EVIDENCE OF FIELD HYBRIDIZATION IN BEANS

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SINCE Johannsen's classical demonstration with the Princess bean in 1903 (8), the fixity of pure lines from single selections has been largely taken for granted. The breeders of beans in both Europe and America who have resorted to artificial hybridization have, however, found that beans do not always remain fixed (9). Pearl and Surface (11), in Maine, working with yelloweye beans, found that it was necessary to grow the parental stocks in cages for several years to be certain of their purity. Emerson (2), in his studies of heredity in common bean hybrids in Nebraska, found cross-pollination which varied from 0 to 10%. Kristofferson (10) recorded cross-pollination amounting to 0.8% in snap beans and 1.42% in field beans. However, many varieties did not show evidence of cross-pollination even after being exposed for several years. Hardenburg (5) believes that hybridization in the bean fields of New York is of no commercial importance. Kooiman (9) cites a number of European and some American references to field hybridization in common beans. Without exception, the bumblebee is charged with the formation of the field crosses.

The evidence of field hybridization in California bean fields is spread over six species of beans grown in the state, namely, (a) common beans (Phaseolus vulgaris), (b) tepary beans (P. acutifolius), (c) blackeye cowpeas (Vigna sinensis), (d) Multiflorus or butter beans (P. coccineus), (e) small or baby lima (P. lunatus var. Sieva), and (f) large lima (P. lunatus var. macrocarpa).

Common beans were first introduced into California through the Spanish missions and have been grown without interruption ever since. Other species and varieties have been added from time to time (7). The conditions of climate and soil in California are adapted to a wide range of bean varieties. These advantages have placed her usually in the first rank in yield per acre and in the value of the crop, due to the superior prices of the lima beans, which are protected by a natural climatic monopoly. The situation is ideal, therefore, for observations on the occurrence of field hybridization.

On the coast, in regions south of Monterey Bay, Small Whites are grown almost exclusively in certain areas, like Salinas and Lompoc. In the fields near Salinas some years ago the Michigan Robust pea-bean was introduced. From this lot a field hybrid, apparently with California Pink, was isolated. The resulting hybrid plants presented a wide range in seed color (white, pink, brown, and black, with all intermediate grades), maturity, yield, and climatic adaptation. From the vicinity of Lompoc black and colored seeds have arisen in fields of Small Whites. These also have shown a wide range of characters. Among the colors, black and pink predominated. Pods

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3Figures in parenthesis refer to "Literature Cited," p. 909.