TABLE II

Chiasma Frequency in the Tetraploid Branch

4*n* Petunia Branch	Number of chiasmata per pollen mother cell																*n*	M_I	$\sigma_{(I)}$
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27			
Number of Pollen mother cells studied	1	0	1	2	2	4	3	5	4	3	4	2	0	1	2	1	35	19·6	3·45

the tetraploid branch (Table II) I found that the average number of chiasmata per cell in the diploid, M_d, was 11·3, while that in the tetraploid was 19·6, which means that diploid pollen mother cells have on the average 1·6 chiasmata per metaphasal bivalent, while the tetraploid cells have only 1·4 chiasmata. In other words $2M_d - M_t = 22·6 = 19·6 = 3$ and $M_d - \frac{1}{2}M_t = 1·5$.

It should be pointed out that the numbers of the chiasmata per cell are more variable in the tetraploids, $\sigma = 3·45$, than in the diploids, $\sigma = 1·72$. Tetraploid pollen mother cells had often metaphases with one, two or even more quadrivalent groups. Univalents, $1 - 3$, as well as trivalents were also observed.

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A Case of Vivipary in Rye

VIVIPARY was observed in a large number of grasses by many investigators (Turesson,[1] Stahlin,[2] etc.).

It maintains sometimes polyploidy, although it is not a sequence of poliploidy (Kostoff[3]). During the last two years I observed viviparous plants, among the progeny of the back cross (*Secale cereale* × *S. montanum*) × *S. cereale* in the eighth generation.

Viviparous forms were detected among the perennial forms of the segregates when they overwintered in the green house and grew for several months at a relatively low temperature (0–10° C.). Viviparous plants formed spikes (Fig. 1) which had rootlets at the nodes. Most of the spikelets had small rootlets. Instead of anthers and ovaries, the spikelets formed leaves and developed further into normal stems with normal leaves. Spiklets with small roots,

FIG. 1

Viviparous spike of rye

transplanted vegetatively into pots developed further giving rise to adult plants. When the temperature in the green house was raised above 15° C. they developed into normal plants, *i.e.*, with sexually normal spikes, the flowers having anthers, ovaries and styles. All of the plants produced by viviparous propagation set quite normal seeds during the summer.

The case of vivipary in rye, which I had, is a special one. The phenomenon, vivipary, was observed only when the plants grew at low

temperature. This case is very interesting from a *phenogenetic* point of view. The same genotype reacts strikingly differently to low and high temperatures. At the former environment formative processes for the realization of typical flowers proceeded in a definite direction so that instead of floral organs (anthers, ovaries), leaves and further small shoots (stems with leaves) with roots, were formed on the spike axis.

The same genotypes react to higher temperature by forming normal sexual organs (anthers and ovaries) and normal sex cells, the necessary elements for realization of sexual propagation.

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[1] Turesson, *Hereditas*, 1930, **13**, 177.
[2] Stahlin, *Wis. Arch. Landwirtsch*, Bd. I, 1929.
[3] Kostoff, *Curr. Sci.*, 1939.

Pseudogamy in Genus Brassica

SINCE the time Focke[1] introduced the term "Pseudogamy" to explain the origin of maternal hybrids by the fact that the pollen in such cases does not take any part in fertilization, but acts merely by stimulating the egg-cell in some way so as to enable it to develop into an embroyo apomictically, this phenomenon has been found to be fairly widely spread in plants. In interspecific and intergeneric crosses particularly, individuals arise frequently which are not true hybrids, as they carry nuclear factors from one parent only and are, therefore, either metromorphic or patromorphic according to the derivation of their genetic factors. Although some cases of patromorphic hybrids have been authenticated by Clausen and Lammerts[2] in *Nicotiana*, and Collins and Kempton[3] in *Tripsicum* X *Euchlaena*, the exact conditions giving rise to Androgenesis are not yet properly understood. In contradistinction to this, the origin of metromorphic hybrids has been demonstrated more concretely, both cytologically and genetically in a large number of cases by several workers and a number of explanations, which have been detailed by Sharp,[4] have been given for the origin of such plants.

In the genus Brassica, to the knowledge of the authors, the only case of pseudogamy that has been reported in literature is by Nogouchi[5] in the cross *B. campestris*, L. Var. *oleifera*, D.C. X *B. oleracea*, L. Var. *gemmifera*, D.C., which gave purely maternal offsprings in F_1 which bred true in later generations. Cytological observations made by him showed that although the two male nuclei carried by the pollen tube penetrate into the egg-apparatus, neither of them actually fuses with the egg nucleus or one of the polar nuclei, and that both of them ultimately disintegrate into small fragments. The young embryo was found to be developing about 5 days after pollination, although the complete process of embryonic development was not traced.

The observations carried out by the authors of this note at Lyallpur since 1937 on the progeny of a large number of interspecific crosses made with the object of finding out the crossability and natural affinities of the various so-called species of Brassica show that pseudogamy is a regular phenomenon in this genus, being prevalent on a much larger scale than hitherto believed. The details of the various crosses made and studied by the authors, including the setting percentage of pods and seeds, and the number of maternal and true hybrids in each case, are given in Table I from which it will be seen that excepting two crosses, in which all the F_1 plants turned out to be true hybrids, showing abortive pollen due to chromosome aberrations and intermediate morphological characters between their respective parents, all others produced nothing but maternal offsprings which resembled the female parent in all their morphological characters, *viz.*, shape and hairiness of leaves and stems, stature of plants, time of flowering, size and shape of pods, seed colour, soundness of pollen, and fertility, etc. This leaves no ground for any doubt about their apomictic origin. In the