A DWARF MUTANT IN *NEGLECTUM VERUM* COTTON

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IN the year 1941 a dwarf plant with very small leaves and flowers was noticed by the writer in a large population of cotton plants belonging to the neglectum group and growing in the breeding area of the Jalgaon Farm. Its botanical characteristics and the genetic nature of dwarfness when studied gave the following information.

TABLE I

Characters of the mutant and normal plants

S. No.	Character	Mutant	Normal	Remarks
1	Plant height	30* cm.	100 cm.	The mutant plant presented a very distinct appearance in the field (Plate I).
2	Leaf length	6·5 ,,	12 ,,	
3	Length of middle lobe of leaf	5·0 ,,	10 ,,	
4	Breadth of middle lobe of leaf	1·1 ,,	2·1 ,,	
5	Margin of leaf	Wavy with stray projections	Smooth	
6	Presence of sinus lobes in a leaf	Present	Present	
7	Length of petal	3·4 cm.	4·7 cm.	
8	Breadth of Petal	2·1 ,,	3·7 ,,	
9	Petal colour	Deep yellow	Deep yellow	
10	Length of bract	2·4 cm.	2·9 cm.	
11	Breadth of bract	1·5 ,,	2·4 ,,	
12	No. of teeth in the bract	7	7	
13	Androeceum	Sparsely developed.	Normal	
14	Gynæceum	Stigma elongated, ovules sterile.	Stigma normal, ovules normal.	

* Figures in the table are the averages of six measurements in each case.

The above table shows that the various plant parts of the mutant are about half of the normal in size in most cases except the height which is about one-third of the normal. The number of teeth of the bract is, however, the same in both. The androœceum and gynæceum show normal development in the dwarf.

The few flowers that were found on the mutant did not set fruit either when selfed or crossed with a normal plant indicating its female sterility. When used as a male parent, however, for crossing with a normal plant it produced normal fruits and seeds.

The plant was crossed with two pure strains, *viz.*, N.R. 5 and B. XXI, with a view to study the genetical behaviour of the dwarf habit. Contrasting characteristics of the female parents are given in the table below:—

TABLE II

Parent	Petal colour	Habit of growth	Sinus lobe
N.R. 5	White (yy)	Normal (DD)	Present (ss)
B XXI	Pale yellow (yy)	Normal (DD)	Absent (SS)

TABLE III

Behaviour of F_1 and F_2 of the cross N.R. 5 × dwarf

F_1	Petal colour = Deep yellow	Habit of growth = Fully normal			
Classes in F_2	Yellow petal		White petal		Total
	Normal growth	Dwarf growth	Normal growth	Dwarf growth	
Frequency in F_2 (observed)	115	31	31	14	191
Frequency in F_2 (expected on 9:3:3:1)	107·4	35·8	35·8	11·9	190·6
Deviation	−7·6	−4·8	−4·8	−2·1	

9 : For 33 : 1 X^2 = 2·19 P between 0·70 and 0·50

TABLE IV

Behaviour of F_1 and F_2 of the cross B. XXI × dwarf

F_1	Sinus lobe = Absent	Habit of growth = Normal			
Classes in F_2	Sinus lobe absent		Sinus lobe present		Total
	Normal growth	Dwarf growth	Normal growth	Dwarf growth	
Frequency in F_2 (Observed)	108	42	35	12	197
Frequency in F_2 (expected on 9:3:3:1)	110·8	36·9	36·9	12·3	196·9
Deviation	−2·8	−5·1	−1·9	−0·3	

For 9 : 3 : 3 : 1 X^2 = 0·88 P between 0·90 and 0·80.

In respect of the above two crosses a good fit for the digenic ratio is observed.

From the results of the F_1 generation it is evident that the dwarf habit behaves as a recessive to the normal in both the crosses. In the cross N.R. 5 × dwarf (Table III) yellow petal of the dwarf is dominant to the white of N.R. 5. The F_2 behaviour of the petal colour and dwarf habit jointly give a 9 : 3 : 3 : 1 ratio indicating that the genes responsible for these characters are situated on different chromosomes.

I = Normal and dwarf plant.

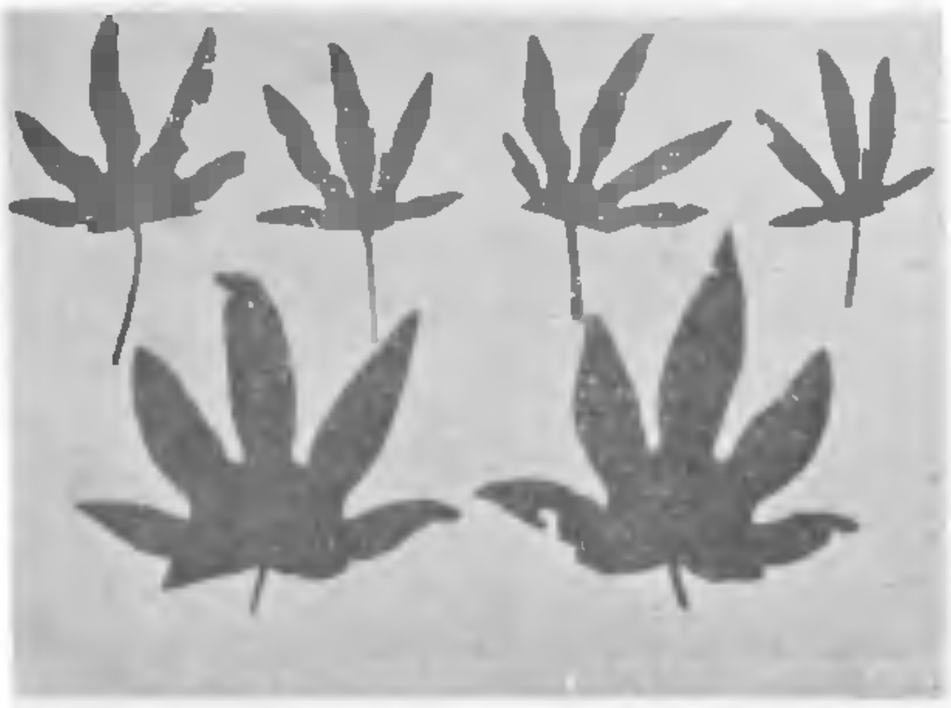
Left : Normal Plant.
Right : Dwarf Plant.

In the cross B. XXI × dwarf (Table IV) the absence of sinus lobes is dominant to its presence or that there is an inhibitor in the B.XXI parent which suppresses the expression of the lobe character in the F_1 generation. In F_2 generation the behaviour of sinus lobe and dwarf habit assort independently on a 9 : 3 : 3 : 1 basis indicating as in the first cross, that the genes controlling these characters lie on different chromosomes.

The genic symbols for the various characters have been assigned as below :—

Yellow petal = YY, White petal = yy.
Absence of Sinus Presence of sinus
sinus lobe = SS, or II ss. lobe = ss or ii ss.
Inhibitor = II.
Normal habit of growth = DD.
Dwarf habit of growth = dd.

It may be pointed out that all dwarf plants in the F_2 could be easily distinguished by their dwarf habit of growth, small leaves with wavy margins (Plate II) and small flowers. All such plants were self-sterile and, therefore, could not be grown further.



II = Leaves of dwarf plant with wavy margins.
Leaves of normal plant.
Top Row : Leaves of Dwarf Plant.
Bottom Row : Leaves of Normal Plant.

The mutant plant described above resembles in certain respects the crinkled dwarf mutant, observed in barbadense (Sea Island) cotton and also recorded in Egyptian cotton under the name crinkled leaf by Trought and has been found in hirsutum cotton by Hutchinson and Ghose. The points of resemblance in the mutant and the crinkled dwarf are (1) the torn and ragged leaf edges and (2) its simple recessive behaviour in the inter-varietal crosses. The leaf-surface of this mutant is smooth and green as opposed to the crinkled and mosaic leaf-surface of the crinkled dwarf.[1]

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1. Harland, S. C., *The Genetics of Cotton*, 1939, p. 79.

ATOMIC RESEARCH IN GREAT BRITAIN

A NEW Atomic Energy Research Establishment is being set up at Harwell (Britain). This estaolishment will be concerned with the development of the scientific and industrial aspect of nuclear energy and with the solution of the scientific problems which will arise in the large-scale production of fissile materials. Physics, Chemistry, Engineering and Biological Laboratories form the main centres of activity in the new establishment. A low-power graphite file is under construction and will be in operation shortly. A high-powered graphite file is also under construction which, when completed, will provide intense sources of radiations and produce, on a large scale, radioactive substances for scientific research and for medical work. For studies in fundamental nuclear physics of importance to atomic energy, an electrostatic generator for the production of 5 million volts and a "92-inch" cyclotron are being built. The Research Establishment is being manned by the large number of British scientists who acquired essential experience in atomic energy development in North America.

The present scientific staff working on the Harwell Project is about 250 of whom 35 are actually working at Harwell.