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Skew Bolls in Cotton

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Introduction. In 1939-40 a few cotton bolls were observed in a bulk field of K. 1 (a strain of *Gossypium arboreum* L., var *neglectum* forma *indica*, evolved at the Agricultural Research Station, Koilpatti) which differed from the normal in displaying a characteristic skewness in their external configuration. Examination of these skew bolls revealed that some of the ovules had not developed. These defunct ovules reduce the potential yield of the cotton plant, and thus cause an economic loss. A similar observation was made by the writer in N 14 (another strain of *Gossypium arboreum* L., var. *neglectum* forma *indica*) at the Agricultural Research Station, Nandyal in 1938-39.

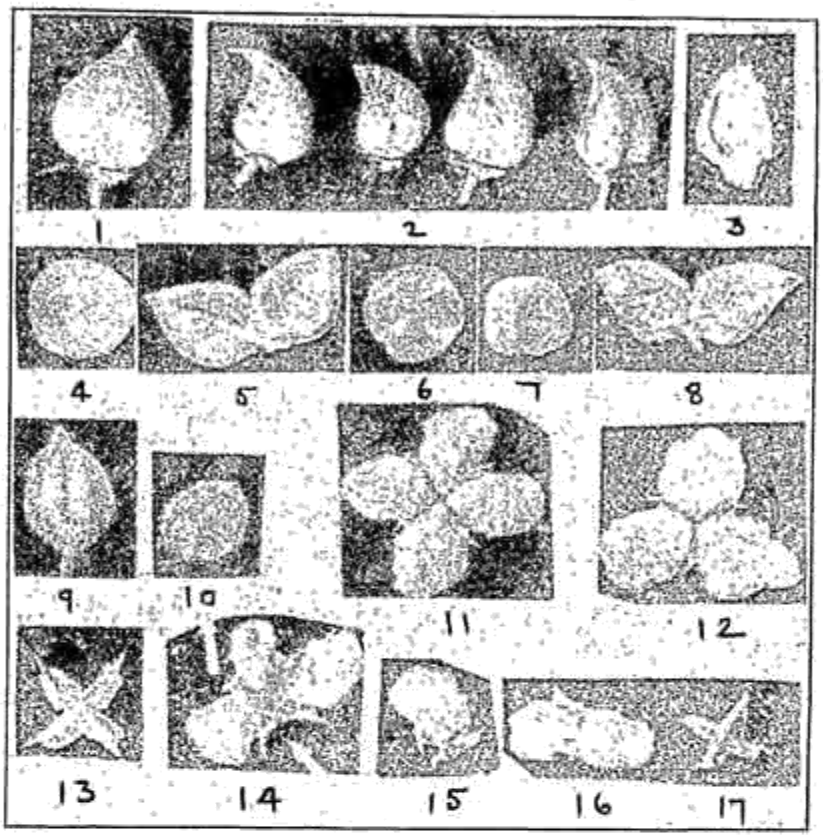
Investigations into the nature and causes of such an intensely localised non-development of ovules, its relation to boll shedding and its seasonal and varietal peculiarities were commenced at the Agricultural Research Station, Koilpatti, in 1939-40. A few interesting conclusions were arrived at in regard to the origin of skewness.

Observations. Uniformity in the development of all the ovules situated in a line in the multilocular ovary of the cotton boll appears to be a necessary condition for determining its shape and symmetry. It is found that the occurrence of a few undeveloped ovules at random in a mature boll does not cause any change in shape, but their presence in a series alters it. (Plate I figs. 1—17).

In fig. 1—3 are shown a normal boll, some skew bolls and a skew boll dissected exposing two locules with suppressed ovules. Fig. 4—10 show the internal morphology of a normal, and a skew boll. Dehisced fruits of normal and skew bolls are shown in fig. 11—17.

Skewness becomes visible when the boll is about a week old, and persists till maturity. The suppression of the ovules takes place commonly in one or two locules and occasionally in three. In all cases the ovary wall opposite the functionless ovules is atrophied, due possibly to the absence of the internal pressure generally developing in a normal locule with growing seeds. The wall is soft to the touch, and yields to gentle pressure testifying to the hollowness inside.

The skew boll is not the result of insect or fungoid disease; neither is it a freak. Its occurrence is fairly common. Random examination of 897 bolls in a bulk crop of K. 1 on a single day prior to the commencement of bursting showed that 30 bolls were skew (3·4%). The percentage was more in bolls from selfed plants. Eighty-eight out of 1,185 selfed bolls examined on the same day were skew bolls (7·4%). When classified according to



SKEW BOLLS IN COTTON

Figs. 1—17. 1. Normal boll; 2. Skew bolls; 3. Skew boll cut longitudinally; 4. Normal boll; 5. Normal boll split lengthwise; 6. Same cut across; 7. Skew boll; 8. Same split lengthwise; 9. Skew boll with aborted locule exposed; 10. Skew boll cut across; 11. Four-loculed normal boll; 12. Same three-loculed; 13. Normal four-loculed boll with kappas removed; 14. Four-loculed boll with one locule abortive; 15. Four-loculed boll with three locules aborted; 16. Three-loculed boll with one locule aborted. 17. Four-loculed skew boll with kappas removed.

locular composition it was noticed that the skew bolls were more in four-loculed bolls (10·3%) than in tri-locular bolls (3·8%). Cotton flowers are found to exhibit variations in contabescence from complete sterility of the androecium to degrees of sectorial contabescence. A hundred flowers with perfect anthers, a hundred with anthers showing sectorial contabescence and fifty flowers with complete sterility of anthers (practically pistillate) were at the time of flower opening tagged during mid-flowering season for study of the morphology of boll shape. Care was taken to see that the flowers were not unduly shaken while tagging. All the 39 bolls that developed from the first set of flowers were normal in shape. Out of 28 bolls that matured in the second set, six (21·4%) were skew. In the third set only seven bolls developed of which two (28·6%) were skew.

Experiments. A more definite evidence was obtained in an experiment on artificial pollination. Pollen grains were gathered on the hairy margins of torn off leaf bits and dusted on the lower regions of the stigma of emasculated flowers on the day of flowering at about 11 a. m., when the stigma was highly receptive. The pollen grains were then carefully distributed thinly and evenly on some of the stigmatic faces, while on others, no grains were left. With a powerful hand lens the number of grains thus deposited were counted and the lobes that had not received any pollen were also checked. A faint pin scratch was made across the line of dehiscence of the dusted lobe with the object of creating a permanent scar to facilitate identification later. The dusted flowers were enclosed in paper bags which were fastened in such a way as to avoid the possibility of the stigma rubbing against the paper. The stigmas were re-examined next morning to make sure that no pollen had strayed to the non-pollinated lobes.

Flowers in which all the stigmatic lobes were dusted, developed normal bolls, but those with a few lobes pollinated grew into skew bolls. It was therefore apparent that the pollen tubes developing from grains deposited low on the stigmatic lobes travelled down straight, entered the corresponding locule, and fertilised the ovules inside. The ovules in the other chambers did not get any pollen tubes and remained unfertilised causing skewness in the developing boll.

Discussion. A similar observation on the pollen tubes was made by Doak (1937) in a study on pistil anatomy in relation to experimental control of fertilisation. He remarks that though the arrangement of the pistil tissue "does not preclude the possibility of pollen tubes switching from the stigma of one carpel to the ovules of another during descent it is such as to disfavour this transfer. This is especially true of tubes grown from points low on the stigmatic lobes".

In the field, the stigma in the flower of K. 1 is well above the staminal column and the first part to get pollinated automatically is the basal region. Insects and wind tend to distribute pollen further up later in the day. Such a type of distribution is not possible in flowers which are selfed. Examination of 700 flowers on a single day in K. 1 bulk during mid-flowering

showed that 8 per cent were fully contabescent. These invariably shed when selfed. About 22 per cent were sectorially contabescent. In these flowers the stigmatic lobes near the contabescent portions of the androecium have no chance of self-pollination. But insects crawling about the stigma unwittingly effect a scattering of the available pollen all over, and thus will counteract the tendency towards skewness. In the absence of such an agency such flowers develop skew bolls. On selfing, the sectorially contabescent flowers produce skew bolls invariably. Thus, while skewness is facultative in open pollinated flowers it is obligate in selfed flowers. It is not improbable that the 3·4 per cent of skew bolls observed in nature is due to the fact that the flowers from which they matured are all sectorially contabescent and are not visited by insects. The selfed flowers suffer from a disadvantage in that the contabescent flowers do not have a chance of pollination by insects. This may account for the numerical preponderance of skew bolls from selfed flowers over those from open pollinated flowers. The conclusion drawn is that skewness is brought about by the non fertilisation of ovules in particular locules.

Further studies into the causes of the skewness are in progress and their results will be discussed in another paper.

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Palmyra Fibre Industry.

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Introduction. In many of the villages of the Vizagapatam district extraction of palmyra fibre is an important cottage industry. The industry is fairly an old one. As a typical cottage industry it provides sufficient employment to the ryot during his spare time and supplements his income from cultivation Of the different sources of brush fibre, the palmyra palm is easily the cheapest as it grows extensively on waste dry lands and on many field bunds. The technique of extraction is simple and does not involve the use of any costly appliances.

Narasimham (1) has dealt about the industry with special reference to Golukonda taluk of the Vizagapatam district. In the present article an account of the different phases of the industry is given, with particular reference to the economic aspect. The industry is mostly concentrated on