

INHERITANCE OF CHLOROPHYLL DEFICIENCY IN INTRASPECIFIC CROSSES OF GROUNDNUT

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The study of F₂ plants of intraspecific hybrid between sub sp. *hypogaea* and sub sp. *fastigiata* of groundnut *Arachis hypogaea* L. showed the varying spectrum of chlorophyll deficient seedlings. The segregation pattern in F₂ occurred in the ratio of 15:1 for green *versus* chlorophyll deficient seedlings, indicating the dihybrid ratio controlled by duplicate factors. Since the ratio is identical in both direct and reciprocal crosses the influence of cytoplasm is ruled out. The spectrum of chlorophyll deficient seedlings consists of *albina*, *viridis* and *chlorina*.

In groundnut (*Arachis hypogaea* L.) two natural or botanical groups namely spanish - valencia and virginia were recognised (Hammons, 1968). The spanish-valencia groundnuts are bunch in habit of growth with sequential flowering pattern. The virginia forms have alternate branching habit which are further sub divided into virginia bunch and virginia runner (Sarma *et al.*, 1970). Thus two such species namely sub sp. *hypogaea* and sub sp. *fastigiata* were recognised by groundnut workers (Gibbons *et al.*, 1971)

MATERIALS AND METHODS

Two cross combinations involving R33-1 (sub sp. *hypogaea*) as female parent and VG18 and VG19 (sub sp. *fastigiata*) as male parents and their reciprocal crosses were effected. The hybrid pods were collected and raised as F₁ generation along with parents. The real hybrid plants were identified based on pod reticulation and growth habit and harvested as single plants. The F₂ generation was raised on single plant basis. Chlorophyll deficient seedlings

were observed along with normal green seedlings. The seedlings were examined from 8th to 15th day after sowing and classified as proposed by Gustafsson (1940). The segregation ratio was subjected to chi square test of goodness of fit.

RESULTS AND DISCUSSION

The F₁ plants were all green with normal pod setting. In F₂ generation the crosses involving R33-1 X VG18 and R33-1 X VG19 and their reciprocals three types of chlorophyll deficient seedlings were observed namely *albina*, *viridis* and *chlorina*. The segregation pattern in F₂ occurred in the ratio of 15:1 for green *versus* chlorophyll deficient seedlings (Table.1) indicating the dihybrid ratio controlled by duplicate factors. Since the chisquare values were not significant, between direct and reciprocal crosses the influence of cytoplasm on chlorophyll deficiency is ruled out.

The cytological behaviour of F₁ of intraspecific origin from many previous studies (Raman, 1976) did not reveal any large structural differences. The absence of sterility in the F₁ also pointed

Table 1 Chisquare test for 15:1 dihybrid ratio

Name of the cross	Filial generation	Normal green seedlings	Chlorophyll deficient seedlings	Ratio	X 2 value	p value between
VG 19 X R33-1	F1	16	1	—	—	—
	F2	645	35	15:1	1.32 NS	0.30-0.20
R33-1 X VG 19	F1	26	—	—	—	—
	F2	1042	63	15:1	0.53 NS	0.50-0.30
VG18 X R 33-1	F1	18	—	—	—	—
	F2	646	39	15:1	0.34 NS	0.95-0.50
R33-1 X VG18	F1	15	—	—	—	—
	F2	714	52	15:1	0.35 NS	0.95-0.50

NS — Not significantly deviating from zero

1 and 3 are direct crosses and 2 and 4 its reciprocals.

Table 2 Frequency of Normal and Chlorophyll Seedlings in Direct and Reciprocal Crosses

Name of the cross	Normal green seedlings	Total Chlorophyll deficient seedlings	Spectrum of Chlorophyll deficient seedling		
			albina	viridis	chlorina
VG19 X R33-1	645	35	15 (42.86)	14 (40.00)	6 (17.14)
R33-1 X VG19	1042	63	44 (69.84)	9 (14.29)	10 (15.87)
VG18 X R33-1	646	39	30 (76.92)	4 (10.26)	5 (12.82)
R33-1 X VG18	714	52	38 (73.08)	10 (19.23)	4 (7.69)

In parenthesis : Percentage occurrence of individual types

out the fact that cryptic structural difference between the genomes of two sub sp. *hypogaea* and *fastigiata* may not exist (Raman, 1976). However, the abnormalities by way of albinos noticed in the F2 indicate some amount of differentiation between the sub species. Since groundnut is known to be an segmental allotetraploid, it is postulated that the differentiation by way of mutations leading to distinct growth habits could have occurred early in the evolutionary process. Mutations leading to the recessives producing chlorophyll deficiencies in the duplicate loci could also have occurred and persisted.

Coffelt and Hammons (1971, 1972) are of the opinion that the chlorophyll abnormalities and other deviations demonstrate how undesirable recessive alleles can accumulate in a self pollinating species if there are traits controlled by duplicate factors. That is, where there are duplications and especially in amphidiploids and higher allopolyploids originating from species having many like loci, there will be selection against undesirable recessive mutant alleles masked by a normal one in the second locus as long as there is self pollination. There will be some selection against these alleles after certain chance crosses but even then it will be limited,

Chlorophyll deficiency is also controlled by 63:1 trigenic ratio in entirely different set of cross combinations (ICR-

ISAT, 1982) indicating that the gene action may vary with genotypes.

The spectrum of chlorophyll deficiency consists of *albina*, *viridis* and *chlorina*. Among them occurrence of *albina* dominated in all crosses (Table. 2) However definite ratio could not be derived.

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