

Twin Seedlings in Sorghum

by

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Introduction: The Talaivirichan Cholan selection, A. S. 7657, belonging to *Sorghum roxburghii* var. hians is very interesting in its genetic behaviour as it exhibits a possible genic unbalance. Interesting mutations such as the grassy sorghums, triploids and striped plants (unpublished) were recorded in this selection. The occurrence of polyembryony in this selection is described in this paper.

Materials and Methods: Polyembryony is common among the Gramineae but the occurrence of multiple carpels is rather rare and is more prevalent in the apomictic races like that of *Poa* and other grasses. In a plot of A. S. 7657, an earhead was noted which showed stages of fusion or the fasciation of carpels ranging from about complete separation of the carpels, i.e. two seeds or two ovaries occurring in the same spikelet to such extreme cases as a single seed formation, the doubleness of which is represented only by its bigger size and a slight furrow running down the middle on the embryo side of the seed. The different stages are described below:

1. Double seeds.
2. The bases fused.
3. The fusion extending to $\frac{1}{4}$ the length of the grain.
4. The fusion extending to $\frac{1}{2}$ the length of the grain.
5. The fusion extending to $\frac{3}{4}$ the length of the grain.
6. Fused completely with a furrow running down the centre of the grain.
7. One half smaller than the other.

The seeds in the earheads were counted. Out of a total of 1515 seeds, 62 appeared to be completely fused. On dissection, two embryos were found, one smaller than the other. During germination one of the radicles comes out earlier, while the other emerges a day or two later. This initial difference is maintained to the end, with the result that one of the twins is vigorous and normal while the other remains short and stunted (Fig. 1). The twin plants were examined and found to be diploid. The pollen grain measurements (average of 100 readings) are recorded below:

Plant	Diameter in Ocular division	S. D.
Normal	27.92	2.7
Twin (Tall)	27.68	3.0
Twin (Short)	27.01	4.8

Conversion factor to microns $\times 1.6$.

The earheads were observed at the flowering stage and the following modifications were observed (Fig. 2).

1. Two ovaries completely separate.
2. Two ovaries showing different stages of fusion.
3. One ovary with three stigmatic branches.

Four progenies were raised and studied; two from completely fused seeds (A. S. 9661/1 and 2) and two from double seeds (A. S. 9662/1 and 2). The character appears to be heritable. The details are recorded below :

Selection No.	Normal	Double	Base fused	Completely fused
A. S. 9661/1 and 2	3322	38	94	99
A. S. 9662/1 and 2	3005	8	0	77

From the progeny of A. S. 9661/1, 60 heads were analysed for the number of fused, normal, double and triple seeds in each. The details are given below : (Fig. 3)

Family No.	Normal	Fused	Double	Triple
A. S. 9661/1—1	653	41	126	1
„ 1—2	1150	14	45	...
„ 1—3	1613	49	49	...
„ 1—4	2046	48	59	...
„ 1—5	2321	35	27	...
„ 1—6	572	81	264	...
„ 1—7	2475	44	127	...
„ 1—8	2985	31	56	...
„ 1—9	2132	14	47	...
„ 1—10 to 19	13869
„ 1—20 to 60	45476	317	205	...

Discussion : The term polyembryony is applied to the condition where more than one embryo arises out of a single nucellus from different embryo sacs or by the activation of either the integument or the nucellar cells which grow into the embryo sac and behave like normal embryos. The latter are diploid and completely maternal in their character. The several types of polyembryony

have developed more out of perenniality, the latter inducing tendency to apomixis. Interspecific hybridisations which in the earlier stages show a higher degree of incompatibility are apt to give these peculiarities especially in their polyploid progeny. This *Sorghum roxburghii* selection though a diploid, shows as much disturbance in its genic balance as any of the interspecific hybrids. It may be that this variety has cryptic structural hybridity in its chromosomes or certain modifying genes probably, which bring about these variations since this selection, A. S. 7657 was isolated from a cross between A. S. 5495 (an extracted type with juicy stalks) and A. S. 1093 (Talaivirichan Cholan selection from Chittoor) and has been maintained in a homozygous condition by selfing through generations. Alternately it may also be due to the peculiar condition in which the genes are highly unstable.

The occurrence of double seeds in a variety of *Sorghum* (*S. roxburghii* var. *hians*) has been reported (Ayyangar and Ayyar, 1929). Later Ayyangar and Rao (1936) recorded the incidence of doubleness in *S. durra*, the different kinds of doubleness resulting in twins, triplets, quadruplet seeds and in extreme cases of five and six grains. In crosses between double seeded and single seeded varieties, the first generation plants were reported to be double seeded. In this paper is discussed the occurrence of the fusion or fasciation of carpels ranging from almost complete separation to complete fusion, the doubleness of which is indicated by its bigger size and the furrow running down the embryo side. Thousands of fused seeds were sown and in all the cases, the twins that were obtained were diploid.

Summary: The occurrence of fused seeds in a pure line of *Sorghum roxburghii* is described.

Different stages of fasciation of carpels ranging from complete separation to complete fusion are described.

All the pairs of twins examined were found to be diploids.

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REFERENCES

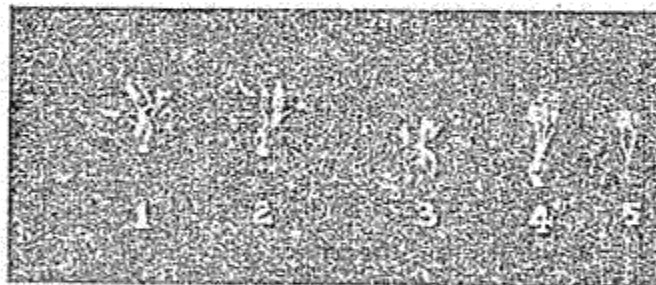
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FIG. 1



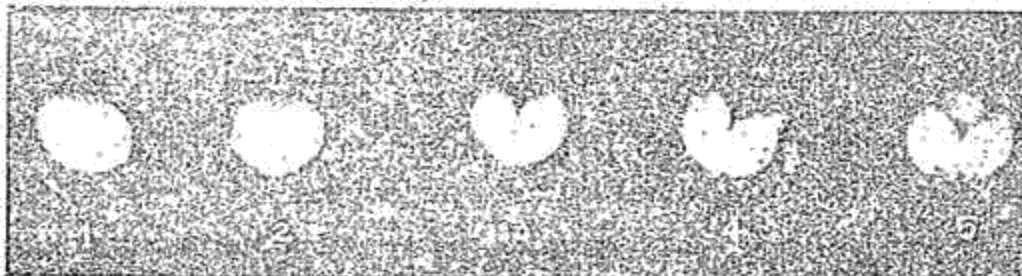
Twin seedling.

FIG. 2



- 1 & 2. Two ovaries showing different stages of fusion.
- 3 Two ovaries completely fused.
- 4 One ovary with three stigmas.
- 5 Normal ovary.

FIG. 3



- 1 Normal seed.
- 2 Completely fused.
- 3 & 4. Different stages of fusion.
- 5 Triple seed.