

A COMPARATIVE STUDY OF AUTOTETROPLOID AND DIPLOID TYPES IN MUNG (*PHASEOLUS RADIATUS* LINN.)*

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Received December 18, 1944

THE successful production of an autotetraploid form in *mung* (*Phaseolus radiatus* Linn.) by colchicine induced method has been previously described (Kumar and Abraham†). A few tetraploid plants were first obtained in 1941. Since then their successive progenies have been grown each season except for one namely 1943 when the entire crop was wiped out due to an extremely severe attack by insects. Fortunately, however, the seed kept in reserve helped to tide over the adverse period and continue the studies of further generations. The autotetraploid type has reached the fourth generation. The present study was undertaken to compare the performance of the autotetraploid with its diploid progenitor in respect of several important characters which are tabulated below.

TABLE I. *Data from crop grown in 1942*

Plant character	Tetraploid		Diploid		% increase (+) or decrease (-) over diploid
	No. of plants observed	Average value	No. of plants observed	Average value	
1. Height in mm. ..	85	391.1	92	485.4	- 19.4
2. <i>Leaf</i> :					
(a) Length in mm. ..	85	90.2	91	101.3	- 11.0
(b) Breadth in mm. ..	"	93.0	"	99.7	- 6.7
3. Number of branches per plant ..	"	2.6	"	4.0	- 35.0
4. Number of pods per plant ..	80	41.5	"	129.9	- 68.0
5. <i>Flowers</i> :					
(a). Petal (standard) length in mm. ..	73	14.9	"	13.5	+ 10.4
(b) Petal (standard) width in mm. ..	"	19.3	"	17.0	+ 13.5
6. <i>Seed</i> :					
Yield per plant in grams ..	80	4.7	91	22.83	- 79.4
Germination percentage ..	"	77.2	"	83.6	- 7.7

* The paper was read before the Joint Meeting of the Indian Academy of Sciences, Bangalore, and the National Academy of Sciences, United Provinces, held at Poona in December 1944.

† 1. "Induction of Polyploidy in Crop Plants," L. S. S. Kumar and A. Abraham, *Current Science*, 1942, 2, No. 3, pp. 112-14.

2. "Study of Colchicine Induced Polyploidy in *Phaseolus radiatus* L.," L. S. S. Kumar and A. Abraham, *Jour. University of Bombay*, 1942, 11, Pt. 3, 30-36.

From the above table it will be observed that except for flower size which has increased, all other characters namely height, size of leaf, number of branches, number of pods set and yield have been adversely affected in the tetraploid type. The percentage of decrease or increase over the diploid varies for different characters. Of the six characters studied, five have been adversely affected and only one shows favourable or gigas effect. The effect has been drastic particularly in respect of characters affecting the yield of plant.

TABLE II. Data from crop grown in 1944

Plant character	Tetraploid		Diploid		% increase (+) or decrease (-) over diploid
	No. of plants observed	Average value	No. of plants observed	Average value	
1. Pod:					
(a) No. of pods per plant	18	7.0	17	9.5	- 26.2
(b) No. of seed per pod ..	"	4.0	"	9.7	- 58.8
(c) Breadth in mm. ..	"	5.7	"	4.7	+ 21.3
(d) Length in mm. ..	"	42.7	"	63.0	- 33.8
2. No. of flowers per plant ..	20	92.5	"	235.1	- 60.7
3. Weight of 100 seeds in grams	"	2.52	"	2.34	+ 7.7

The data recorded above which belongs to a different year shows that except for the increase in size of the seed and breadth of pod of the tetraploid the other characters exhibit a retrograde influence resulting from doubling of chromosomes. In respect of pod size, it is interesting to note that while the length of the pod has decreased, its breadth has increased. If this is compared with the effect of chromosome doubling on flower size (Table I), it is seen that both length and breadth have increased. Why there should be this differential influence in respect of the various characters and of the same character in respect of two separate organs need explanation.

The result of induction of tetraploidy in *mung* has not given the desired results of enhancing economic characters. Three years' observations go to show that the tetraploid is later in flowering, more susceptible to disease and extremely poor yielding. The reasons for low yield are, reduction in the number of branches and flowers produced, number of pods set, and number of seeds per pod.

If these results are considered with the result obtained in *rahar* (*Cajanus indicus* Spreng*) in which the induction of autotetraploidy has resulted in

* A Preliminary Note on Autotetraploid *Cajanus indicus*, by L. S. S. Kumar, A. Abraham and V. K. Srinivasan, *Proc. Ind. Acad. Sci.* (In Press).

adversely affecting economic characters, it would appear that colchicine induced autotetraploidy is not a suitable method for improving the crops belonging to the pulse group. Probably colchicine induced allotetraploids may prove of greater use than autotetraploids of the type described above.

SUMMARY

Colchicine induced autotetraploid progenies belonging to two different years were compared with their diploid progenitor for various characters. Most of the characters of the autotetraploid exhibit a decrease over that of the diploid except in the case of petal size and pod breadth which have increased slightly. The unfavourable effect is rather drastic particularly in respect of characters affecting the yield of the plant.

Since very similar results have been obtained in *rahar* (*Cajanus indicus* Spreng), it is suggested that colchicine induced autotetraploidy may not prove to be a suitable method for improving the various pulse crops.