GENETIC ANALYSIS AND REGRESSION STUDIES FOR YIELD AND YIELD ATTRIBUTES IN F_2 SEGREGATING POPULATIONS OF GROUNDNUT CROSSES

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ABSTRACT

GCV and PCV values were high for number of secondary branches per plant, pod yield per plant, kernel yield per plant and Jassid incidence. Moderate GCV and PCV were observed for shelling out-turn and 100- kernel weight. Low values of GCV and PCV were recorded for days to initial flowering, days to maturity, number of primary branches, SCMR, late leaf spot and rust. This low variability may be due to the presence of both positive and negative alleles for these characters. All the characters showed high heritability values ranged from 66.67 % (number of primary branches per plant) to 99.50%. High heritability along with the GAM was high for number of secondary branches per plant, shelling out-turn, kernel yield per plant and 100- kernel weight, indicated the importance of additive gene action hence, mass selection procedure can be used to improve the pod yield. Regression coefficient values indicated that number of primary branches per plant had significant positive relation with pod yield (r^2 = 0.4395), pod yield per plant with kernel yield (r^2 = 0.9999), shelling out-turn with kernel yield (r^2 = 0.4333) and SPAD chlorophyll meter reading with jassid incidence (r^2 = 0.0026).

INTRODUCTION

Groundnut is the major oilseed crop in India and in Andhra Pradesh it is being grown in an area of 19.25 lakh ha with a production of 17.17 lakh tones and a productivity of 924 kg ha^{-1} and is mainly cultivated as rainfed crop during Kharif season in dry lands where the most important abiotic stress factor limiting groundnut yield is drought. The productivity is considered to be low because groundnut is predominately grown under rainfed (80%). Yield is also affected by moisture stress during critical stages of crop growth and pod formation and also affected by biotic stresses (sucking insects and foliar diseases). In this situation, varieties that could perform better under moisture stress and to some excess moisture situations and also resistant to biotic stresses are needed. The physiological trait that is SCMR (SPAD chlorophyll meter reading) was found to be a rapid and low cost and breeder friendly technique to screen for water use efficiency (WUE) in segregating population.

MATERIAL AND METHODS

The experimental material comprised of six F_2 populations. The six F_2 s were grown in randomized block complete design with three replications *kharif* 2002. Each entry was sown in three rows of 3 m length and adopted a spacing of 30 x 10 cm. The observations were recorded on twenty five competitive plants selected at random for

twelve characters *viz*., days to initial flowering, days to maturity, number of primary branches per plant, number of secondary branches per plant, SCMR, pod yield per plant (g), shelling out-turn (%), kernel yield per plant (g), 100- kernel weight (g), severity of Late leaf spot and rust (on 1-9 scale) and Jassid incidence (%). SCMR was recorded on the third leaf of all twenty five plants in each progeny at 55-60 days after sowing. Days to initial flowering and physiological maturity, severity of late leaf spot, rust and Jassid incidence was recorded on the basis of crop. Other observations were recorded at the time of harvest and after harvest. The genotypic and phenotypic coefficients of variations were computed according to Burton (1952). The heritability in broad sense was computed as suggested by Allard (1960) and GAM as per Johnson *et al* (1955).

RESULTS AND DISCUSSION

The analysis of variance for pod yield and its components indicated significant differences among the crosses for all the characters. Tables 1 and 2 revealed very low magnitude of difference between genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for most of the characters studied indicating little environmental influence. GCV and PCV values were high for number of secondary branches per plant, pod yield per plant, kernel yield per plant and Jassid incidence. Moderate GCV and PCV were observed for shelling out-turn and 100- kernel weight. Low values of GCV and PCV were recorded for days to initial flowering, days to maturity, number of primary branches, SCMR, late leaf spot and rust. This low variability may be due to the presence of both positive and negative alleles for these characters.

All the characters showed high heritability values ranged from 66.67 % (number of primary branches per plant) to 99.50% (Jassid incidence). Jayalakshmi *et al* (1998), Isleib *et al* (1978) and John *et al* (2005) also confirmed the above findings. High heritability along with the genetic advance expressed in percentage of mean was high for number of secondary branches per plant, shelling out-turn, kernel yield per plant, 100-kernel weight, late leaf spot, rust and Jassid incidence indicated the importance of additive gene action in the inheritance of these characters are controlled by additive gene action, hence mass selection procedure can be used to improve pod yield. For yield

improvement all the contributing characters except foliar diseases and Jassid incidence would have the scope for selection. Similar results were reported by Reddy and Gupta (1992) and Vasanthi and Raja Reddy (2002) in groundnut. Regression coefficient studies (Fig - 1 to Fig - 4) indicated that number of primary branches per plant had significant positive relation with pod yield (r^2 = 0.4395), pod yield per plant with kernel yield (r^2 = 0.9999), shelling out-turn with kernel yield (r^2 = 0.4333) and SPAD chlorophyll meter reading with jassid incidence (r^2 = 0.0026). It showed that jassid incidence was low due to high SPAD chlorophyll meter reading. Similar results were reported by John *et al* (2005) in groundnut.

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Table 1. Mean values for pod yield and its attributes in F_2 segregating populations of groundnut

S.No.	Character	Mean	Range	Critical difference (CD)	Standard error of mean	C.V (%)	F- Value
1	Days to initial flowering	20.20	18.67-31.00	0.56	0.29	3.00	8.92
2	Days to maturity	100.78	97.67-102.67	1.06	0.54	0.67	16.63
3	Number of primary branches per plant	4.17	3.98-4.78	0.23	0.12	17.05	6.67
4	Number of secondary branches per plant	0.44	1.00-2.22	0.07	0.36	10.11	926.32
5	SCMR	31.04	27.10-39.37	0.48	0.25	9.80	32.44
6	Pod yield per plant (g)	13.45	8.26-19.45	0.17	0.09	3.77	152.44
7	Shelling out-turn (%)	68.72	51.00-79.67	1.79	0.92	1.63	114.96
8	Kernel yield per plant (g)	9.24	4.21-15.49	0.38	0.19	12.03	11.09
9	100- kernel weight (g)	27.72	21.00-36.67	6.14	3.15	7.84	17.33
10	Severity of late leaf spot (1-9 scale)	8.17	7.00-9.00	0.47	0.24	3.60	7.02
11	Severity of rust (1-9 scale)	5.89	4.00-6.00	1.19	0.10	1.86	34.00
12	Jassid incidence (%)	34.41	9.67-46.67	1.19	0.61	2.17	599.57

Table 2. Estimates of genetic parameters for twelve characters in F_2 segregating populations of groundnut

S.No.	Character	Genotypic variance	Phenotypic variance	Coefficient of variance		Heritability (%) in broad sense	GA	GAM
				Genotypic	Phenotypic			
1	Days to initial flowering	1.13	1.55	4.81	5.70	72.90	1.87	8.56
2	Days to maturity	2.33	2.78	1.54	1.68	83.81	2.84	2.86
3	Number of primary branches per plant	0.04	0.06	4.80	5.87	66.67	0.34	8.11
4	Number of secondary branches per plant	0.61	0.64	177.51	181.82	95.31	1.57	356.82
5	SCMR	0.94	1.03	3.12	3.27	95.43	1.99	6.39
6	Pod yield per plant (g)	0.54	0.55	25.78	26.02	98.18	1.50	11.15
7	Shelling out-turn (%)	47.82	49.08	10.06	10.19	98.72	142.22	207.28
8	Kernel yield per plant (g)	0.19	0.25	22.13	25.13	76.00	7.83	84.74
9	100- kernel weight (g)	25.69	30.42	18.29	19.90	84.48	9.54	17.36
10	Severity of Late leaf spot (1-9 scale)	0.17	0.26	5.06	6.21	65.38	1.41	15.76
11	Severity of rust (1-9 scale)	0.22	0.24	7.96	8.32	91.67	0.93	61.28
12	Jassid incidence (%)	111.73	112.29	30.72	30.80	99.50	21.09	61.29

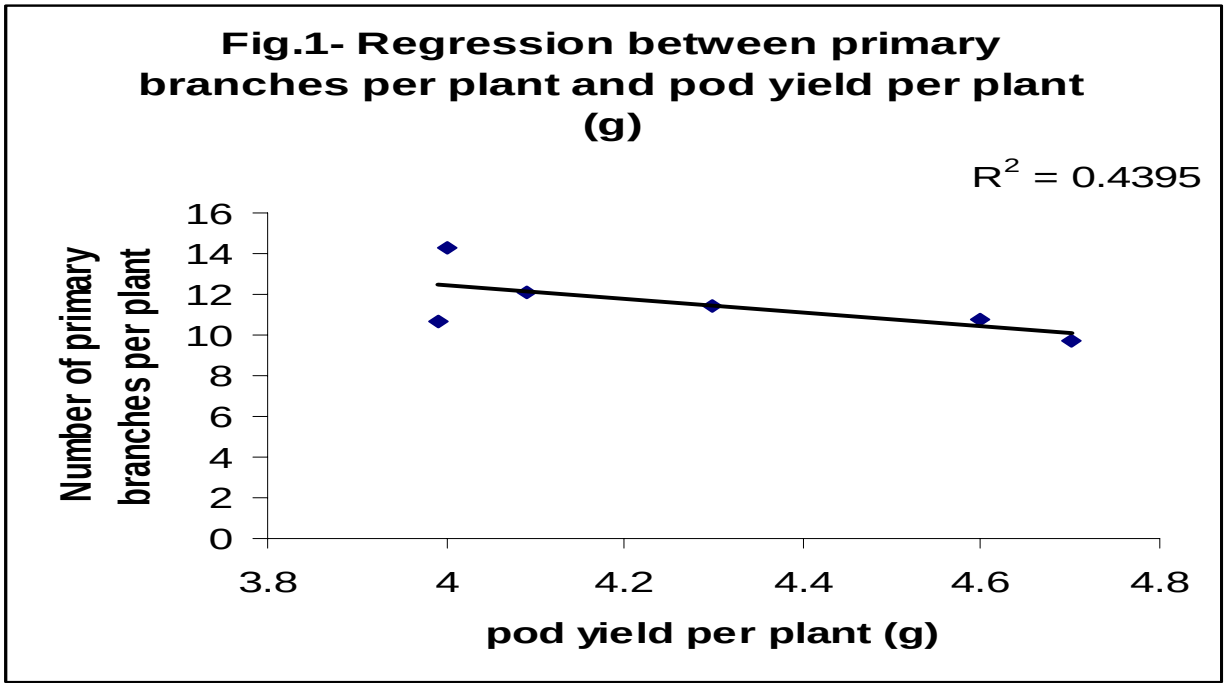
Fig.1- Regression between primary branches per plant and pod yield per plant (g)
R2 = 0.4395
Number of primary branches per plant
16
14
12
10
8
6
4
2
0
3.8
4
4.2
4.4
4.6
4.8
pod yield per plant (g)

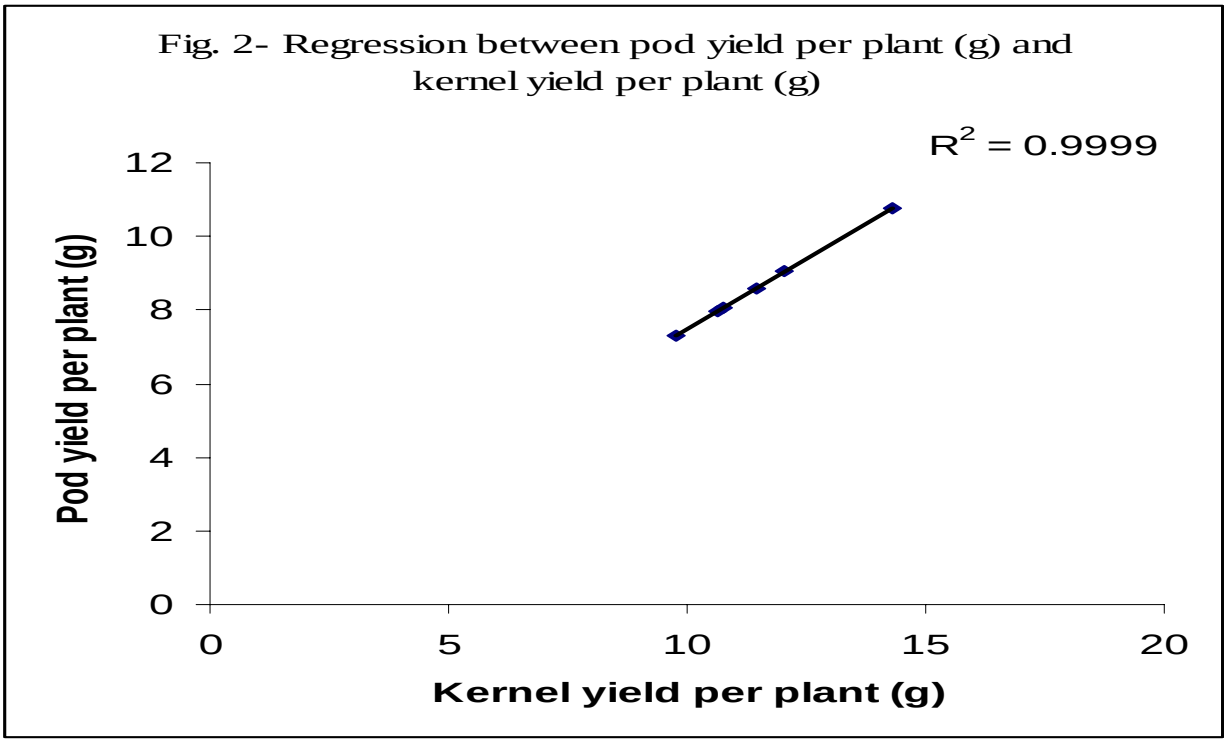
Fig. 2- Regression between pod yield per plant (g) and kernel yield per plant (g)
R2 = 0.9999
Pod yield per plant (g)
12
10
8
6
4
2
0
0
5
10
15
20
Kernel yield per plant (g)

Fig. 3- Regression between Shelling out-turn (%) and Kernel yield per plant (g)

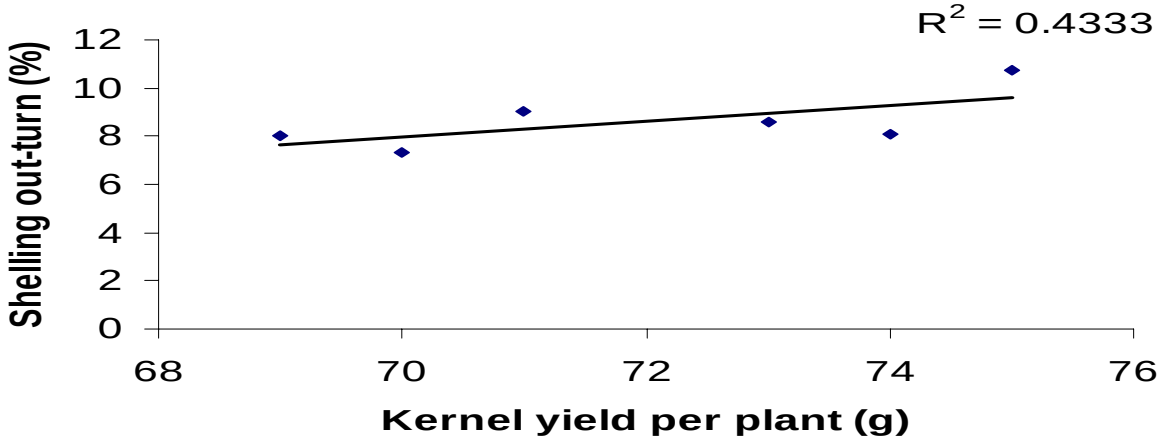

Fig.4- Regression between SPAD chlorophyll meter reading and Jassid incidence (%)