Chicory-Endive Hybridized

isolation necessary to prevent production of undesired hybrids by the two species

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Numerous hybrids—recently obtained—prove that chicory and endive can be hybridized.

The classification of chicory as *Cichorium intybus* and endive as a separate species, *C. endivia*, has been accepted by horticulturists for many years, and—following the uncertain premise that different species cannot be hybridized easily—often no attempt is made to isolate them from each other for breeding or seed production purposes. Problems arising from such practices stimulated a study of the barriers separating chicory and endive.

To test the compatibility of the two species, plots consisting of a single plant of each were planted in several locations isolated by more than a half mile from each other and from any other plantings of either crop.

One variety of chicory—Radichetta—was used and two of endive — White Curled and Green Curled Ruffec. Seed was harvested separately from each plant and was sown for observation of seedlings in the following season.

The progenies of the endive plants in these tests consisted of several thousand plants, all of which had typical endive traits except one that deviated markedly from the rest. In the chicory families, on the other hand, only five of a total of 445 seedlings resembled chicory, the remainder, approximately 99%—though uniform as a group—differed from chicory in having broader, paler, and more serrate leaves, which were more prostrate than those of chicory. The conjecture that these off-type plants in the progenies of chicory and the single exceptional plant in the endive families were F_1—first generation—chicory-endive hybrids was verified by further study.

Representative plants of each type—the parents included—were grown for observation of characteristics, including fertility, of the mature plants. For nine characters of leaf, stem, or inflorescence in which the parents differ, the off-type plants resembled the chicory parent in four characters and showed intermediate expression in the other five. Such a combination of chicory and endive traits as found in these plants is unknown within varieties of either crop and provides very convincing evidence that these plants are true F_1 hybrids. Conclusive proof is provided by their chromosomal irregularities, partial pollen sterility, and the great segregation in the second generation derived from them.

Differences in compatibility relations can account for at least part of the great difference in yield of hybrids of the chicory and endive plants used in these tests. Chicory, for instance, has been demonstrated in these and other experiments to be self-incompatible—self-pollinations of single plants do not succeed—but most cross-pollinations between different plants yield offspring. Endive, on the other hand, is self-compatible—it does not possess barriers that prevent self-pollination. When a single plant of chicory was set out in an isolated plot with a plant of endive, it was compelled by its compatibility relations to cross with the endive. The few chicory seedlings obtained indicated that the self-incompatibility was not complete. The plant of endive was free to self-pollinate. It is suspected that some other device—possibly one to prevent cross-pollination in general—was also partly responsible for the observed high proportion of endive seedlings.

Preliminary studies have been made of the inheritance of chicory and endive traits in these hybrids. Although a moderate degree of F_1 sterility and marked reduction in germination of seeds produced by the F_1 were encountered, it was not difficult to obtain progenies.

The nine characters studied seemed to segregate without restriction and without appreciable correlation between themselves. These observations suggest that it should not be difficult to derive—by breeding—certain desired combinations of chicory and endive traits or to incorporate one or a few traits of one crop into the general background of the other.

The possible horticultural value of such derivatives is not yet known. Nevertheless, the present study suggests that it might be worthwhile to transfer the extremely erect habit of certain chicory varieties into endive in order to obtain a self-blanching type of endive. Also, the fasciated condition of endive, which causes the very prolific leaf production in that crop, might be useful for the same purpose in salad varieties of chicory.

These tests demonstrate that under field conditions—and without artificial aid—chicory will hybridize freely with endive. On the basis of this experience it is imperative to isolate well plantings of endive and chicory intended for breeding purposes or seed production. By the same token isolation from the common wild chicory would also be important. The distance required for satisfactory isolation has not been determined, but it should be of the same order of magnitude as for other crops pollinated by honey bees, the most active pollinating agents.

Apparently the rate of contamination of endive by chicory is not great and might be negligible in practice. There is no doubt, however, that the quality and uniformity of chicory can be severely jeopardized by near-by endive.

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Representative leaves of parent chicory — Radichetta — at *left;* and parent endive — Green Curled Ruffec — at *right;* and leaves of the first generation hybrid — *center*. Note the intermediate leaf shape of the hybrid.