

WILD SPECIES OF GENUS BETA

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An arrangement of species within the genus Beta somewhat along lines originally proposed by Transchel and in part followed by E. Ulbrich (Engler and Prantl, Die Naturlichen Pflanzenfamilien, 2nd Ed., Vol. 16<sup>c</sup> "Chenopodiaceae," 1934) is now suggested as a workable system for American workers.

Section I. Vulgares Ulbrich.

Flowers in full blooming, upright spikes or panicles; free part of sepals mostly longer than the fruit, keeled in back, at the top more or less hooded, not petaloid, stigmas 3, seldom 2 or 4, pointed or blunt. Distribution coastal, Mediterranean countries, extending northward on Atlantic coast of Europe; also coastal in Asia.

1. Beta vulgaris L.

It is generally conceded that B. vulgaris L. includes a wide range of forms such as B. maritima L., B. perennis L., etc., as well as the cultivated types. Beta maritima is retained as a convenient name for the common wild beet. Various intergrades are found in B. maritima with other forms of B. vulgaris. The other species listed in this section are probably not distinct from B. vulgaris, considered in a broad sense. They are retained, however, provisionally as convenient designations in the same way that B. maritima serves.

2. Beta macrocarpa Guss. (B. bourgaei Coss.)

3. Beta patula Ait.

4. Beta atriplicifolia Rouy.

Section II. Corollinae W. Transchel.

Sepals more or less petal-like, white, yellowish or reddish; upright plants mostly with abundant-flowered paniculate stalks. Distribution chiefly Asia Minor steppes.

5. Beta trigyna Waldst. & Kit.

6. Beta lomatogona Fisch. & Mey.

7. Beta intermedia Bunge.

8. Beta macrorrhiza Stev.

9. Beta nana Boiss. & Heldr.

(B. nana is placed in a separate Section "Nanae" by Ulbrich, but is considered as a subspecies of B. lomatogona by Zossimovitch).

Section III. Procumbentes Ulbrich (emend).

Flowers 1-3, clustered in axils of upper leaves; free portions of sepals short, mostly not exceeding fruit. Prostrate strand plants in western Mediterranean area, Canary, Cape Verde, and Madeira Islands.

10. Beta patellaris Moq.

11. Beta procumbens Chr. Sm.

12. Beta webbiana Moq.

The genus has received various types of handling so that the Index Kewensis lists 19 species and in the literature 50 or more names have been applied to collections, essentially represented in the above listing of 12 species.

As certain systematists have subdivided the genus into many species, other, such as Zossimovitch, have combined species into fewer group species, indicating the species as enumerated above as subspecies. Thus Zossimovitch combines B. lamatogona, B. nana, B. intermedia into one species. In the Vulgares group, there is one species, all others being considered subspecies. In all, seven species are recognized by him.

When more genetic information is at hand and with fuller information as to intercrossing and intergrades, a superior basis for classification will be supplied, but pending such study, in the writer's opinion, it is convenient to retain from the older classifications the outstanding distinctive forms as "species."

Interesting relationships doubtless will be revealed as the studies go forward. It is to be expected that intercrossing will readily be effected among the members of the Vulgares Section. Here the 2n number of chromosomes is 18; the literature already reports B. maritima crossing readily with cultivated forms of B. vulgaris. Rimpau very early gave evidence easily interpretable as indicative of a fertile hybrid being obtained between B. patula and sugar beet. Observations indicate that B. patula crosses with B. maritima. B. atriplicifolia has crossed readily with sugar beet.

B. trigyna has been hybridized by Tschermak with sugar beet, and F. Schneider has repeated this cross and studied the back-cross with sugar beet. Since B. trigyna exists as a form in which the 2n chromosome number is 36, and as a so-called variety "hexaploidea" from Crimea, in which the 2n number is 54, very interesting results may come from this study.

The chromosome number of Group III, so far as is known, is  $n = 9$ . Interspecific crosses between species of Group III and B. vulgaris have not as yet been positively obtained. Schneider has informally reported results which he interprets as a cross of B. procumbens with the sugar beet. The  $F_2$  plants were, however, pure sugar-beet types, with no clear-cut segregations. Attempts at crossing B. patellaris with sugar beet made by Dewey Stewart were not positive, but reactions of B. patellaris fruits hand-pollinated with B. vulgaris pollen were suggestive that crossing infrequently may be obtained.

In working with the collections now available, it must be borne in mind

that the material represents only a very limited range of the biotypes of any species. Negative results from crosses, or failure to find desired characters, does not mean that the possibilities are exhausted. The evidence now at hand could be interpreted to mean that hybridizations between groups may be obtained as more extensive collections are employed.

What in the way of improvement in sugar beets may come from utilization of wild forms as a source of new genes is, of course, unpredictable. Immunity to curly top, to leaf spot, and resistance to draught and cold, and other highly desirable characters are shown by certain wild species. The utilization of these factors depends upon research which will develop methods for bringing them into the B. vulgaris complex. With other crop plants, recourse to new genes has been a fruitful technique. It is not too optimistic to believe such may be the case with the wild species of Beta.

#### SOME OBSERVATIONS ON WILD BEETS (BETA MARITIMA)

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For the purpose of discussion I shall use two main groups, as follows, to describe Beta Maritima:

1. Mediterranean
2. Atlantic (often called Beta Maritima Atlantica)
  - a. North Sea Type

The Mediterranean group contains many types which are either annuals or have a great tendency to bolt the first year. The plants are small, lower in sugar than the Atlantic type, very much sprangled as to root shape, and have a very high percentage of deep red or pink hypocotyls. A great many of them have multiple crowns. Some have a considerable redness factor in the seed balls before they mature.

Munerati, in Italy, has probably made a more thorough study of the Mediterranean types than any other plant breeder. I therefore think it would be well to include in this paper the following conclusions which he has made:

#### "THE CROSSING OF CULTIVATED BEETS WITH THE TYPE GROWING WILD ALONG THE COAST OF THE ADRIATIC"

"Observations for 20 years at the R. Experiment Station at Rovigo have permitted some conclusions which are judged to be definite.

1. It must be noted at first that the beets growing spontaneously along the coast of the Adriatic (around the mouth of the Po) comprise a population from which there have readily been separated several tens of bio-types having external characteristics, fixed and transmissible. (Some of these bio-types differ greatly from those which are separable among the cultivated varieties.)

2. Direct examination of the said wild forms has permitted the verification of the fact that a certain number of individuals, more or less noticeable depending on the year, are biennials (either actually, or due to a