a streptomycin-sensitive P^+ and a streptomycin-resistant P strain for such crosses and using selective media containing streptomycin (100 μg./ml.) for the isolation of recombinants. On such media, only the P^- strain can survive and be capable of giving rise to recombinants. Results of these experiments are given in Table II.

Table II

Differential effect of streptomycin on fertility in Vibrio cholerae *crosses*

Cross		Selective markers		No. of recombinants (per 2×10^8 cells of the pool)	
Strain V58	Strain V63	Strain V58	Strain V63	Pre-incubation on membrane filter (30 min.)	Control
P^+	P^-	pur^+	str-r	102	17
		leu^+	str-r	103	4
P^-	P^+	pur^+	str r	6	5
		leu^+	str-r	1	1
P^+	P^+	pur^+	str r	6	3
		leu^+	str-r	11	3

(*See* Table I for markers of strains and symbols used)

It will be seen that recombinants were isolated in large numbers only from $P^+\times P^-$ cross after pre-incubation on membrane filter. If the membrane filter technique was omitted, as in controls, there was a considerable reduction in their numbers. Such a reduction was also seen in reversed $P^+\times P^-$ and $P^+\times P^+$ crosses. These findings provide strong evidence for one-way transfer of genetic material in *V. cholerae*, as is known in *E. coli*[9] and *S. typhimurium*.[10]

It is obvious that the membrane filter technique should permit detailed studies on the kinetics of the mating process in *V. cholerae* and also facilitate crosses between *V. cholerae* and *V. el Tor* strains and between *V. el Tor* strains which presented difficulties in the past.[11]

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A DENSE FRUITED MUTATION IN INDUCED AUTOTETRAPLOID BROWN SARSON (*BRASSICA CAMPESTRIS* var. BROWN SARSON)

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SEED yield in induced autotetraploid brown sarson, *Brassica campestris* var. brown *sarson*, could be increased not only by selecting plants for larger number of branches, larger number of seeds per siliqua and higher seed weight but also by selecting plants having a larger number of silique per branch. Such a "dense fruiting" mutation, arising as a result of radiation, is reported in this note.

Induced polyploids have been of economic value in only a few species principally those grown for their vegetative or floral parts. Autotetraploids of some crop plants have proved valuable because of their intrinsically superior qualities conferred by polyploidy alone. The most successful of these is the cereal rye which is competing successfully with diploids by virtue of its large kernel size, superior sprouting ability and better baking quality of the grain due to its high protein content. (Muntzing).[5] It has, however, some disadvantages such as reduced tillering, lower seed setting, tall straw which makes harvesting with combines difficult and also the necessity of isolating it from the diploids with which it crosses readily resulting in sterile triploids. Similar advantages and disadvantages like low seed setting are also found in other induced autotetraploid cereals and oil crops. Some of these defects have been partly rectified.

Employing the mass pedigree method of breeding Parthasarathy and Rajan[6] considerably improved the fertility of tetraploid population of *Brassica campestris* var. *toria* which was

highly sterile when it was originally produced.[7] Asana *et al.*[1] made a comparative and comprehensive study of the morphological characters relating to yield, of autotetraploid 'elite A' produced by Parthasarathy and Rajan[6] and its original diploid progenitor. They found that the autotetraploid consistently produced less number of branches than the corresponding diploid. Consequently the diploid outyielded the tetraploid in spite of the latter having 50-55% higher seed weight. As the fruit number per branch did not differ much in the two chromosomal races they concluded that if the difference in branch number between the diploid and the autotetraploid was narrowed down by further selection, the autotetraploid could be expected to compete with the diploid. Instances are known where tetraploids are either inferior or only equal to diploids in respect of particular morphological characters. Thus, Kostoff and Kendall in tomato,[3] Deshmukh and Pal in Nicotiana[2] and others reported that induced tetraploids were either equal to or shorter than the corresponding diploids. Similarly, in *Sesamum* and *Linum* while some types responded to duplication of chromosomes with reduced branches others showed a larger number of branches and even branches of a higher order than present in the diploids.[8] Kuckuck and Levan[4] have also reported that different varieties of *Linum usitatissimum* react differently to duplication. It may also be possible to induce larger number of branches by mutation breeding.

While conducting some experiments in which seeds of *B. campestris* var. brown *sarson*, variety GBS 223, were irradiated with 60 kilo rads of gamma-rays first and immediately afterwards treated with 0·2% aqueous colchicine for 30 hours to duplicate their chromosomes, a tetraploid was isolated in the 1966-67 crop season. The progeny of this tetraploid, besides showing the usual gigas characters accompanying duplication of chromosomes, bore a large number of silique on the fruiting stalks (Fig. 1). The intersiliqual space in these plants was much reduced as the total length of the fruiting branch remained more or less the same as in the other colchicine induced tetraploids (Fig. 2). This mutant may have arisen as a result of the effect of radiation as no such variation was noticed either in colchicine induced tetraploid without previous irradiation or their segregating populations. Such a variation was also not met with among the diploid brown *sarson* varieties. The large number of silique per branch in this mutant may compensate for the low branch number in the tetraploids since Stolle[9] observed a high positive correlation between number of pods and yield per plant in winter rape.

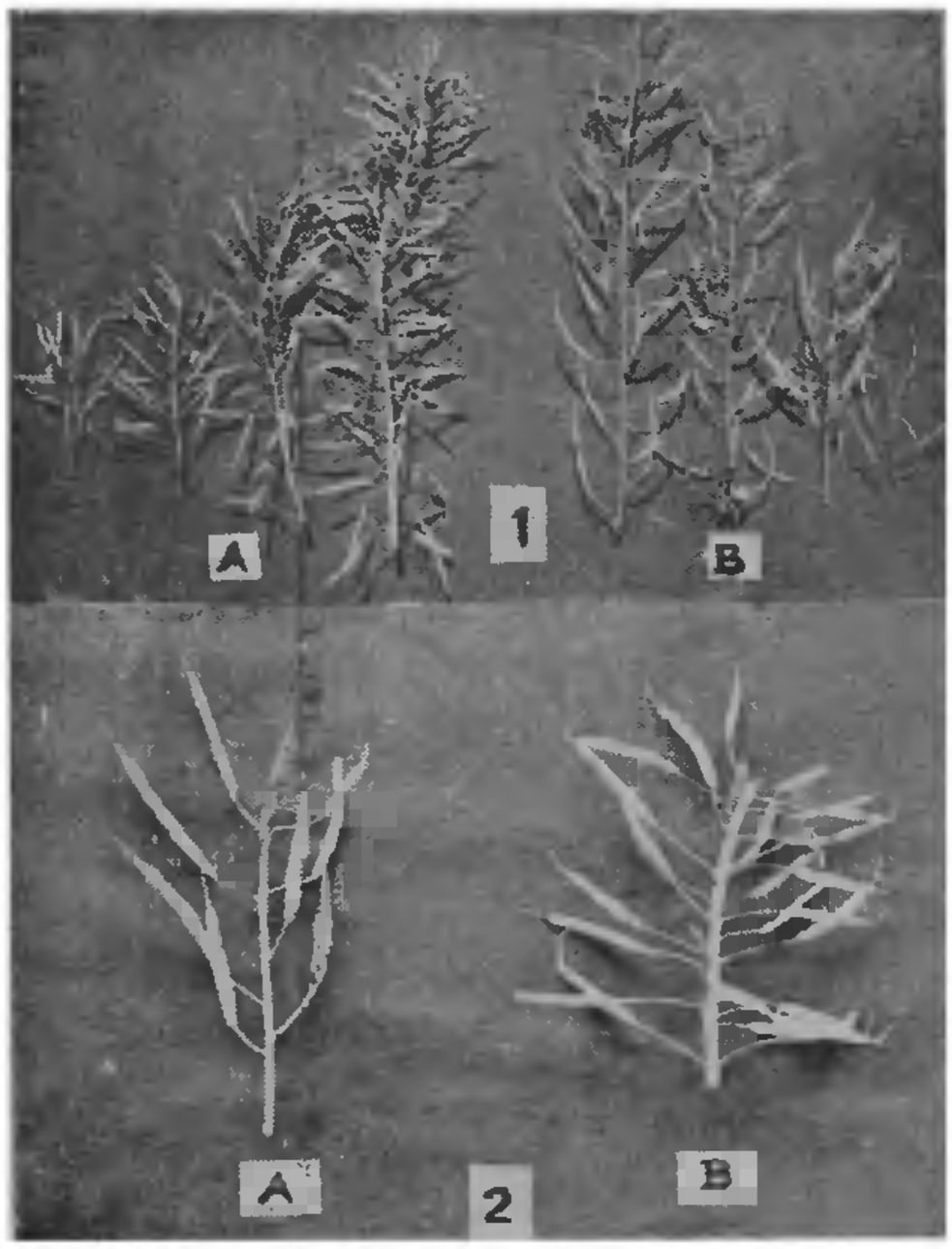

FIG. 1. A-B. Fig. A. Tertiary, secondary, primary branches and main shoot respectively of mutant tetraploid. Fig. B. Main shoot: primary, secondary and tertiary branches respectively of diploid.

FIG. 2. A-B. Fig. A. Fruitfng branch of normal tetraploid. Fig. B. Fruiting branch of mutant tetraploid. Note the narrow intersiliqual space.

If all the important yield components, namely larger number of branches, higher seed weight, larger number of seeds per siliqua and larger number of silique per branch could be combined in a tetraploid the brown *sarson* may even become economically more important than the diploid.

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