendel and Triumph strains are good examples. In the early part of this Century there was a great lack of good tulips for forcing. There was a limited number of early tulips that would flower early in the season, for instance at Christmas and early in January, but generally the stems were too short for use as cut flowers. Then the hybridists of the firm E. H. Krelage and Son started the crossing of the very early Duc van Tol forcing strain with the long-stemmed richly-colored Darwin tulips. These crossings began in 1909 and in 1915 the first hybrids flowered. They had a longer stem and the coloration of the Darwin tulips. Only later was it possible to be sure that the aim in view was attained—to obtain early-forcing tulips with such long stems that they could be used for cut flowers. The hybrids were named Mendel tulips and several of them could be brought to flower about Christmas and especially about the first half of January. They then had stems from 12—16 inches tall. Another weighty advantage was that the period of forcing was considerably shortened, for good Mendel tulips can be brought to flowering in 20—24 days in a temperature of 60—65° F., and it is proved that two batches of Mendel tulips can be forced in the same time that it takes to force one batch of Darwin tulips.

One great mistake should be noted—in the beginning unselected Mendel tulips were marketed. It is a fact, that even in the best seedlings there are bad sorts, for instance with too weak stems, or with flowers not up to grade. The name Mendel tulips for a time was brought into ill repute in foreign countries. Now that gradually the chaff has been sifted from the wheat, it is proved that among the Mendel tulips there are some very good sorts, which are now in demand everywhere and give the best results to customers.

The Triumph tulips as a matter of fact had a similar history. Probably these originated by the crossing of early tulips with Darwin and Breeder tulips. In the beginning hundreds of varieties were brought into the market. Soon it was obvious that most of them were not suitable for forcing because they were too late and therefore had no advantage over Darwin tulips. Also the growth of the leaves was too heavy and the colors are too sombre. They were however suited to garden culture,

but it was evident that only the very best could be maintained. In the end—of the hundreds of varieties—a very small part was left. The final selections had the best qualities, and these now have a prominent place in the bulb trade.

In the early part of the Century, the Lily-Flowered tulips sprang from the crossing of *Tulipa retroflexa*, *T. elegans* and similar species with Darwin tulips. The flowers have a graceful form, looking very much like a liliium, and the first one distributed, *Sirene*, is still common in culture. The Lily-Flowered tulips have some difficulties in culture, but these too should be overcome in the future.

During the period when these new breeds came into being, the Darwin, Cottage, and Breeder tulips were not neglected. Even before the war improvements had been made. As will be shown further on in this article, the improvements were made due to a determined effort.

Since the early part of the Century daffodil culture was on a very high level, and the improvements in the flowers attained are so beautiful that it is hard to believe that so much beauty can be developed in the open without the shelter of hot-houses.

Also in the case of other subjects, as hyacinths, crocuses, etc., much was accomplished, and when the great war broke out all cultures were on the highest level.

#### BULB-CULTURE DURING THE WAR

Dutch bulb-culture could hardly keep its head above water during the five terrible war years as a consequence of the severe trials imposed by the Germans. It was very difficult to endure these years of oppression, for Dutch bulb-culture, even before the war, had to carry on a sharp struggle for life. In 1933 the economic crisis had shaken the whole international trade to such a degree, including also the bulb trade which depends entirely on export into foreign countries, that many growers pressed the Government for protective measures. High toll-bars were run up, import prohibited, quotas fixed, and in this way the export-amount declined to a critically low level. The cultures were drastically curtailed. Costly sacrifices had to be made by the bulb growers, but Dutch bulb-culture of ancient lineage was saved.

War came and the Netherlands were usurped by the Germans. Buildings and barns were requisitioned, stocks plundered, fortifications constructed in bulb-fields, workmen drafted, and very low minimum prices imposed on the sale of bulbs. By all of these measures bulb-culture was heavily struck. Nations which have not suffered under the stringent yoke of the Germans cannot possibly know what this means. The constant confidence of the Dutch people in the final victory of the Allies was the reason why the hostile occupants were not mighty enough to break the determination and will of the bulb growers. On one side the bulb growers applied themselves hand and soul to the production of food, on the other they were compelled to cultivate tobacco and other crops in order to keep body and soul together. And besides this determined struggle for "to be or not to be," the bulb growers applied themselves with tenacity and "élan" into the improvement of the bulb strains.



## TULIP MUTATIONS, OR "SPORTS"

The improvement of bulbs had already been pursued purposefully and with great zeal for a long time in the Netherlands; in each domain important novelties were won, the new seedlings were critically judged by experts, some forced and similar bulbs grown in the open. In this way it is possible to separate the good from the inferior in a relatively short time and so select a quantity of good varieties.

As for tulips, new varieties were obtained from seeds or from "sports" of existing trade sorts. The latter method is very important, for in most of the cases a sport of a good trade sort is characterized by the same qualities as the mother sort. A good example is the Darwin tulip *Bartigon*, from which a number of good sports have sprung:—the glowing-red *All Bright*, *Campfire*, etc., the pink *Philip Snowdon*, *Prunus*, and others. *Queen of Bartigons*, one of the newest sports with salmon-pink color, is remarkable for in this sport the anthers are of another color, viz., yellow, while those of *Bartigon* are black. *Florex*, also is a magnificent pink sport and *Pink Attraction* too is an exceptional *Bartigon* sport. In foreign countries these sports are much in demand, because it is a fact that *Bartigon* is one of the best tulips for forcing and for the market.

The Darwin tulip *William Pitt* gave a sport with glittering red flowers: *Red Pitt*, which will surely make its way, having the same good qualities as the mother tulip for forcing as well as for the cooling-procedure. The sports of *William Copland* are already known: *Rose Copland*, *Copland Purple*, and the newest, *Copland Rival*, that outshines in pink the *Rose Copland*.

The tulip that undoubtedly has given the greatest number of sports is the Double Early Tulip, *Murillo*. Sports as *Electra*, *Mr. v. d. Hoef*, *Maréchal Niel*, *Oranje Nassau*, *Schoonoord*, *Peach Blossom*, etc., are well known. Less known are *Madame Testout*, a very fine pink; *Wilhelm Kordes*, orange; *Reingold*, deep yellow; *Aga Khan*, orange; *Goya*, bright salmon-orange outside; to mention only some with divergent colors. In pink and lilac there are a great many sports, only a fine red is still to be attained. The total number of *Murillo* sports is estimated at over 500. Such closely-related tulips are very valuable to the growers. They flower at the same time, are nearly all of the same height, qualities that are of much value for planting in pots. The whole lot is called: "Mother *Murillo* and her children."

*White Hawk* and *La Reine* too have many sports and among these such beautifully colored varieties as *Apricot Yellow*, buff yellow slightly tinted red and orange; *Golden Pheasant*, mahogany-red, edged golden yellow; *Orange Hawk*, carmine yellow and orange. All of these have the same good qualities of the "Mother," and are thus of particular usefulness for garden decorating.

Also very important are: *General de Wet*, orange, and *Prince Carnaval*, artistic combination of red and yellow, both sports of *Prince of Austria*. *Ellen Moore*, yellow striped scarlet, is a sport of *Fred Moore*; *Joffre*, a bright yellow, is a sport of *Brilliant Star*. There are many

others, but they are available at present only in small quantities.

All of the above mentioned sports represent changes in color, but the plant is like the mother-sort in all other characters. Another group of sorts excels by taller flowers with almost the same color as the mother-sort, as in *Bartigon max*, *Brilliant Star max*, *Crimson Queen max*, *Princess Elisabeth max*, *Le Nôtre max*, *Vermillon Brillant max*, etc.

A third group also keeps the same color, but the form is quite distinct. We refer to the Parrot tulips. *Blue Parrot* sported from the Darwin tulip, *Bleu Aimable* of the same color, but with much taller and fantastically formed flowers; *Black Parrot* is a sport of the Darwin, *Ph. de Comines*; *Discovery*, of the Darwin, *Princess Elisabeth*; *Gemma*, of *La Reine*; *Gadelan*, of *Sensation*; *Henrik Ibsen*, of the Triumph tulip, *Pluvia d'oro*; *Orange Favourite*, of the Cottage tulip, *Orange King*; *Pierson*, of the Darwin, *Allard Pierson*; *Red Champion*, of the Darwin, *Bartigon*; *Rex*, of the Single Early tulip, *Keizerskroon*; *Sunshine*, of the Cottage tulip, *Bouton d'Or*; *Thérèse*, of the Darwin, *Farncombe Sanders*; *Violet Queen*, of the Breeder tulip, *Opal*. Many others are also being propagated, but the supply is still very small. Thus quite a new assortment of Parrot tulips, great improvements over the older sorts, are ready to enrich gardens.

Still another group of sports is very important because these have different flowering seasons. From the Darwin *Bartigon* came a sport that flowers much earlier, and may be forced about Christmas. It is named *Murillo max*, an earlier flowering sport of *Murillo*, with taller flowers. *Christmas Bartigon*. Such sports originated also from other tulips, for instance, *Early v. d. Hoef*, a very early flowering sport of *Mr. v. d. Hoef*; *Aristan*, an early flowering form of the Double Early tulip, *Triumphator*;

### TULIP HYBRIDIZATION

By means of hybridization many choice new tulips were obtained which will bring about a real revolution as soon as a sufficient stock of them is available. One of the most interesting crossings was that of *Fosteriana Mad. Lefeber* with Darwin tulips. The hybrids have very tall stems like the Darwins and big flowers in the form of the father tulip. The colors are fantastically beautiful, ranging mostly from violet red to vermilion red. Foremost among these is *Holland's Glory* with enormous stems and big brilliant-red flowers. *Lefeber's Favourite* perhaps is somewhat smaller, glowing scarlet-red, but gets closer to the Darwin type. The last was magnificently in flower this year (1947) in the early part of February. We mention only two hybrids, but there are more of them.

Mendel tulips x *Fosteriana* too gave a hopeful result. The flowers are big, the stems solid and the flowering time is somewhat earlier than in the case of the above mentioned crossings. One of the most beautiful hybrids from this crossing is *Red Matador*, with violet-scarlet color. It is beyond doubt that in this strain there is still more to be expected in the near future. *Tulipa Kaufmanniana* and *T. Greigii* have also played a great part in the improvement. Their crossings gave a number of hybrids with flowers formed like *T. Kaufmanniana* and the beautifully spotted leaves of *T. Greigii*. The first hybrids, such as *Gluck*, *Robert Schumann*

and *Vivaldi* are rather well known, but they are surpassed by *Alfred Cortot*, glowfully red, black basis; *Henriette*, white, basis red and black; *Johan Strauss*, white, outside with red; *Josef Kafka*, dark golden-yellow inside, outside bright red with golden-yellow; *Jacques Thibaud*, yellow, outside red; *Shakespeare*, salmon colored; *Sweelinck*, uniform soft yellow, small red blotches at the tip of the petals, etc.

The number of new tulips for garden use is very large, but apart from the above mentioned sports of Single Early and Double Early tulips, nothing in particular needs to be mentioned in these sections. Nevertheless, it will be appropriate to turn our attention to the Single Early tulip, *Adjutant*, with big scarlet-red flowers, which can be forced early. Also to *Bel Ami*, deep rose with white base, that can be brought into the hot-house as early as December 15; *Bellona*, bright yellow, tall solid stem, quite new; *Orange Marvel*, lively deep orange, splendid color; *Oranje Vaan* (*Fred Moore* x *Vermillon Brilliant*) with very warm orange-red color.

Among the Double Early tulips, *Engelenburcht* has come to the front this winter, with pure white flowers and long stems; and also *Hoangho*, bright golden-yellow, with a first quality stem and well shaped flowers.

The Mendel tulips are more and more nearing perfection. *Her Grace*, deep lilac-rose and white, is already known, but every winter it becomes more obvious, that it is a quite distinct and superior tulip also for bedding. *Athleet* ought to have been mentioned among the sports, it is pure white and is a sport of *Weber*. Undoubtedly it is one of the most beautiful white tulips in the last half of January. Without doubt it will soon take the place of *Fred Moore* and like *Gertrude Carlee*, has a distinct salmon-rose color, somewhat brighter than that of the well known Darwin tulip, *Clara Butt*, a tint which certainly will attract attention. *Olaf* has a violet scarlet-red color and is particularly strong. *Orange Wonder* is one of the very finest tulips, also in the open, deep orange-red and orange edged. *Peerless Pink* fascinates by the fine silvery-rose color, the big flowers and strong stems. *Pink Trophy*, deep rose, is in all respects a shiner and can be forced early. *Topscore* is sparkling red, a most beautiful color. *White Grace* is a pure white sport of the already mentioned *Her Grace* with all the good qualities of the mother tulip; and finally *Yellow Gem*, pure yellow, should be noted.

Great improvements have also been obtained in the Triumph group. *Aureol*, for instance, is a magnificent sport of *Elmus* with bright red flowers, orange-yellow edged; *Beator* is a strikingly beautiful pink, with well-shaped flowers. *Bruno Walter* is of quite a different style, bronze-orange, a very distinct color that had not as yet been met with; *Golden Wonder* is no longer so new, but the big deep-yellow colored flowers indeed are a wonder. *Glory of Noordwijk* is deep lilac-rose and white, very strong, a distinct tulip, though the color is somewhat hard. *Nivea*, pure white, is excelling by very big flowers on tall strong stems; it is not easily to be beaten in the second half of February. *Robinia* is dark red and many people regard this tulip as an improvement over the single Early tulip *Couleur Cardinal*, the more so since it grows better and can better be forced. *Patria*, *Red Signal* and *Red Giant* are three brilliant

tulips in violet-red color. The future will show which of the three is the very best, also with respect to garden decoration. *Pax* is pure white and a first class tulip, either for forcing or the open air. *Pierre Monteux* excels by a glowful purple that had not as yet been seen in this group. *Richard Strauss* too has a distinct carmine-red color, and is very fine under artificial light, and also in the field. *Reforma* has a soft yellow color and particularly big flowers. Last we must mention *Wintergold*, pure yellow, somewhat sharp-pointed flowers, but long lasting.

The Double Late tulips are best in the cold hot-house. There the big flowers develop into Peony-like flowers. In this group many improvements have been obtained in the last several years. However, time must show which are the most valuable for general use. In our opinion, the following are most promising: *Granada*, deep rose; *Orange Triumph*, warm orange edged and a sport of *Coxa*; *Pink Fancy*, beautifully shaped, lilac-rose; *Racket*, a red sport of *Eros*; and *Royal Yellow*, a deep yellow sport of *Bouton d'Or*.

The improvements in the Darwin group are enormous, and it is difficult to make a good choice. In doing so, we must consider the grower's ideal in order to select all-purpose varieties that are not only magnificent garden tulips but also have good forcing qualities. Many experiments must be made in order to confirm this, and it is not certain as yet whether all of these new seedlings are all-purpose tulips. However, we are of the opinion that the sorts mentioned below will surely give satisfaction though we are conscious of the possibility that others may also be as good.

*Ace of Spades* is a very dark brown-red tulip, excellent for forcing and of particular value for special purposes of garden decoration. Quite different is *Ambon*, pure yellow, with very strong stems. For shape and bigness of flower one could call it a yellow *Bartigon*. *Aristocrat* is no longer very new now, but has proved its excellent qualities for forcing, and satisfies the demand for garden decoration. The color is soft purplish-violet-rose. *Baden Powell* is a fine bright salmon-red, a tint that satisfies the exacting demands of artificial light as well as sunshine in the open air. *Bismarck*, violet-red is excellent for forcing, but is less to be recommended for the garden. *Capitol*, one of the very best white tulips for forcing, is much to be recommended for garden decoration. The pollen is black. *Dementer*, the strange Darwin tulip that can be forced very early, excels by a reddish-purple color, a tint of great value for particular purposes, such as grave decoration. *Desiree* is one of the most beautifully colored vermilion-red tulips with first class qualities for forcing and garden decoration. *Dorrie Overall* too, light petunia-violet edged lilac-mauve, with big broad flowers on 25 inch stems can easily be forced about February 15, and is a welcome addition to the lilac color section. *Eminent* is a tulip for garden decoration. The enormous flowers are dark old-rose, tinted salmon-rose. The stem is about 20 inches tall. *Jo Warnaar* probably is a sister of *Desiree*. The color is deep scarlet-red and though *Desiree* perhaps is superior for garden decoration, *Jo Warnaar* is better for forcing. It can be in flower in early January. *Juweeltje* is notable for a deep madder-red, when forced, almost orange. It may be flowering

about February 15. *Mamasa* is one of the very best yellow Darwin tulips. The color is dark butter-cup yellow and the flowers are big and solid-shaped. *Neerlandia*, when forced, is pure salmon-rose, in the open air, carmine-rose with a salmon glow. It can be in flower by the end of January. *Nobel* fascinates by a big broad flower with violet-geranium sealing-wax color. The stems are 30 inches tall. For the garden it is a brilliant acquisition. *Paul Richter* also can be in flower about January 15. The color is a wonderfully beautiful geranium sealing-wax red with an orange glow. *Queen of Night*, the blackest tulip, which can be forced in the second half of February, is most valuable for garden decoration. *Rosa v. Lima* has an exceptional color—lively lilac-rose with a narrow salmon colored rose brim and could be regarded as a *William Pitt*, diverging in color. It can be forced into flower in the last part of January. *Scarlet Sensation* has already proved year after year to be a magnificent scarlet-red tulip that can be forced somewhat earlier than *Bartigon*. *Sweet Harmony* is a sport of *Mrs. Grullemans*, but it has a distinct color, suggesting that of the old single Early tulip *Brunhilde*—pure lemon-yellow with ivory-white edge.

In the Breeder and Cottage groups there are numerous novelties that may soon receive more attention, but at this time they are still in the testing stage. We make an exception for the Cottage tulips, *Kleurenpracht* and *Vlammenspel*, both yellow with red flames, and both sports of *Inglescombe Yellow*. They flower very late, and for garden decoration these warm-colored tulips are exceedingly beautiful.

Very valuable selections and hybrids are to be found among the *Tulipa* species, but these have been mentioned above.

#### HYACINTH BREEDING

The propagation of hyacinths is difficult, but it is still more difficult to obtain improvements by breeding methods over the existing varieties that are characterized by rather uniform flowers. It is important above all to obtain varieties with large well-shaped spikes, and that satisfy at the same time the most exacting cultural demands. They must also be suited for preparation methods so that they can be brought into earlier flowering. In spite of the difficulties involved in hyacinth breeding, progress has been made. Some very good varieties have been obtained, such as the pure white *Edelweiss*; the beautiful *Ostara*, blue; and the warm rose *Anna Marie*. In the near future however other fine varieties can be expected in various tints from bright to dark blue, from carmine to scarlet-red, from yellow to orange, from rose-white to very warm rose, etc. During the last couple of years we have seen most promising results that give us grounds for looking to the future development of the hyacinth with optimism.

#### NARCISSUS BREEDING

The modern daffodils are noble in form and rich in color. Formerly daffodils were available only in yellow and white colors, but now there are varieties with orange, or red cups. The Dutch growers however did

not confine themselves to the objective of obtaining orange or red cups, on the contrary, they always had a feeling that the big trumpet *Narcissus* would remain among the favorites. The big trumpets are of special importance for forcing, though even here good colored orange and red cups are playing their part.

By means of scientific experiments, daffodil forcing has been revolutionized. Once one did not expect beautiful daffodils before mid February. Early forcing results were expected from varieties that are inclined by nature to come early into flower. There are trumpet *Narcissus*, for instance, *Magnificence*, that can be flowered as early as the first days of January. With most varieties this is not possible and for this reason it is of interest to mention that scientific experiments with the cooling process made it possible to have flowering daffodils as early as the end of November. Although the superior novelties are numerous, there are not so many real favorites that satisfy the highest requirements for every purpose. Among the yellow trumpet-daffodils, *King Alfred* was for a long time the very best, although a free bloomer it does not come up to the highest mark. Then came *Golden Harvest* with very big flowers, golden yellow and fine form. Because of its large flowers, and free-flowering and early forcing habits, it will gain increasing popularity. *Magnificence* too has excellent qualities; first of all because of its early-flowering habit, and also because of the very beautiful deep yellow color of the flowers. *Rembrandt* could best be called an improved *King Alfred*, and *Insurpassable* is remarkable for exceedingly large flowers. Other novelties offered of late are *Covent Garden*, uniform yellow, fine form—in our opinion a first class flower for the trade. *Decency*, a medium large clear yellow daffodil of perfect form which can be forced rather early. *Godolphin* is already well known and is admired because of the uniform yellow color. *Golden Sunrise* is a good bright yellow daffodil, free-flowering. *John Farquhar* excels by large flowers with a sulphury-yellow perianth and deep yellow trumpet. *Louis Bouwmeester* is one of the darkest yellow daffodils, belonging to the early kinds for forcing. Among the new promising yellow trumpets are: *Flower Carpet*, a very free-flowering rather deep-yellow one, regarded as a great improvement over *King Alfred*. *King Albert*, *Lutine*, *William the Silent* are three closely related varieties with tall, well-formed flowers and rich yellow color. *Mulatti* is distinct lemon-yellow on sulphury-yellow background—an attractive color.

The bicolor-trumpet group too urgently needs improving, for the old kinds as *Glory of Sassenheim*, *Spring Glory*, *Victoria* have some faults. Although it is very difficult to obtain improvements in this group, *Queen of Bicolors* with creamy-white perianth and tall yellow trumpet is a distinct advance, especially with respect to the free-flowering habit. *Bonython* is beautifully shaped, has a bright white perianth and sulphury-yellow trumpet, and to our view is very promising. *Lotta Svard* will probably prove to be a very good bicolor for the trade. It is free-flowering, and the perianth is bright white with golden-yellow trumpet. *Norway* may be a good substitute for *Victoria* if it can hold

up under the exacting cultural tests. *President Lebrun* is a very beautifully-formed bicolor with a bright white perianth, and lemon-yellow trumpet passing to creamy-white. *Patria* has big well-formed flowers with magnificent deep-yellow trumpet.

White trumpet daffodils have always been scarce. The old *Peter Barr* and *Madame de Graaff* have held up their names rather a long time, but after all the flowers did not satisfy the demands that could be required from white daffodils. *Mrs. E. H. Krelage* is of far better quality and is still being cultivated in large quantities. The form of the flower is perfect, but the trumpet is more or less sulphury-yellow. A great improvement is *Beersheba*, pure white and of exceptionally fine shape. *Imperator* has tall flowers, an excellent shape, and a very attractive creamy-white color. *Mount Hood* is a very good white trumpet daffodil, free flowering, and fades to pure white after some days. *Romaine* has very large well-formed flowers that are creamy-white. *Roxane* is older; it makes a good show because of the large flowers. Finally, *Stresa*, with large creamy-white flowers on tall strong stems may be mentioned.

The incomparabilis group could best be divided into two parts—giant-incomparabilis and those with smaller flowers. The giants have the most attraction for the trade. First consideration is given to *Fortune*, with stems as tall as those of the trumpet daffodils and enormous flowers too. The perianth is deep yellow and the very large trumpet-shaped cup is fine orange. A bunch of flowers of this *Narcissus* attracts buyers. During forcing however one has to be careful with high temperatures lest the cup should fade. *Carlton* also has very large flowers on long, strong stems with sulphury-yellow perianth and clear yellow cup. *Monique* is midway between the giants and the smaller flowers, but is in all respects a very beautiful daffodil with white perianth and golden-yellow cup, edged orange. *Scarlet Leader* also is on the midway line, although it has a large flower. It is a brilliant variety with white perianth and bright red cup. *Solario* is a real giant with pure white perianth and large canary-yellow cup. Well-developed flowers of this variety are not inferior in size to those of a bicolor-trumpet. *Sempre Avanti* has large flowers with creamy-yellow perianth and bright orange cup.

Among the incomparabilis with smaller flowers there are many varieties of high standing, as *Aranjuez*, medium large, light yellow perianth, large orange cup, edged red; *Bartizan*, medium size, perianth bright yellow, cup orange red; *Deanna Durbin*, medium size, perianth white, cup light orange; *Edward Buxton*, medium large, light yellow perianth, deep orange cup; *Gold Cresh*, medium size, perianth bright yellow, large orange cup; *Killigrew*, medium size, perianth yellow, cup light orange; *Scarlet Elegance*, medium size, perianth deep yellow, cup deep orange-red, a very fine color.

The newest and most promising incomparabilis is *Flower Record*, exceedingly free-flowering, with white perianth and dark yellow cup, red edged. It is particularly beautiful and excellent for the trade because it is free-flowering. The *Barrii* section is actually surpassed by the incomparabilis. Generally the flowers are smaller. *John Dix*, however,

flowering rather late with bright white perianth and dark red cup, is very much to be recommended for garden decoration. *La Riante* with clear white perianth and rather large flat red cup is recommended for it can be easily forced. *Vergers*, medium large, perianth pure white, deep red cup, is very meritorious and will replace *Firetail*.

In the poeticus section, after *Actaea* and *Sarchedon*, few conspicuous varieties have been offered although there are notable new ones which may be included in the larger assortments.

The Dutch growers have had success in producing double daffodils, especially for forcing. *Texas*, with very large flowers, yellow color, shaded with fiery orange, is one of the best, and will undoubtedly play a great rôle in forcing. *Indian Chief*, also a large-flowered, yellow with orange, and *Mary Copeland*, white with deep orange-red, are very promising. A remarkable novelty, a sport of *Cheerfulness*, with delicate yellow flowers, will come to the foreground in the near future.

Of the poetaz daffodils there are already many, but *Geranium*, with large flowers, pure white with deep orange-red cup and very well-formed umbels is a very good advance. It does not bloom very early but by the end of February one can have magnificent specimens. *Cragford*, of English origin, the stock of which is in Holland, is one of the most interesting varieties that we know. Without cooling we can have magnificent flowers of it at Christmas. This variety can be forced into flower in water. The stock is not very large, but when available *Cragford* will be one of the daffodils most in demand, perhaps it will compete with the "Paperwhites."

*Golden Perfection* is a very large-flowered jonquil hybrid, shiningly golden-yellow in color. *Thalia*, *Moonshine* and *Laurentia*, are extra fine triandrus hybrids, with three to four white flowers to the scape.

#### VARIOUS BULBOUS PLANTS

With reference to other bulbous plants, the Dutch growers can also report progress, either by crossing or by importing species from other countries. For instance, *Acidantha Murielae* was imported from western Abyssinia. It is about 30 inches in height, and on every stalk has several sweetly scented large white flowers with a crimson maroon blotch. The culture is very easy and like that of gladiolus.

COLCHIUM. The meadow saffrons too are enriched with magnificent novelties such as *Lilac Wonder*, uniform violet-mauve, most free-flowering; *Premier*, soft pinkish, mottled mauve, large white center; *The Giant*, dark lilac-mauve with a magnificent white base, rather late; and *Waterlily*, with full double flowers, with a brilliant lilac-mauve color.

CROCUS. The diversity in the large-flowered Crocus has always been very great and the Dutch growers do not rest on their laurels but are trying to produce still better varieties. However, it is very difficult to surpass such fine sorts as *Early Perfection*, violet purple-blue; *Excelsior*, fine lilac-blue; *Niggerboy*, uniform very dark lilac; *Paulus Potter*, very distinct deep magenta; *Remembrance*, purple blue, very large; *Snowstorm*, pure white. In the near future there will be improvements, as



*Jeanne d'Arc*, large-flowered white, and *Cinderella*, purple striped on soft ground. A very distinct *Crocus* is *Vanguard*, soft violet-blue on the outside and sulphur inside; it flowers two to three weeks before the other large-flowered ones, and is a fine garden subject.

New and beautiful varieties have been obtained in the spring-flowering *Crocus* species. *C. chrysanthus* E. Aug. Bowles has nicely-shaped round flowers that are butter-yellow, and bronze-grey outside; *C. Balansae* var. *Zwanenburg* has small round, very dark-orange colored flowers; *C. Tomasianus* var. *Zwanenburg* reminds one of *Vanguard* but in our opinion it is still finer and more free-flowering.

ERANTHIS. A great advance has been made by the introduction of the new *Tabergeni* hybrid with shining golden-yellow flowers. It is much taller than *E. hyemalis* and *E. cicilica*.

FREESIA. Recently numerous magnificent *Freesia* novelties have appeared. Rijnveld's *Golden Yellow* is particularly good. The large flowers are golden yellow with orange blots, and they have stalks reaching, in the glass-house, to the height of 30 to 40 inches. *Caro Carlee*, already in the trade, has large creamy flowers on strong stalks, and it is especially valuable for decorative purposes. *Glorious Victory* is deep yellow with orange and has the shape and lasting qualities of *Buttercup*. *Nieuw Amsterdam* has large, far outstanding flowers, soft lilac-pink with white base. *The Bride*, pure white, is one of the very best of the well known white varieties.

GLADIOLUS. No flower is more popular in summer than the gladiolus and for about 30 years the Dutch growers have applied themselves heart and soul to their improvement. The number of varieties is perplexingly great, and we are considering a few of them briefly. *Alpenklokken*, pure white; *Bellona*, soft yellow, magnificent spikes; *Je Maintiendrai*, glowing-red, unsurpassable color; *Joh. v. Konijnenburg*, nice light garnet-red, unprecedented, fine color; *Leeuwenhorst*, particularly large-flowered, 8 flowers open at the same time, vividly pink colored; *Majuba*, glowing-red with vermilion-red glow; *Mansoer*, dark auburn, enormous flowers; *Marathon*, deep rose, tall, well-formed flowers on long strong stems; *New Europe*, glowing vermilion-red with scarlet glow; *Normandie*, magnificent pink, flowers on long stems; *Paul Rubens*, the most beautiful lilac-purple; *Pink Giant*, soft rose, very large; *Radiance*, distinct warm velvety-scarlet, medium large; *Ravel*, the best lilac-blue with perfectly-shaped flowers on very tall stalks; *Salmon's Glory*, one of the biggest with enormous flowers of pink-white color with a red blotch; *Salmon Joy*, with medium large flowers, exceedingly fine salmon-orange; *Sonja Henie*, white with a large red spot, very large; *Sweet Seventeen*, finest silvery pink, nicely waved flowers; and *Vincent van Gogh*, dark salmon-pink-white and carmine in the throat, with large cups.

IRIS. Especially the Dutch iris have been much improved. Flowers of increased size and fine colors are found in *Alaska*, uniform deep canary-yellow; *Albino*, pure white; *Belle Jaune*, deep golden-yellow; *Bronze Queen*, standards mauve-violet, falls bronze, spotted orange; *Golden Emperor*, dark yellow; *Harmony*, standards pale blue, falls yellow, fine

combination of colors; *Jeanne d'Arc*, the very best creamy-white; *Mauve Queen*, uniform lilac-mauve; *Oranje Vaan*, beautiful orange; *Princess Irene*, the most beautiful variety raised, the standards pure white and the falls deep orange; *Subliem*, bright blue; and *White Trophy*, pure white. There are still other fine varieties, and when these enter the trade, the older ones will be superceded.

LILIUM. Some growers are busy producing good liliium novelties. A number of good ones have already been raised, but the greater part have not as yet been named. There is one exception, *Queen Wilhelmina*, with rather large flowers, white with clear orange center, a color combination never seen before in *Lilium*.

SCILLA. Very important varieties have been obtained, for instance *Scilla sibirica* var. *Spring Beauty*, a very fine form of the old species, with larger flowers and a brighter blue. This Squill is very suitable for wild-gardening and for the rockery, but it can also be forced in February. In that case it forms nice material for pots and baskets. Another outstanding Squill is *S. Tubergeniana* introduced from North Persia, but now growing with success in Holland. The color of the flower is delicate greyish-lilac and there are three or more spikes on each strong bulb; every spike bears many lovely flowers. This Squill is a fine addition for the rockery and wild-gardening.

In the so-called May-flowering scillas, such as *S. campanulata*, very fine novelties have been raised. The flowers of these new-comers are much larger than those of the older varieties, and the spikes are much stronger and bear more flowers. Some of the best are: *Blue Pearl*, amethyst-blue, broad spikers; *Blue Ribbon*, violet-blue with purple tint; *Myosotis*, sky-blue; *Queen of the Pinks*, lovely violet-rose, very large; *Rosabella*, soft lilac-rose, extra; *White Triumphator*, pure white.

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### BRIMBLE'S "FLOWERS AND TREES IN BRITAIN"

HAMILTON P. TRAUB

That the British have reached cultural maturity long ago is evidenced by the general appreciation of ornamental plants in the British Isles. In the past, many fine popular treatises on gardening have appeared in Britain, and now we have the pleasure of reviewing briefly two outstanding companion volumes on "flowers and trees" in Britain,<sup>1</sup> by L. J. F. Brimble, joint Editor of *NATURE* (London) and formerly lecturer in the University of Glasgow and Manchester.

The first volume, "Flowers in Britain," is concerned with ornamental herbaceous plants and shrubs, and the second, "Trees in Britain" treats primarily of trees. By a stroke of genius he has brushed aside the usual rigid and illogical separation between "flowers and trees" and thus has produced two companion volumes that unify the outlook of the ornamental gardener. It is therefore recommended that the two volumes be used together for it is time to realize that "a mere allusion to trees is not enough for the reader who wants a comprehensive view of flowering plants."

The volumes are written in a clear and pleasing style "for anyone who is interested in or wants to know something about flowering plants," including the "structure of plants, their classification, habit and habitats." Mr. Brimble also emphasizes "the part played by plants in folklore and above all their rôle in literature."

Within each volume, Br. Brimble has adopted the sound unifying principle of arranging the plants under their botanical families, and in this connection he has had the inspiration to adopt Dr. Hutchinson's classification (1926, 1934) with some slight exceptions.

The illustrations in the two volumes total no less than 368. In the first there are 18 colored plates, and 167 black and white text figures; in the second, 8 colored plates, 58 black and white plates, and 117 black and white text figures. But the generous quantity is not the important fact about these illustrations. Their content and quality is outstanding. This is especially true of the colored plates, and the many black and white portraits of trees.

The plant subjects included are not only those native to the British Isles, but also many other forms from other lands are considered, especially those that have found a congenial home in Britain. The subject matter therefore is of immediate interest to those living in other areas of the Temperate Zone.

<sup>1</sup>L. J. F. Brimble. **Flowers in Britain; Wild, Ornamental and Economic; and some Relatives in Other Lands.** Macmillan & Co., St. Martin's Street, London. First issued 1944; reprinted 1945, 1947.

L. J. F. Brimble. **Trees in Britain; Wild, Ornamental and Economic; and some Relatives in Other Lands.** Macmillan & Co., St. Martin's Street, London. 1946.

NOTE.—Both volumes may be obtained from Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

Mr. Brimble has produced two volumes that will add immeasurably to the enjoyment and appreciation of plants by anyone interested. The acquisition of these volumes can be considered as a worth while investment that will yield liberal dividends.

## JAEGER'S "A SOURCE-BOOK OF BIOLOGICAL NAMES AND TERMS"

HAMILTON P. TRAUB

This book by Edmund C. Jaeger on the subject of biological names and terms<sup>2</sup> will appeal to all interested in the biological sciences. To the plantsman, for example, who wishes to determine the meaning of scientific plant names, it will prove to be a veritable mine of information. To the trained scientist, its usefulness is readily apparent. It is a book in which "are alphabetically listed fully 12,000 elements from which scientific biological names and terms are made. With them are given their Greek, Latin, or other origins and their concise meanings, together with numerous examples of their use in scientific nomenclature." It also contains concise sections on the elementary principles of word-building, and the types of names considered. For those who are unacquainted with the Greek Language, the basic Greek words for combining forms have been translated into English. Mr. Jaeger is to be congratulated on an excellent job.

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<sup>2</sup> Edmund C. Jaeger, "A Source-Book of Biological Names and Terms." Ed. 1. Charles C. Thomas, Publisher, 301-327 East Lawrence Ave., Springfield, Ill. 1947, 2nd. printing. pp. 256; 96 figures. \$3.75.