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Short Communication

GENETICS OF POD AND SEED SHAPE IN GROUNDNUT

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SUMMARY

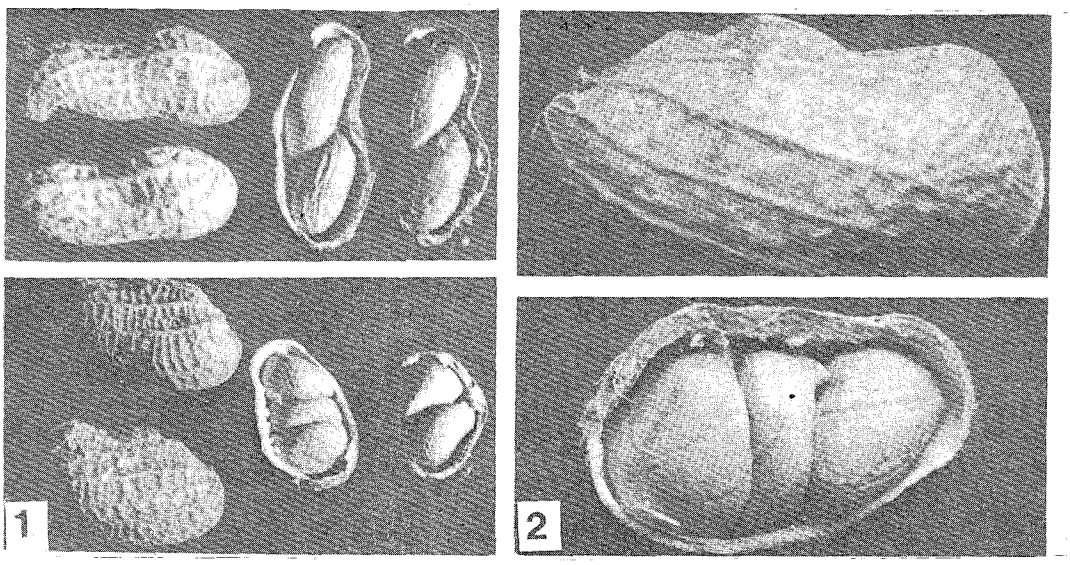
Inheritance of button type seeds was studied for the first time in groundnut, using 4 cross combinations. A stable advanced derivative of cross Co 1 x NCAc 17090 was found to produce pods with flat, button-shaped seeds instead of normal round or elongated ones. Also, the pods of this genotype had hard humps on their ventral side. The segregation pattern in F_2 and F_3 generations of crosses between 4 genotypes producing normal shaped pods and seeds and the one with humped pods and button type seeds indicated that pod and seed shapes in groundnut is controlled by 2 independent loci, *Psd psd* and *I i* . The action of *Psd* is partially inhibited by the dominant *I*, which led to the formation of flat, button-shaped but viable seeds instead of the usual round, oval-shaped or elongated seeds. The genes for humped pods and button type seeds were either closely linked or pleiotropic.

Key Words: Groundnut, seed, pod, inheritance.

The pod of groundnut, *Arachis hypogaea* L., is one-loculed indehiscent lomentiform carpel (Gregory et al. 1951). It consists of 1 to 5 seeds separated by moderate constriction. The unconstricted and deeply constricted pods are commercially unacceptable because of difficulties in mechanical shelling. Absence of pod constriction was reported to be controlled by 2 independent dominant genes (Badami 1928), 3 complementary genes (Hassan 1964) or interaction of nuclear and cytoplasmic factors (Coffelt & Hammons 1974). The seeds of groundnut are round to elongated in shape (Hayes 1933). The inheritance of unconstricted humped pods and button type seeds in groundnut has been reported here.

PBDR 25, a stabilized advanced derivative of the cross Co 1 x NCAc 17090 was observed to produce small (1 - 2.5 cm long), unconstricted. 2-4 seeded pods with hard humps on the ventral side of the pod (Figs. 1, 2). In 2-seeded pods, the seeds at one end were always flat while in 3- or 4-seeded pods the middle seeds were flat at both ends, looking like buttons. The genotype was selfed for 5 generations and found to breed true for the above traits. It was then crossed as male parent with 4 cultivars, namely , M 13, GAUG 10, C 363 and Karad 4-11, all having moderately constricted 2-seeded pods with usual round or elongated seeds. The F_1 generation was space-planted for realising maximum number of F_2 progeny. The F_2 generation was grown in kharif 1989 and observation on pod and seed characters were recorded after harvest. The F_2 plant-to-F_3 progeny rows were grown in summer 1990. The validity of expected genetic ratios was tested by the chi-square test.

All the F_1 hybrids produced unconstricted humped pods with button type seeds, as in PBDR 25 (Figs. 1, 2). In F_2, the segregation of plants with humped pods and button type seeds and those



Figs. 1 & 2: Pod and seed shapes in groundnut. 1. Normal pods and seeds (top) and humped pods containing button type seeds (bottom). 2. A close view of pods of genotype PBDR 25 showing button type seeds (bottom) and humps on ventral side of the pod (top).

TABLE 1: Inheritance pattern of button type seeds in groundnut.

Cross	Segregation in F_2				F_3 progeny grown from button type F_2 plants		
	Button type	Normal type	Total	X^2 (13:3)	Segregating	Non-segregating	X^2 (6:7)
GUAG 10 x PBDR 25	162	25	187	3.55	45	59	1.42
Karad 4-11 x PBDR 25	52	9	61	0.64	11	20	0.34
M 13 x PBDR 25	83	16	99	0.48	-	-	-
C 384 x PBDR 25	43	6	49	1.36	-	-	-

X^2 values were non-significant

producing normal type of pods and seeds was distinct in all the 4 cross combinations, and showed a good fit to the expected ratio of 13 button type : 3 normal type, indicating presence of inhibitory genes (Table 1). There were no plants with intermediate seed shape in the F_2 generation. The number of segregating and non-segregating families was recorded in F_3 generation for 2 cross combinations, GAUG 10 x PBDR 25 and Karad 4-11 x PBDR 25. In both the crosses, the ratio of segregating and non-segregating families derived from F_2 plants with button type seeds showed a good fit to the expected ratio of 6 : 7. 4 of the 20 F_3 families derived from normal seeded F_2 s of the cross GAUG 10 x PBDR 25 also segregated for plants with normal seeds and those with button type seeds.

These results suggest that the button type seeds are controlled by 2 independent loci. It is proposed that the locus *Psd psd* is essential for normal (round or elongated) shape of seeds. Another locus, *I i,* inhibits the action of *Psd-* when in dominant condition. Thus, F_2 plants with the genotypes *I- Psd-, I- psd psd* and *ii psd psd* produce button type seeds, whereas those with ii Psd- will have normal seed shape.

The button type seeds were viable and produced healthy plants, suggesting that the inhibitory gene, *I,* affects the action of *Psd-* only during the later stages of seed development. Since the humped pods and button type seeds are always associated, it is proposed that these traits are either closely linked or pleiotropic. This is the first report on the presence of inhibitory genes for seed development in groundnut.

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