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Evaluation of Recombinant Inbred Lines (RILs) of the Cross GKVK 4 x NRCG 12473 for Pod Yield and Identification of Elite Lines in Groundnut (*Arachis hypogaea* L.)

S. K. Savita and D. L. Savithramma
Department of Genetics and Plant Breeding, College of Agriculture, UAS, GKVK, Bengaluru - 560 065

Abstract

Two hundred and fifty Recombinant inbred lines (RILs) of cross GKVK 4 x NRCG 12473 in F7 generations, their parents and two verities (TMV 2 and KCG 2) were evaluated for the performance and genetic variability for pod yield and yield related traits during Kharif 2014. The phenotypic co-efficient of variability (PCV) and genotypic co-efficient of variability (GCV) estimates were relatively high for number of pods per plant, sound mature kernel percentage, kernel yield per plant and pod yield per plant suggested the presence of considerable variability in the population. Hence, individual plant selection can be practiced for the above mentioned characters to get higher yields. High heritability coupled with high genetic advance as per cent of mean was observed for characters like number of pods per plant, shelling percentage, sound mature kernel percentage, kernel yield per plant and pod yield per plant indicating the involvement of additive gene action. Based on the mean performance of the genotypes, RIL 1100-6-8, RIL 1511-12-3, RIL 1326-2-8, RIL 1040-14-2, RIL 1609-6-7, RIL 1663-4-8, RIL 1326-2-2, RIL 1026-10-5 and RIL 1546-6-8 could be considered as elite genotypes for improving groundnut pod yield.

Groundnut (*Arachis hypogaea* L.) is a major crop in most tropical and subtropical regions of the world and in India it ranks first among edible oilseed group. Groundnut is a rich source of edible oil (40-55%) and protein (22-28%). Genetic variability is the prerequisite for crop improvement, as this provides wider scope for selection. The success of any breeding programme depends upon the quantum of genetic variability present in the population. Wider range of genetic variability helps in selecting desired genotypes. In addition to genetic variability, knowledge on heritability and genetic advance as per cent of mean helps in selection of a particular yield contributing traits. Therefore, it is necessary to have knowledge of genetic variability, heritability and genetic advance as per cent of mean present in the available genotypes. Hence, in the present investigation an attempt was made to determine the performance of 250 F7 RILs of the cross GKVK 4 and NRCG 12473 to assess the variability of pod yield and yield attributes.

The present experimental material consisted of 250 F7 RIL population developed through single seed descent method using parental lines GKVK 4 and NRCG 12473 which are diverse for traits Carbon isotope discrimination ($\Delta^{13}C$), Specific leaf area (SLA) and SPAD chlorophyll meter reading (SCMR), which are surrogate traits of WUE and pod yield and yield attributes. Hence population was developed for the QTL mapping for yield and yield related characters. These were grown in an augmented design including parents (GKVK 4 and NRCG 12473) and checks (TMV-2 KCG-2) with a spacing of 30 x 10 cm during kharif 2014 at UAS, GKVK, Bengaluru. Observations were recorded on five randomly chosen plants from each RILs. Five characters *viz.*, number of pods per plant, kernel yield per plant, shelling percentage, sound mature kernel percentage and pod yield per plant were recorded. The GCV and PCV were computed as suggested by Robinson *et al,* (1949). Heritability in broad sense and genetic advance were worked out as per the method outlined by Hanson *et al.* (1956).

Analysis of variance in F7 RIL population of the cross GKVK 4 X NRCG12473 (Table I) revealed significant differences among the lines indicating the presence of genetic variability. Presence of high variability for these characters were in agreement with the results obtained by Suvarna *et al.* (2004), Gopinath *et al.* (2008) and Nandini *et al.* (2011). This was further supported by the fact that range has been also quite wider for all the characters also pointing out extreme genotypes for selection.

TABLE I

Analysis of variance for pod yield and its component traits in F7 recombinant inbred lines of the cross GKVK 4 × NRCG 12473 in groundnut

Source of variation	DF	Number of pods per plant	Shelling per cent	Sound mature kernel per cent	Kernel yield per plant (g)	Pod yield per plant (g)
Block (eliminating Checks+RILs)	9	17.06**	49.92 *	45.01***	1.70*	3.37 **
(Checks+RILs) (ignoring Blocks)	253	70.51***	109.22***	298.19***	7.35***	19.23***
Checks	3	214.16***	388.06 ***	375.35 ***	15.06***	32.23***
RILs	249	62.25 ***	99.74***	262.52 ***	6.98 ***	18.20***
Checks vs. RILs	1	1696.42 ***	1633.72***	8946.61***	75.71***	235.95***
ERROR	27	4.40	18.28	5.16	0.56	0.762

*Significant @ P =0.05 ** Significant @ P = 0.01 ***Significant @ P = 0.005

The PCV and GCV estimates were relatively high for number of pods per plant, sound mature kernel percentage, kernel yield per plant and pod yield per plant suggesting the presence of considerable variability. Hence, individual plant selection can be practiced for the above mentioned characters to get higher yields (Table II). These results are in agreement with the findings of Suvarna *et al.* (2004), Parameshwarappa *et al.*,(2007), Gopinath *et al.* (2008) and Nandini *et al.* (2011) in groundnut. The PCV and GCV estimates were moderate for shelling per cent indicating the presence of variability for this character. Similar results were observed by Rudraswamy *et al.* (1999) and Nandini *et al.* (2011) in groundnut.

On the whole, co-efficient of variation values indicated considerable amount of variability for most of the characters. As there is considerable variability exists in RIL population hence parental polymorphism was done for 365 SSR markers and found polymorphism for 94 markers on metaphor gel. These markers will be used in identification of QTLs related to pod yield and yield attributing traits and to select some good genotypes with high pod yield.

The close correspondence between the estimates of GCV and PCV for traits number of pods per plant, sound mature kernel percentage, kernel yield per plant and pod yield per plant indicated less influence of

TABLE II

Genetic variability parameters for pod yield and its component traits in F7 recombinant inbred line population of the cross GKVK 4 × NRCG 12473 in groundnut

Characters	Mean	Range		GCV (%)	PCV (%)	h2 bs (%)	GAM (%)
		Min.	Max.				
Pods per plant	22.60	10.00	45.00	30.31	31.58	92.11	59.92
Shelling (%)	55.53	24.87	87.00	13.80	15.44	79.84	25.40
Sound mature kernel (%)	66.11	24.14	98.18	20.31	20.53	97.79	41.37
Kernel yield per plant (g)	5.95	1.00	18.40	41.97	43.98	91.01	82.51
Pod yield per plant (g)	9.21	1.16	25.70	42.90	43.93	95.32	86.26

TABLE III

Superior RILs with high pod yield and related attributes selected in F7 recombinant inbred lines of the cross GKVK 4 × NRCG 12473 in groundnut

RILs	Pods per plant	Shelling per cent	Sound mature kernel per cent	Kernel yield per plant (g)	Pod yield per plant (g)
1100-6-8	23.00	68.94	71.43	11.10	16.10
1511-12-3	29.00	64.04	80.00	14.60	22.80
1326-2-8	27.00	65.63	86.00	12.60	19.20
1040-14-2	35.00	71.00	88.61	16.92	23.83
1609-6-7	31.00	64.11	94.79	13.18	20.56
1663-4-8	35.00	71.13	84.52	17.10	24.04
1326-2-2	28.00	66.67	83.00	12.66	18.99
1026-10-5	25.00	63.83	78.95	12.00	18.80
1546-6-8	40.00	62.53	81.67	25.70	41.10
Mean	23.66	62.95	78.33	7.020	11.15
SD	7.87	17.15	18.54	3.84	6.91
GKVK-4	17.00	57.11	76.47	8.66	15.16
NRCG 12573	10.00	49.59	81.58	5.86	11.82
TMV-2	8.00	38.34	48.72	4.34	11.32
KCG-2	8.00	37.84	68.57	5.40	7.70

environment on these traits. Hence, these can be used further selection for higher yield.

High heritability coupled with high genetic advance as per cent of mean was observed for characters like, number of pods per plant, shelling percentage, sound mature kernel percentage, kernel yield per plant and pod yield per plant (Table II) indicated the presence of lesser environmental influence and prevalence of additive gene action in their expression. Hence, there is lot of scope for improvement of these traits in the further breeding programme and single plant selection can be followed to breed for high yielding genotypes in groundnut. These reports are in agreement with Suvarna *et al.* (2004) and Gopinath *et al.* (2008) in Groundnut.

The data on the mean performance of the RILs for the characters governed by additive genes (Table III). The RILs namely RIL 1040-14-2, RIL 1663-4-8, RIL 1100-6-8l, RIL 1511-12-3, RIL 1326-2-8, RIL 1609-6-7, RIL 1326-2-2, RIL 1026-10-5 and RIL 1546-6-8 have exhibited superiority for pod yield and yield attributes compared to the parents (GKVK 4 and NRCG 12473) and check varieties (KCG-2 and TMV-2). Hence, these genotypes could be considered as elite genotypes for improving groundnut pod yield. The RILs *viz.*, RIL 1040-14-2, RIL 1663-4-8 and RIL 1100-6-8 showing superior performance over all traits can be used as variety after yield trail and other RIL namely RIL 1511-12-3, RIL 1326-2-8, RIL 1609-6-7, RIL 1326-2-2, RIL 1026-10-5 and RIL 1546-6-8 showing superior performance for trait SMK (%) can be used as parents in hybridization for the improvement of pod yield in Groundnut

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