

MORPHOLOGICAL MUTATIONS IN TRITICUM PYRAMIDALE Perc.
INDUCED BY ETHYL-METHANE-SULPHONATE.

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In hexaploid wheats, Swaminathan and Rao (1961) had shown the role of macro-mutations which at one step lead to the origin of taxonomic categories higher than varieties. Therefore, mutation studies were initiated in tetraploid wheat species with a view to obtain mutations of phylogenetic importance.

Seeds of T. pyramidale were soaked in 300 ppm of EMS in 0.01 molar phosphate buffer at pH 7.0, for 8 hours. The 232 M₁ plants out of 250 seeds sown, grew to maturity and the M₂ plant families were grown the following season. The examination of the M₂ families for the chlorophyll mutations showed 5.27 % of the families segregating for albina and chlorina mutants. The search for the morphological mutants among the M₂ plants revealed three plants which had light straw coloured awns instead of dark brown to black as in control (Figure 1-b); three plants had spikes with speltoid characteristics and slight reduction in the awn length (Figure 1-c); two plants had ears which had highly reduced awns and elongated rachillae showing a very close resemblance to T. vavilovii (Figure 1-d); and finally, there were seven plants which were 10 to 14 inches taller than the rest of the plants in the population. These seven plants had long lax ears closely resembling T. turgidum (Figure 1-e), and had characteristic awns as in controls. Both speltoid and vavilovoid mutants were 8 to 10 inches shorter than the control plants. The vavilovoid mutants, which were also speltoids, were found in the same M₂ family from which the speltoid mutants were isolated. The speltoid as well as the vavilovoid mutants had tough rachis and were completely sterile.

Barabas (1959) had reported the occurrence of vavilovoid mutants in the X₃ populations of T. carthlicum. The mutants were described to be having elongated rachilla and reduced awns, however no mention was made of the speltoid characteristic of these mutants. It was in hexaploid species, that Rao and Swaminathan (1963) had described vavilovoid mutants in T. aestivum ssp. vulgare, and had noted the characteristic speltoid features of these mutants. Swaminathan and Rao (1961) had earlier

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postulated that Q suppresses vavilovoid expression and as a result vavilovoid mutants in free-threshing wheat (either tetraploid or hexaploid) can occur only in conjunction with speltoidy. The vavilovoid mutants in pyramidale described in this report lend further support to their postulate.

Isenbeck and Rosenteil (1950) had suggested that T. vavilovoid might have arisen as a single step mutation from T. aestivum. The present findings indicate that possibly the recessive mutation leading to the vavilovoid expression was incorporated at the tetraploid level and later carried on to the hexaploid level as well. Probably the vavilovoid mutants at the tetraploid level could not get established in nature. At hexaploid level, these mutants did survive, although in a limited geographical area in the foot-hills of Armenia (Jakubziner, 1933), suggesting that possibly the elongated rachilla character might be of an advantage to the plant in this limited area of the Transcaucasian region.

It is interesting to note that all the vavilovoid mutants reported earlier and in the present study, in both tetraploid and hexaploid species, occur in free-threshing species. Further, these mutants had tough rachis and a very significant reduction in awn length. Swaminathan and Rao (1961) had indicated that in T. aestivum ssp vulgare the gene controlling vavilovoid expression (i.e. elongation of rachillae) is situated on the long arm of chromosome 5A between Q and the awn inhibitor B_1 . It was also shown by Swaminathan (1966) that in T. dicoccum there is a gene concerned with awn development located near Q. Therefore it would seem that in vavilovoid mutants there is a simultaneous deletion of Q and the gene for awn development. Also it would be logical to speculate that the gene V (for vavilovoid expression; Swaminathan and Rao, 1961) is present in both the tetraploid and hexaploid free-threshing species and is suppressed by Q; that gene Q is flanked on one side by the gene for awn development and on the other by the gene for vavilovoid expression; that there are speltoid mutants as a result of the deletion of both Q and V, or vavilovoid mutants due to the loss of Q along with the gene for awn development.

The lax-eared mutants found in pyramidale very closely resembled the free-threshing species T. turgidum. These mutants were fully fertile and bred true in M_3 generation. Swaminathan and Rao (1961) had shown that the loss of gene C of T. compactum results in lax-eared mutants. The occurrence of the lax-eared mutants in pyramidale suggest that probably pyramidale also carries compacting gene like C of compactum.

Lastly, the occurrence of speltoid mutants in pyramidale

with reduced awns resembled the reduced awn mutants in polonicum and several fully awned varieties of ssp. vulgare described by Swaminathan (1963, 1966)

In summing up, the morphological mutants described in pyramidale bring out a distinct similarity between the genetic architecture of tetraploid and hexaploid species of Triticum with regard to the major genes of systematic importance. It also shows that T. pyramidale, the Egyptian cone wheat which Percival(1921) regarded as an endemic dense-eared mutation derived from the Abyssinian form of T.dicoccum, probably is a parallel form to T. compactum, and might have been a dense-eared mutation from T. turgidum, the cone or rivet wheat.

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