established it passes fairly readily from generation to generation. Nor is it necessary, as Eichenwald⁴ believed, for infection to be recent and acute. Twenty-three of the infected litters were borne of mothers themselves congenitally infected, and in one instance a congenitally infected mother produced congenitally infected offspring even in her fourth litter.

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An Induced Mutant in *Triticum carthlicum* with the Diagnostic Feature of *T. vavilovi*

THE spike of *Triticum vavilovi* Jakub. is distinctive in that the internodes of the rachilla are more elongate and the number of rachilla nodes increased compared with other hexaploid wheats. The elongated rachilla internodes sometimes so reduce the extent to which the florets overlap as to give the spikelet two or three distinct levels (Fig. 1).

Fig. 1. Two *T. aestivum* normal (left) and two *T. vavilovi* spikelets with several levels (right)

Fig. 2. Two *T. carthlicum* normal (left) and three *T. carthlicum* mutant spikelets (right) with several levels

In 1955, as part of a larger programme, dry seed of genetically pure *T. carthlicum* Nevski (= *T. persicum* Vav.), a tetraploid wheat, was treated with a dose of 10,000 r. X-rays. In the X_3 generation, examined in 1957, a mutant was found which strikingly resembled *T. vavilovi* (Fig. 2). This type had not been present in the X_1 or X_2 generations, but 21 plants in the X_4 progeny of the mutant plant all repeated the mutant structure.

The most important divergences of this mutant from the original *T. carthlicum* stock are compared in Table 1 with the differences between *T. vavilovi* and *T. aestivum* var. Newthatch, the hexaploid common wheat. The total extent of the difference between the *T. carthlicum* mutant and the parental stock is readily ascertainable but the extent of the original difference between *T. vavilovi* and *T. aestivum*

Table 1

Character	Hexaploids		Tetraploids	
	<i>T. aestivum</i>	<i>T. vavilovi</i>	<i>T. carthlicum</i>	Mutant
Spike	normal	pseudo branch	normal	pseudo branch
Spikelet number of levels	1	2, sometimes 3	1	2, sometimes 3
Rachis at the spikelet bases			glabrous	pubescent
Rachilla number of nodes	5	7	5	7
Internodes	short	elongated	short bearded	elongated beardless
Glume, outer glume			long	with beak-shaped end shorter
Inner glume, arista				

cannot be exactly determined because of the present variation in the latter species. The two species are constantly differentiated only by the characters listed in Table 1. Many of the spikelet types seen in the investigation of the genetical constitution of *T. vavilovi* by Singh, Anderson and Pal¹ were observed in this relatively small range of mutant material.

According to Isenbeck and Rosentiel², *Vavilov* does not touch upon the genetical bases of *T. vavilovi*. Isenbeck and Rosentiel suggest that the development of this form may be explained as a one-step mutation from *T. aestivum*. This explanation is not excluded by the data of Singh, Anderson and Pal¹ from crosses between *T. vavilovi* and several *Triticum* species. Further, it appears that there is no genome difference between *T. aestivum* and *T. vavilovi*. This hypothesis is confirmed, at the tetraploid level, by a mutant analogous with *T. vavilovi* which actually originated in a single mutational step. In this case of parallel mutations, it may be supposed that since the final outcome was identical the pathways were also identical.

The genetic foundations of the mutant in *T. carthlicum* will only be established by crossing experiments already commenced. The mutation of a single gene to the recessive condition would be the most simple explanation for segregation occurring in X_3 and for the mutant to be true breeding in X_4 .

Summing up, the 'vavilovoid' mutant may be of interest in that it illustrates parallel variation and parallel genotypes at the tetraploid and hexaploid level. Moreover, it throws light on the origin of *T. vavilovi* and confirms the supposition of Isenbeck and Rosentiel. Finally, it raises a taxonomic problem, namely, that if *T. vavilovi* is treated as a distinct species as classified by Vavilov³, by Jakubinsin⁴ and by Singh, Anderson and Pal¹, then it must be accepted, at the tetraploid level, that a new species arose from *T. carthlicum* in a single mutational step. Alternatively, if *T. vavilovi* is treated as a subspecies of *T. aestivum*, as it is classed by Sears⁵ and by Schiemann⁶, subspecific variation must have originated in a single step.

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