

5. Responses of Sorghum plants to gibberellic acid.

Treatment of dwarf, medium and tall varieties of Sorghum with GA resulted in excessively thin and almost non-productive plants at concentrations of 125 and 625 μg GA every 3rd day. However, an amount of 25 μg caused, in addition to the usual suppression of tillers, development of inflorescences two weeks earlier than controls; plants were also shorter by 15 cm, 30 cm and 60 cm than corresponding controls. Studies are continuing, employing stocks which insofar as possible differ only in the number of dwarfing genes present.

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1. Paramutagenic action of Navajo mutants from a presumed stippled-Navajo compound allele.

The occurrence of a presumed stippled-Navajo compound allele, symbolized as $\underline{R}^{st}:nj$, among the offspring from an $\underline{R}^{st} / \underline{R}^{nj} / \underline{r}^{g} \times \underline{R}^r \underline{R}^r$ mating was reported in News Letter 34 (1960). This allele mutates rather frequently to a stable form giving the Navajo phenotype. Unlike ordinary Navajo, however, which is non-paramutagenic, the Navajo mutants from the compound are paramutagenic in heterozygotes with \underline{R}^r at about the same level as the parent allele, as the following data show.

| Genotype testcrossed on $\underline{r}^g \underline{r}^g \text{ ? ?}$ | Pigmentation score of $\underline{R}^r \underline{r}^g \underline{r}^g$ testcross kernels $\underline{1}$ |
|---|--|
| $\underline{R}^r \underline{r}^g$ (control) | 5.48 |
| $\underline{R}^r \underline{R}^{st}$ (control) | 2.32 |
| $\underline{R}^r \underline{R}^{st}:nj$ | 3.36 |
| $\underline{R}^r \underline{R}^{nj-1}$ (mutant from $\underline{R}^{st}:nj$) | 3.33 |
| $\underline{R}^r \underline{R}^{nj-2}$ (mutant from $\underline{R}^{st}:nj$) | 3.16 |
| $\underline{R}^r \underline{R}^{nj-3}$ (mutant from $\underline{R}^{st}:nj$) | 3.77 |
| $\underline{R}^r \underline{R}^{nj-4}$ (mutant from $\underline{R}^{st}:nj$) | 3.14 |

$\underline{1}$ 1 = colorless, 7 = self-colored.

It appears probable that these Navajo mutants result from change of the stippled component of the compound to self-color, thus permitting the Navajo component to express itself in the endosperm in the usual form. Retention by the mutants of paramutagenic action about equal to

that of the parent allele finds a parallel in McWhirter's earlier observation that many, but not all, self-colored mutants from ordinary \underline{R}^{st} are still strongly paramutagenic in $\underline{R}^r \underline{R}^{st}$ heterozygotes.

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2. A phenotypic comparison of three stippled alleles.

Three stippled alleles (\underline{R}^{st}) have been compared on the basis of aleurone-pigmenting effects, dosage effects, and interaction with the stippled modifier, \underline{M}^{st} .

The stippled alleles were:

\underline{R}^{st-1} -- from Wisconsin genetic stocks,

\underline{R}^{st-2} -- from Maize Co-op. stocks,

\underline{R}^{st-4} -- a "mutant" originally found heterozygous with \underline{R}^{sc80} (a self-coloured mutant) in an exceptional plant in the progeny derived by self-pollination of a plant of $\underline{R}^{sc80} \underline{R}^r$ genotype. There is circumstantial evidence for origin of \underline{R}^{st-4} by mutation of \underline{R}^{sc80} , but recurrence of the mutation was not obtained.

The stippled alleles were incorporated in W22 inbred background, and matings were made among stocks carrying \underline{R}^{st} , $\underline{R}^{st}\underline{M}^{st}$, $\underline{r}^r\underline{M}^{st}$ and \underline{r}^r , to obtain the endosperm genotypes required. The data reported are from the matings which enable an analysis of the dosage effect of the stippled alleles in absence of the modifier, and the dosage effect of the stippled modifier when stippled is held constant at 1 dose.

The number of pigmented spots, in an area enclosed by a 10 x 10 reticule grid at 30x magnification, on the abgerminal face of the kernel was measured. This area was approximately 6 mms². The mean scores reported are based on 125 kernels (25 from each of five ears) for each endosperm genotype with the exception of combinations 1-1 and 1-3 for \underline{R}^{st-4} . The latter means were based on 100 kernels (25 kernels from each of four ears).

The first three columns of the table show the aleurone-pigmenting effect and dosage response of the three stippled alleles, in the absence of the stippled modifier. The three stippled alleles differ markedly in the frequency of self-coloured spots at each of the dosages 1-0, 2-0 and 3-0. \underline{R}^{st-1} produced a linear increase in frequency of pigmented spots with increasing dosage. \underline{R}^{st-2} and \underline{R}^{st-4} were non-linear in dosage effect. $\underline{R}^{st-2} \underline{r}^r \underline{r}^r$ kernels (combination 1-0) were essentially colourless, only one of 125 kernels examined had a pigmented aleurone spot.

The interaction of \underline{M}^{st} with the stippled alleles is shown by the comparison of the columns headed 1-0 with 1-1, and 2-0 with 2-1 for each of the \underline{R}^{st} alleles. Substitution of \underline{M}^{st} for \underline{m}^{st} resulted in marked increases in the frequency of pigmented spots. Interaction with \underline{M}^{st} may be held to be an objective criterion for distinguishing stippled alleles, and all three alleles showed the interaction. The distinctive effects of each of the stippled alleles are maintained in these combinations, however, as is shown by cross comparison between \underline{R}^{st} alleles.