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STUDY ON TRANSGESSIVE SEGRIGATION IN GROUNDNUT

(*Arachis hypogaea L.*)

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Abstract

Present investigation on transgressive segregation means a production of plants in the segregating generations, that are superior to both the parents for one or more characters by accumulation of favourable genes from both the parents, as a consequence of segregation and recombination. Transgressive segregants in desirable direction were observed for all characters in F_2 generation of all three crosses. In general the highest proportion of transgressive segregants were recorded for Dry pod yield per plant (gm), followed by Harvest index%, Number of mature pods per plant, Days to 50% flowering, 100 kernel wt (gm), Sound mature kernel% and shelling%. The most promising transgressive segregants *viz.,* plant No.45 of Phule Unnati x TPG 41, plant No.222 of Phule 6021 x RHRG 6110, plant No.111 of Phule 6021 x SB XI transgressed Dry pod yield per plant (gm) in addition to the higher expression of other three or four characters than the increasing parent. They produced 46.77 (Phule Unnati x TPG 41,), 76.79 (Phule 6021 x RHRG 6110) and 66.52 (Phule Unnati x SB XI) per cent more Dry pod yield per plant (gm) than their respective increasing parents. These transgressants needs to be evaluated further for maintaining consistency in their performance. If they found superior in further generations, they may be identified as improved varieties after adequate evaluation or used in future breeding programme for amulgamation of desired genetic constellations

Introduction

Groundnut (*Arachis hypogaea L.*) is a major oilseed crop in India. The crop accounts for near about 45.00 per cent of total area under oilseed and 55.00 per cent of the oilseed produced in the country. Groundnut seeds contain about 50.00 per cent edible oil and 25.00 per cent protein. The haulms are used as valuable nutritious fodder. Groundnut oil cake is an important cattle feed and a good soil amendment.

Production of transgressive segregants for yield and its components like Dry pod yield, harvest index and mature pod number, plays a vital role in breeding programme. Although transgressive segregants includes lines which fall outside the range of performance of either parents, but only those being superior to better parents in desirable direction are of practical value. Therefore, a breeder is more concerned with obtaining higher frequency of transgressive segregants in segregating population, as it provides him a better scope for exercising selection to improve productivity

The present study was undertaken to access variability and transgressive segregants in a set of groundnut genotypes irrespective of their growth habit for yield and other component characters.

Materials and Methods

The material used in the present study consisted of nine crosses of groundnut. The crosses were obtained from the Groundnut Breeder, All India Co-ordinated Research Project, on Groundnut, M.P.K.V.Rahuri. The experiment was conducted in a randomized block design with three replications. Each plot consisted of a single row of 5 m length with a spacing of 30 cm between rows and 10 cm between plants. One border row was sown at both the sides of block to reduce the border effect. The parents and F_2 generations of three crosses for the transgressive segregation &Nine crosses for genetic variability were used for conducting an experiment during summer-2015.

Result and Discusion

Transgressive segregation

The conventional idea of hybridization is to recombine the desirable characteristics in a new hybrid derivative, already observed in two parents involved in hybridization. The occurrence of transgressive segregants in segregating generation suggests that, transgressive breeding can be used as positive tool in plant breeding. The studies on transgressive segregation in the segregating generation, suggest that parent do not represent the extremes in terms of intensities of desired characters. If some genes for enhanced expression of a character are lacking in the genotype of the increasing parent but are present in donar parent, some individuals among the hybrid derivatives, emanating from the cross of these parents, might receive a fortuitous gene combination showing a larger effect than produced by either of the parents (Gardner, 1968). Smith (1966) suggested that in order to have reasonable chance of getting transgressive segregants, parents should have favorable expressions of the desirable characters and they should be rather distantly related so that desired character in the two parents may be controlled by differing set of genes.

Not much information is available on this aspect in groundnut. Hence, some research reports on pulses and oilseeds are discussed here. Auckland and Singh (1976) were the first to report transgressive segregants in this crop. Hence present study was carried out to provide information on transgressive segregation in straight F_2 originating from three groundnut crosses made among the five genotypes namely, Phule Unnati x TPG-41 (Cross1), Phule 6021 x RHRG 6110 (Cross2), Phule Unnati x SB XI (Cross3).

Transgressive segregants

Transgressive segregation is considered as an important tool by the plant breeder to bring about crop improvement. Due to segregation and recombination, in certain cases transgressive segregants are produced in F_2 or latter generations by accumulation of favourable genes from the parents involved in hybridization. Bahl (1979) initiated the work on Kabuli-Deshi introgression and reported encouraging results from this line of work. He could isolate early maturing types with determinant growth habit and better harvest index as compared to standard check variety. He also suggested that three ways instead of single cross are more useful for introgression of new germplasm in to breeding population.

It is interesting to note that, in the present study, transgressants were recorded in each of the three crosses in F_2 generation for all the seven characters (Table 7 to 24). In case of Dry pod yield per plant (gm), the highest proportion of individuals 14.33 to 24.67 percent transgressed beyond the increasing parent in total the three crosses, followed by Harvest index% 14.33 to 22.33, No of mature pod per plant 12.00 to 29.67

and Days of 50% flowering in which 12.33 to 29.00 per cent individuals were transgressed beyond the increasing parents. Rest of the characters in order of decreasing proportion of transgressive segregants were 100 Kernel weight (gm) 4.00 to 22.26 ,Sound mature Kernel% 7.67 to 18.54 and Shelling % 4.00 to 5.00.

Auckland and Singh (1976) reported transgressive segregants in respect of plant height (cm), number of seeds per pod, pod number and grain yield per plant (gm) in F_2 generation. Haddad (1979) isolated transgessants in Lentil in term of earliness, tallness, erectness, high pod number and high yield. Ugale (1980) reported transgressants for all these characters except pod length and cluster per plant with the highest proportion of individuals for plant spread (30.77 %). Kant and Singh (1998) observed transgressive segregants for plant height, yield per plant, primary branches per plant, secondary branches per plant, pods per plant, seed per pod and 100-seed weight. Girase and Deshmukh (2002) reported transgressive segregants for all seven characters like plant height, plant spread, fruiting branches per plant, pods per plant, seeds per pod and 100-seed weight, yield per plant. They observed the highest transgressive segregation for plant height (27%) followed by pods per plant, fruiting branches per plant and yield per plant in both F_2 and F_3 generation of all the three crosses.

If we consider ranking based on the proportion of transgressive segregants in F_2 generation, we find that top ranks for majority of the characters were shared by cross 2 depending on the involvement of increasing parent. The first rank appeared for three characters in Phule 6021 x RHRG 6110 (Table 25), whereas it was for one characters in Phule Unnati x TPG-41 and three character in Phule Unnati x SB XI. In general Phule Unnati x TPG-41 secured second rank for majority of the characters, which indicated relatively lesser number of transgressive segregants.

Apart from the frequency of transgressants, it will be of great interest to examine the intensities of the characters achieved in the transgressants in each of the crosses. This will provide an insight into the extended limits and intensities of desired characters achieved by transgressive breeding. In the present investigation, the highest yielding transgressants in crosses 1, 2, and 3 produced 59.40, 64.23, and 59.40 Dry pod yield per plant (gm), respectively as against 40.47, 36.33 and 35.67 g per plant, produced by their respective increasing parents. These intensities for Dry pod yield per plant were 76.79 (Phule 6021 x RHRG 6110), 66.52 (Phule Unnati x SB XI) & 46.77 (Phule Unnati x TPG-41), per cent higher than those of their respective increasing parents.

Table 1

Ranking of F_2 generation based on proportion of the

Ranking of F_2 generation based on proportion of the transgressive segregants for different characters in three crosses

Characters	Cross No.	Increasing parent	F_2	Rank
Days to 50% flowering	1	TPG-41(+)	43.97	1
	2	Phule 6021(+)	41.91	2
	3	SB XI (+)	40.59	3
No of mature pod/plant	1	Phule Unnati(+)	48.75	1
	2	Phule 6021(+)	43.86	2
	3	Phule Unnati(+)	41.55	3
Dry pod yield/plant(gm)	1	TPG-41(+)	40.77	2
	2	Phule 6021(+)	37.92	3
	3	Phule Unnati(+)	43.09	1
Hundred kernel wt(gm)	1	TPG-41(+)	45.52	1
	2	Phule 6021(+)	39.99	3
	3	Phule Unnati(+)	43.61	2
Shelling %.	1	TPG-41(+)	65.79	3
	2	RHRG 6110(+)	66.45	1
	3	Phule Unnati(+)	65.83	2
Harvest index% wt basis	1	TPG -41(+)	38.37	2
	2	Phule 6021(+)	46.08	1
	3	Phule Unnati(+)	37.89	3
Sound mature kernel%	1	Phule Unnati(+)	86.64	2
	2	Phule 6021(+)	84.21	3
	3	SB XI(+)	86.80	1

Table 1

Means, Standard deviations, frequency distribution and percentage of desirable transgressive segregants (T.S.) in different generations of the cross Phule Unnati x TPG 41 for the traits

Sr. No.	Generations	Mean±SE.	S.D.	Frequency distribution in standard deviation units											Frequency Total	N.D. value	Percentage of T.S.
				-5	-4	-3	-2	-1	0	1	2	3	4	5			
A.	**Sound Mature Kernel%**																
1.	P.unnati(+)	86.00±0.65	2.54	-	-	-	-	-	-	-	-	-		-	15	-	-
2.	TPG 41(-)	84.67± 0.47	1.84	-	-	-	-	-	-	-	-	-	-	-	15	-	-
3.	F_2	86.64± 0.18	3.16	-	-	-	-	24	253	22	1	-	-	-	300	-0.62	7.67

(+) = Increasing parent N.D. = Normal deviation

(-) = Decreasing parent S.D. = Standard deviation

Table 2

Threshold value, frequency and range in values of transgressive segregants for seven agronomic characters of the cross Phule Unnati x TPG-41.

Sr. No.	Characters	Threshold value	Transgressive segregation F_2	
			Frequency	Range
1.	Days of 50% flowering	45.27	47	48.77-55.80
2.	No.of mature pod/plant	43.07	67	53.73-85.74
3.	Dry pod weight/plant(g)	40.47	53	45.20-59.40
4.	100 kernel weight(g)	48.07	16	55.26-69.66
5	Shelling %	67.23	40	72.83-78.44
6	Harvest Index	37.93	67	44.19-50.45
7	Sound Mature Kernel%	87.00	23	91.96-96.93

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