

From these it was determined that the striped effect, tentatively designated Sd, was located on the long arm of chromosome 3. Its position in relation to the known markers on this chromosome is at present uncertain.

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9. Another two-unit mutator system.

The above described plant was unique in another respect. It grew from a colored-colorless mosaic seed selected from an otherwise full colored ear. The mosaic pattern was transmitted to its progeny and proved to be the result of changes at the R locus. The character appears to be a mutable seed color allele (R^m) which changes to r, thus producing colorless patches on an otherwise colored or mottled aleurone. These changes occur only in the presence of another factor (tentatively called M) which is located on chromosome 9 between sh and wx. The three characters Sd, R^m, and M first appeared in a single plant suggesting that they have a common origin. However, they are all on separate chromosomes and a careful check of the parents of the original cross revealed that the A C R dt parent carried Sd without expressing it. Therefore, the appearance of these three characters in a single plant most likely was the result of the chance combination of a mutator factor, M, producing a mutable allele at R, and of a favorable genotype for the expression of Sd.

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1. Serological investigation with the phylogenetical relationship among inbred lines in maize.

Up to the present, many works on the serological classification of various species in the plant kingdom have been carried out by using leaves or seeds of the plant. But, within a species, data on the phylogenetical relationship among races or inbred lines have not been accumulated. Since 1952, work has been done along the latter line by using the protein extracts of maize pollen as an antigen.

Pollen grains collected from the plant were preserved in a dessicator. According to need, they were immersed in physiological saline, and centrifuged at 3,000 r.p.m.; the supernatant was used as an antigen. Rabbits were immunized with three intravenous injections of such extracts, amounting to 5 to 8.5 cc in total. At the tenth day after the last injection, bleedings were taken, and held in a refrigerator at a temperature of 2°C. At the next day, antisera were performed, and then, inactivated

by holding at 55° to 56°C for 30 minutes in a water-bath. Judgments of precipitation were made by two methods; (1) the Ring method based on visual sight and (2) the chemical method based on a comparison of the amount of nitrogen contained in precipitates of antisera analyzed by the Microkjeldahl method.

Results of experiments are summarized as follows:

(1) Pollen extracts immersed in physiological saline, which were obtained from the inbred lines, were certainly representative of the antigenicity. The intensity of precipitation was found to be different among the inbred lines.

(2) The protein contained in pollen extracts was composed of albumin, α -, β - and γ -globulin, of which the former two were the main constituents of protein.

(3) Of these constituents, only two, albumin and α -globulin, varied quantitatively among the inbred lines, resulting in a difference of precipitation. The related inbred lines, which were derived from a given race, showed a tendency to be similar to each other in precipitation, because of having similar amounts of the two fractions.

(4) The antigenicity of pollen protein was recognized to rest mainly on the precipitation of three protein fractions, albumin, β - and γ -globulin, but not with the remaining one, α -globulin. It is thereby considered that the phylogenetical peculiarity of the serological reaction should be dependent upon the difference in the albumin fraction in various inbred lines.

(5) A difference in precipitation between any two of the given inbred lines was closely associated with the degree of heterosis appearing in the single-crossed hybrids from their F_1 combinations. The correlation coefficient between the precipitation analyzed by the chemical method and the heterotic vigor was computed to be $r = -0.921 \pm 0.147$ and $r = -0.753 \pm 0.245$ for the grain and green yield, respectively.

(6) With respect to the judgment of precipitation, the chemical method was superior to the visual ring method in its precision.

(7) For detecting the serological reaction, the three types of antigen extracts may be rated: non-heated pollen was most satisfactory, next non-heated seed, and lastly heated pollen extracts. However, heated pollen extracts were better in the case of the visual ring method although they were least satisfactory in the case of the chemical method.

(8) A strong precipitation reaction was always found in tests of a single-crossed hybrid and its parent lines, even though it was weak between the two parent lines. When a single-crossed hybrid was backcrossed with one of its parent lines, the precipitation was greater for the test of the backcrossed hybrid and its recurrent parent line than for the single-crossed hybrid and the same parent.

(9) From these results, it may be assumed that the serological reaction may be used as an index for detecting phylogenetical relationships among various inbred lines.

(10) With regard to breeding methods, the precipitation reaction should make it possible to predict the degree of heterotic vigor in the F_1 combinations of given inbred lines, without making any crosses, because a higher heterosis usually appeared in F_1 hybrids between those inbred lines with the more remote relationship from a serological viewpoint.

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1. Maize races native to the island Shikoku situated at the southeastern part of Japan.

About 250 samples with 3 ears for each were collected from about 200 farmer's fields in about 50 upland localities, totaling about 750 ears. On all these ears, 20 characters were measured. In order to examine the general characteristics of the races, 57 samples were chosen and grown at three stations, Hiratsuka, Iwate and Ehime. Measurements or observations were made on 29 characters. Results obtained were the following:

(1) All of the 250 samples were characteristic of a Caribbean type of tropical flint. In accordance with the topographic complexity of the arable land and the accompanying diversity in maize cultivation, the racial differentiation was extreme. About 60 or more local races were met with. The 250 samples were, however, identified as belonging to 28 distinct races.

(2) The 28 races were classified into 12 types; Okuuchi, Kowase, Wada, Gojô, Abeto, Sengoku, Hiyoshi, Okawa, Kuma, Irareko, Yellow-Yamakibi and Orange-Yamakibi. Most of them had a conical ear with orange seeds, typical of the Caribbean flint, and only two, Okuuchi and Yellow-Yamakibi, had a rather cylindrical ear with yellow seeds. Some races in the 6 types, Kowase, Wada, Gojô, Abeto, Okawa, Irareko and Orange-Yamakibi, were demonstrated to be favorable as breeding material. From a genocological viewpoint, the main peculiarities are as follows:

a) The Okuuchi type is planted as a mixed crop in sweet potato fields, and is distributed mainly over terraces on the hill-sides in the southwestern coastal region. It is used purely as a catch crop; the soft ear is boiled or roasted. The erect, short, and broad