J. Farm Sci., 34(4): (371-375) 2021

RESEARCH PAPER

Seasonal influence on oil quality and productivity parameters in groundnut (*Arachis hypogaea* L.)

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(*Received:August, 2021 ; Accepted: December, 2021*)

Abstract: A set of twenty six segregating lines along with their parents (ICGV 06189 and Sunoleic 95R) were studied over seasons (*kharif* 2019 and *summer* 2020) at University of Agricultural Sciences, Dharwad to study the seasonal influence on oil quality and productivity parameters. Significant genetic variation was observed for productivity parameters and fatty acid components along with oil content and O/L ratio in both the seasons. Significant differences among genotypes, seasons and their interaction was observed for majority of the productivity and fatty acid components. Oleic acid had significant positive association with O/L ratio whereas, significant negative association with linoleic acid and palmitic acid during both *kharif* and summer seasons. Non-significant correlation existed between oleic acid with all the productivity parameters during both the seasons. Two lines each with higher oleic acid (line number 2 and 14) and higher pod yield (line number 10 and 17) were identified during *kharif* season while three lines (line number 1,2 and 12) with higher oleic acid and nine lines with higher pod yield were identified during summer season. The pooled analysis over seasons indicated one line (line number 2) superior for oleic acid across two seasons. The promising lines with high oleic acid and pod yield need to be tested over locations and years for studying their stability.

Key words: Fatty acid, Groundnut, Oil quality, Oleic acid

Introduction

Groundnut (*Arachis hypogaea* L.), an important oilseed crop contains good quality edible oil (35–55%) which varies depending upon the variety, season and maturity (Gulluoglu *et al.,* 2016). Groundnut oil has been found as stable and nutritious because it contains the right proportions of saturated and unsaturated fatty acids. Since fatty acids constitute the major part of an oil molecule's weight, the proper physical and chemical properties tend to be determined by the properties of the fatty acid that predominate in its makeup. Oleic acid, a monounsaturated fatty acid and linoleic acid, a polyunsaturated fatty acid, together constitute 75-80 % of the total fatty acids in groundnut oil. The oleic/linoleic acid ratio in groundnut oil ranges from 0.75 - 5.5, provides stability and increases its shelf-life by delaying rancidity production (Mozingo *et al*., 2004) and thus improves keeping quality.

It is important for breeders, farmers and oil users to understand the influence of environment on the composition of oil. Information about the influence of various factors on oil quality may be useful to guide the choice of planting location, sowing date, and crop management according to the purpose of the crop production and *vice -versa*. Current trends in the consumption of vegetable oils necessitate an understanding of the factors that affects oil stability, nutrition and quality. Keeping these points in view, the present study was envisaged to study the seasonal influence on various oil quality and productivity parameters in the segregating generations of groundnut over seasons.

Material and methods

Material comprised of twenty six segregating lines selected based on pod yield from the F_3 generation of ICGV 06189 × Sunoleic 95R cross, wherein ICGV 06189 is a confectionary groundnut variety while, Sunoleic 95R is a genetic stock with high oleic acid content of 85 %. These lines along with their parents were evaluated for oil quality and productivity parameters during *kharif* 2019 and *summer* 2020 at All India Coordinated Research Project (AICRP) on Groundnut, Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad.

Each genotype was sown in a row of 3m length with spacing 30 cm between rows and 10 cm between the plants in two replications following Randomized Block Design. All the agronomic practices were followed to raise successful crop. The observations were recorded on five randomly selected plants for various productivity parameters *viz.,* plant height, number of primary branches, number of pods per plant, pod yield per plant, kernel yield per plant, shelling percentage, hundred seed weight, protein content and oil quality parameters (oleic acid, linoleic acid, palmitic and stearic acid) along with oil content and O/L ratio. The oil quality parameters were recorded with the help of Near Infrared Resonance Spectrophotometer of Perkin Elmer.

The data collected on both productivity and oil quality parameters during both *kharif* 2019 and *summer* 2020 was subjected to individual as well as pooled analysis of variance. Genetic components (GCV, PCV, Heritability and Genetic Advance over Mean) were estimated for all the traits under study. The correlation between various traits was estimated. Identification of superior lines was made based on the mean ± 1CD criterion.

Results and discussion

Analysis of variance indicated highly significant genetic variation among the segregating lines of ICGV 06189 x Sunoleic

Table 1. Mean sum of squares for productivity parameters and oil quality traits at F_4 generation during *kharif* 2019 and F_5 generation during *summer* 2020

Source of variation	df	PH	NPB	NP	PY	KY	SP	HSW	Protein content	OC (%)	OA (%)	LA (%)	PA (%)	SA (%)	O/L ratio
Kharif 2019															
Replication	1	0.13	0.05	32.01	15.73	3.56	35.06	1.77	0.01	3.15	5.05	7.24	0.01	0.09	0.01
Genotypes	25	511.74**	0.50**	19.27**	44.60**	17.62**	48.43**	137.88**	10.07**	17.61**	78.36**	72.72**	3.44**	0.32	2.46**
Error	25	71.45	0.13	2.73	7.80	3.27	6.02	8.92	2.31	5.37	5.45	2.94	0.76	0.10	0.04
Total	51	583.32	0.68	54.01	68.13	24.45	89.51	148.57	12.39	26.13	88.86	82.90	4.21	0.51	2.51
Summer 2020															
Replication	1	13.20	0.69	0.76	0.08	1.11	42.48	8.48	0.06	0.03	0.54	10.98	0.01	0.01	0.01
Genotypes	25	37.70**	0.99*	19.70**	2.49**	13.41**	26.88**	133.48**	4.10**	3.97**	89.72**	70.35**	2.27**	0.01**	33.15**
Error	25	6.03	0.10	0.78	0.14	2.92	13.36	17.56	0.97	0.73	8.64	3.80	0.03	0.68	7.19
Total	51	56.93	1.78	21.24	2.71	17.94	82.12	159.52	5.13	4.73	98.90	85.13	2.31	0.70	40.35
Pooled over *kharif* and *summer* seasons															
Season	1	556.61**	9.99**	14.70**	73.51**	6.92	624.75**	2080.81**	498.09**	38.16**	660.54**	334.44**	17.01**	0.16	35.72**
Genotype	25	27.78**	0.95**	19.02**	32.47**	13.43**	32.39**	165.92**	6.88**	14.53**	98.62**	87.08**	2.55**	0.13*	1.22**
S × G	25	30.38**	0.54**	19.94**	45.54**	17.63**	42.91**	105.44**	7.28**	7.04**	69.45**	55.98**	3.10**	0.27**	1.40**
Pooled Error	50	4.44	0.11	1.75	7.48	3.08	9.69	13.24	1.64	3.02	7.04	3.37	0.74	0.06	0.13
Total	51	619.21	11.59	55.45	159.00	41.06	709.74	2365.41	513.89	62.75	835.65	480.87	23.4	0.62	38.47

*& ** - Significant at 5 % and 1 % level of probability

df: Degrees of freedom PH: Plant height (cm) NPB: Number of primary branches NP: Number of pods/plant
PY: Pod yield/plant (g) KY: Kernel/per plant (g) SP: Shelling percentage (%) HSW: Hundred seed weight (g)
OC: Oil content (%) OA: Oleic acid (%) LA: Linoleic acid %) PA: Palmitic acid (%)
SA: Stearic acid (%) O/L ratio: Oleic acid/ Linoleic acid ratio

95R cross at F_4 generation during *kharif* 2019 and F_5 generation during *summer* 2020 for different productivity parameters *viz*., plant height, number of primary branches, number of pods per plant, pod and kernel yield per plant, shelling percentage, hundred seed weight and protein content (Table 1) suggesting scope for selection for different traits in both the seasons. Highly significant genotypic variation was also observed among the lines for major fatty acid components (oleic acid, linoleic acid and palmitic acid) O/L ratio and oil content during both the seasons indicating scope for selection (Table 1).

Pooled analysis of variance revealed significant seasonal variation for all the traits except kernel yield per plant and stearic acid. Earlier, Babu and Kendurkar (2010) reported that, fatty acid composition of oil was greatly influenced by seasons as palmitic and oleic acids increased considerably, while linoleic acid decreased to a great extent in *summer* season. On the contrary, Prakash *et al*. 2000 reported least influence of environment on oil content in groundnut. Such contrasting results could be depending on the genotypes used under study. There was also significant genotypic differences and interaction between season × genotype for all the productivity parameters and fatty acid components under study indicating differential behavior of genotypes to different seasons (Table 1). This indicates scope for selection of lines for various productivity parameters and

Table 2. Components of variation for productivity parameters and fatty acid components in ICGV 06189 × Sunoleic 95R cross at F_4 generation during *kharif* 2019 and F_5 generation during *summer* 2020

Traits / Components	Minimum		Maximum		Mean		PCV (%)		GCV (%)		H_{bs}		GAM	
	K	S	K	S	K	S	K	S	K	S	K	S	K	S
Plant height (cm)	31.00	25.00	44.20	42.75	37.20	32.57	9.17	14.35	7.97	12.21	75.00	72.00	18.29	21.41
No. of primary branches	4.00	3.00	5.50	6.40	4.69	4.25	11.96	17.36	9.22	15.72	59.00	81.00	18.77	29.33
No. of pods / plant	12.00	11.00	24.10	21.80	15.86	15.10	20.90	21.17	18.13	20.35	75.00	92.00	41.51	40.31
Pod yield / plant (g)	7.00	7.80	25.75	23.10	13.32	15.01	38.40	29.91	32.18	24.00	70.00	64.00	71.21	39.66
Kernel yield / plant (g)	4.80	4.75	17.75	13.65	9.05	9.58	35.67	29.80	29.57	23.89	68.00	64.00	64.71	39.44
Shelling percentage (%)	61.00	58.50	79.70	71.50	68.80	63.90	7.58	7.01	6.69	4.06	77.00	33.00	15.59	4.85
Hundred seed weight (g)	34.35	38.50	69.10	72.00	45.76	54.71	18.72	15.88	17.54	13.91	87.00	76.00	43.41	25.11
Protein content (%)	21.95	29.10	31.00	35.85	26.79	31.16	9.28	5.10	7.35	4.01	62.00	61.00	15.37	6.48
Oil content (%)	44.30	43.85	54.05	50.10	48.50	47.29	6.98	3.22	5.10	2.71	53.00	70.00	9.82	4.70
Oleic acid (%)	39.10	39.25	71.50	68.50	50.11	55.15	12.91	12.71	12.04	11.54	86.00	82.00	29.66	21.59
Linoleic acid (%)	10.60	10.30	37.55	35.85	27.42	23.83	22.42	25.54	21.53	24.20	92.00	89.00	54.06	47.22
Palmitic acid (%)	7.82	7.45	13.45	11.05	10.04	9.22	14.42	13.27	11.51	9.49	63.00	51.00	24.25	13.97
Stearic acid (%)	1.55	2.10	3.15	2.95	2.37	2.45	19.30	10.31	13.77	7.62	50.00	54.00	25.95	11.61
O/L ratio	1.05	1.20	6.80	6.65	2.0	2.57	54.63	44.61	53.83	42.19	97.00	89.00	77.60	82.23

PCV: Phenotypic co-efficient of variation (%) H_{bs}: Heritability (Broad sense) K- *Kharif*
GCV: Genotypic co-efficient of variation (%) GAM: Genetic advance as per cent of mean S- *Summer*

Table 3. Phenotypic correlation among productivity parameters and fatty acid components in ICGV 06189 × Sunoleic 95R cross at F_4 generation during *kharif* 2019 and F_5 generation during *summer* 2020

Traits	PH	NPB	NP	PY	KY	SP	HSW	PC	OC	OA	LA	PA	SA	O/L ratio
PH	1.000	0.050	-0.114	-0.278	-0.249	0.248	-0.138	-0.028	0.074	-0.201	0.216	0.119	-0.043	-0.18
NPB	0.367**	1.000	-0.027	-0.368	-0.377**	0.115	-0.216	0.206	0.002	0.069	-0.164	-0.078	0.083	0.168
NP	0.193	0.484**	1.000	0.171	0.100	-0.332*	0.292*	-0.087	0.193	0.201	-0.195	0.102	0.341*	0.177
PY	0.158	0.182	0.034	1.000	0.973	-0.470	0.573	0.322	-0.623	0.110	0.016	-0.246	0.084	0.075
KY	-0.216	-0.215	-0.044	0.976	1.000	-0.259	0.486	0.302	-0.592	0.094	0.038	-0.179	0.034	0.061
SP	-0.269	-0.117	-0.279**	-0.061	0.162	1.000	-0.348*	-0.058	0.078	-0.136	0.045	0.279*	-0.042	-0.107
HSW	-0.187	0.211	0.318*	0.060	-0.074	-0.011	1.000	0.154	-0.077	0.143	-0.119	-0.218	0.255	0.069
PC	-0.013	-0.184	0.105	0.103	0.088	0.037	0.148	1.000	-0.659	0.299	-0.314	-0.103	-0.277	0.291*
OC	-0.091	0.242	0.148	0.528	0.541	0.065	-0.130	-0.047	1.000	-0.252	0.187	0.325	0.175	-0.194
OA	-0.037	0.140	-0.120	-0.048	-0.073	-0.109	0.258	0.327	-0.540	1.000	-0.886**	-0.519**	0.181	0.912**
LA	0.009	0.134	-0.013	0.198	0.194	0.098	-0.261	-0.232	0.473	0.879**	1.000	0.542**	-0.251	-0.874**
PA	-0.229	0.173	-0.030	0.119	0.252	0.288	-0.284*	-0.546	0.537	0.648*	0.474**	1.000	-0.255	-0.494**
SA	-0.243	-0.016	-0.085	0.128	0.114	-0.128	0.180	0.018	-0.006	0.144	0.098	-0.207	1.000	0.128
O/L ratio	-0.215	0.114	-0.103	-0.068	-0.051	-0.015	0.145	0.141	-0.427**	0.858**	-0.918**	-0.330*	0.098	1.000

*& ** - Significant at 5 and 1 percent level of probability

Values above the diagonal represent phenotypic correlation during *kharif*, while values below the diagonal represent the phenotypic correlation during summer

PH: Plant height (cm) | PY: pod yield/plant (g) | HSW: Hundred seed weight (g) | OA: Oleic acid (%)
SA: Stearic acid (%) | NPB: Number of primary branches | KY: Kernel yield/plant (g) | PC: Protein content (%)
LA: Linoleic acid (%) | O/L ratio: Oleic acid/Linoleic acid ratio | NP: Number of pods/plant | SP: Shelling percentage (%)
OC: Oil content (%) | PA: Palmitic acid (%)

Table 4. Performance of high oleic lines for other parameters in F_4 generation during *kharif* 2019, F_5 generation during *summer* 2020 and over seasons

Progeny lines	OA	PH	NPB	NP	PY	KY	SP	HSW	PC	OC	LA	PA	SA	O/L ratio
Kharif 2019														
Line 2	60.35*	32.00	5.00*	17.00	15.65	10.40	66.50	43.25	26.40	45.50	17.05	7.82	2.65	3.55*
Line 14	55.25*	31.00	5.00*	19.00*	18.55	11.50	62.00	54.15*	25.60	44.30	24.05	10.04	2.25	2.30*
ICGV06189	48.55	40.00	5.00	21.00	21.75	13.25	61.00	69.10	29.65	45.60	27.20	8.95	2.55	1.80
Sunoleic 95R	71.50	35.90	5.10	17.00	16.30	10.95	67.00	47.00	30.75	45.05	10.60	8.04	2.35	6.80
Mean	50.11	37.20	4.69	15.86	13.32	9.05	68.80	45.76	26.79	48.50	27.42	10.04	2.37	2.04
C.D. 5%	4.80	3.48	0.73	3.40	5.75	3.72	5.05	6.15	3.12	4.77	3.53	1.79	0.66	0.39
C.V.	4.65	4.54	7.64	10..41	18.95	19.96	3.56	6.52	5.67	4.77	6.25	8.69	13.52	9.36
Summer 2020														
Line 1	62.50*	35.00	6.00*	22.00*	18.65	11.35	61.00	58.00	31.85	47.70	18.75	7.45	2.30	3.35*
Line 2	65.25*	33.60	4.00	12.00	16.00	9.60	60.50	49.50	31.35	45.35	18.90	7.60	2.95*	3.45*
Line 12	61.20*	31.00	4.00	14.00	9.85	5.95	61.00	54.00	32.85	43.85	16.45	7.65	2.60	3.75*
ICGV 06189	48.90	42.75	6.00	20.20	7.80	4.75	72.00	61.00	30.25	45.75	28.20	9.50	2.65	1.75
Sunoleic 95R	68.50	25.00	4.30	11.80	15.05	10.40	68.50	50.50	30.75	45.90	10.30	10.65	2.35	6.65
Mean	55.15	32.57	4.25	15.10	15.01	9.58	63.90	54.71	31.16	47.29	23.83	9.22	2.45	2.57
C.D. 5%	6.05	5.05	0.64	1.81	5.52	3.51	7.52	8.63	2.03	1.69	4.01	1.76	0.35	0.76
C.V.	5.32	7.53	7.37	5.83	17.36	7.82	5.71	7.65	3.16	1.73	8.17	9.28	6.94	14.46
Across *kharif* and *summer*														
Line 2	62.80*	32.80	4.50	14.50	15.82	10	63.50	46.37	28.87	45.42	17.97	7.71	2.80	3.50*
ICGV 06189	48.72	41.37	5.5	20.60	14.77	9.00	66.50	65.05	29.95	45.67	27.7	9.22	2.6	1.77
Sunoleic 95R	70.00	30.45	4.70	14.4	15.67	10.67	67.75	48.75	30.75	45.47	10.45	9.34	2.35	6.75
Mean	52.63	34.88	4.47	15.48	14.16	9.31	66.35	50.23	28.97	47.89	25.62	9.63	2.41	2.30
C.D. @ 5%	5.80	4.89	1.20	3.80	6.00	4.2	6.78	7.88	3.50	4.23	5.01	1.50	0.81	0.39

OA: Oleic acid (%) | PY: Pod yield / plant (g) | PC: Protein content (%) | SA: Stearic acid (%)
PH: Plant height (cm) | KY: Kernel yield / plant (g) | OC: Oil content (%) | O/L: Oleic acid/ Linoleic acid ratio
NPB: Number of primary branches | SP: Shelling percentage (%) | LA: Linoleic acid (%)
NP: Number of pods / plant | HSW: Hundred seed weight (g) | PA: Palmitic acid (%)

fatty acid components across the seasons. Earlier, Singkham *et al.,* 2010 reported significant G x E interactions for biomass, pod yield, harvest index and also for oleic, linoleic acids and O/L ratio in a study involving 21 genotypes.

Large amount of variation was noted for oleic acid (39-71 % during *kharif* and 39-68 % during *summer*), linoleic acid (10-37 % during *kharif* and 10-35 % during *summer*), hundred seed weight (34-69 g during *kharif* and 38-72 g during *summer*)

Table 5.Performance of high yielding lines for other parameters at F_4 generation during *kharif* 2019 and F_5 generation during *summer* 2020

Progeny lines	PY	PH	NPB	NP	KY	SP	HSW	PC	OC	OA	LA	PA	SA	O/L ratio
ICGV 06189 × Sunoleic 95R(*kharif* 2019)														
Line 10	25.75*	38.00	4.00	16.00	17.75*	69.00	56.15*	26.50	46.25	49.05	29.45	10.75	2.85	1.70
Line 17	21.65*	36.00	4.00	14.00	13.25*	61.30	41.45	29.20	46.95	50.35	29.90	10.09	1.90	1.70
ICGV 06189	21.75	40.00	5.00	21.00	13.25	61.00	69.10	29.65	45.60	48.55	27.20	8.95	2.55	1.80
Sunoleic 95R	16.30	36.00	5.00	17.00	10.95	67.00	47.00	30.75	45.05	71.50	10.60	8.04	2.35	6.80
Mean 13.32	37.20	4.69	15.86	9.05	68.80	45.76	26.79	48.50	50.11	27.42	10.04	2.37	2.04	
CD 5%	5.75	3.48	0.73	3.40	3.72	5.05	6.15	3.12	4.77	4.80	3.53	1.79	0.66	0.39
CV 18.95	4.54	7.64	10..41	19.96	3.56	6.52	5.67	4.77	4.65	6.25	8.69	13.52	9.36	
ICGV 06189 × Sunoleic 95R (*summer* 2020)														
Line 15	23.10*	28.90	5.00*	15.05	13.55*	58.50	42.50	30.65	47.25	47.20	35.05*	10.05	2.45	1.30
Line 620.85*	38.00	4.00	15.00	13.15*	63.00	58.50	32.40	47.90*	60.75	16.30	8.60	2.95*	3.75*	
Line 21	20.30	26.00	3.00	19.00*	13.55*	67.50	60.00	35.85*	49.35*	49.05	28.90*	9.80	2.35	1.70
Line 14	19.60	35.00	3.00	11.00	12.95	66.00	54.50	31.15	47.95	49.75	32.75*	9.70	2.65	1.50
Line 24	19.70	31.00	4.00	15.00	11.65	59.00	49.00	30.25	48.15	58.05	21.65	8.55	2.75	2.75
Line 20	19.05	32.00	4.00	12.00	13.65*	71.50*	43.50	29.75	47.55	49.75	29.40	10.75	2.30	1.70
Line 118.65	35.00	6.00	21.00	11.35	61.00	58.00	31.85	47.70	62.50	18.75	7.45	2.30	3.35	
Line 17	18.20	35.00	4.00	20.00	10.70	59.00	53.00	30.30	47.95	50.20	27.10	11.05	2.10	1.85
Line 517.60	28.00	4.00	16.00	11.45	65.00	58.50	30.10	45.75	58.90	19.65	9.05	2.35	3.00	
ICGV06189	7.80	42.75	6.00	20.20	4.75	72.00	61.00	30.25	45.75	48.90	28.20	9.50	2.65	1.75
Sunoleic 95R	15.05	25.00	4.30	11.80	10.40	68.50	50.50	30.75	45.90	68.50	10.30	10.65	2.35	6.65
Mean 15.01	32.57	4.25	15.10	9.58	63.90	54.71	31.16	47.29	55.15	23.83	9.22	2.45	2.57	
CD 5%	5.52	5.05	0.64	1.81	3.51	7.52	8.63	2.03	1.69	6.05	4.01	1.76	0.35	0.76
CV 17.36	7.53	7.37	5.83	7.82	5.71	7.65	3.16	1.73	5.32	8.17	9.28	6.94	14.46	
Across *kharif* and *summer*														
Line 17	19.92*	35.50	4.00	17.00	11.97	60.15	47.22	29.75	47.45	50.27	28.50	10.57	2.00	1.77
ICGV 06189	14.77	41.37	5.00	20.60	9.00	66.50	65.05	29.95	45.67	48.72	27.70	9.22	2.60	1.77
Sunoleic 95R	15.67	30.50	5.00	14.40	10.67	67.75	48.75	30.75	45.47	70.00	10.45	9.34	2.35	6.72
Mean 14.16	34.88	4.00	15.48	9.31	66.35	50.23	28.97	47.79	52.63	25.62	9.63	2.41	2.30	
C.D. 5%	5.20	4.44	1.01	2.84	4.87	8.10	6.23	3.88	4.08	5.66	4.82	1.67	0.57	0.97

PY: Pod yield /plant (g) KY: Kernel yield / plant (g) OC: Oil content (%) SA: Stearic acid (%) PH: Plant height (cm)
SP: Shelling percentage (%) OA: Oleic acid (%) O/L: Oleic acid/Linoleic acid ratio
NPB: Number of primary branches HSW: Hundred seed weight (g) LA: Linoleic acid (%)
NP: Number of pods/plant PC: Protein content (%) PA: Palmitic acid (%)

and shelling percentage (61-80 %) during *kharif* and 58-71% during summer; Table 2). O/L ratio, linoleic acid, pod and kernel yield per plant showed higher phenotypic and genotypic coefficient of variation (> 20 %) while it was moderate for oleic acid. On the contrary, lower PCV and GCV (< 10 %) was observed for shelling per cent and oil content during both *kharif* 2019 and *summer* 2020 seasons. The magnitude of difference between PCV and GCV was less for all the traits under study (Table 2) during both the seasons. Higher genetic variability for pod yield was reported earlier in groundnut by Golakia *et al.* (2005) and Mahalaxmi *et al.* (2005). Higher genetic variability for kernel yield per plant in these crosses in both the seasons indicates scope for selection. Similar results were reported by Golakia *et al.* (2005) for kernel yield in groundnut. High variability for O/L ratio and linoleic acid were also reported earlier by Archana *et al.* (2007), Kavera *et al.* (2008), Sarvamangala *et al.* (2010) and Gangadhara *et al.* (2016).

Heritability was high (> 61%) for O/L ratio, linoleic acid, oleic acid, hundred seed weight, plant height, number of pods per plant, protein content, pod and kernel yield per plant during both the seasons (Table 2) indicating more influence of genetic component in governing these traits. GAM was high (> 20 %) for O/L ratio, pod and kernel yield per plant, linoleic acid, hundred seed weight, number of pods per plant, oleic acid indicating more influence of additive component of genetic variance governing these traits, whereas GAM was low for oil content during both *kharif* 2019 and *summer* 2020 seasons (< 10 %; Table 2). High heritability coupled with high GAM was reported earlier for pod yield and kernel yield, number of pods per plant, hundred seed weight (Kadam *et al*. 2016; Vinithashri *et al.,* 2019), oleic acid, linoleic acid and O/L ratio (Mollers and Schierholt, 2002, Kavera *et al*. 2008, Sarvamangala *et al*. 2010 and Gangadhara *et al*. 2016), indicating preponderance of additive gene action which might be exploited through simple selection based on phenotype.

There was significant negative phenotypic correlation between oleic acid and linoleic acid during *kharif* (-0.886) and *summer* (-0.879) season. Oleic acid also had significant negative association with palmitic acid during *kharif* (-0.519) and summer (0.648) seasons (Table 3). The inverse relationship between oleic acid with palmitic acid and linoleic acid were also evident from earlier studies (Lukange *et al.* 2007 and Singhkham *et al.* 2010).

Oleic acid had significant positive association with O/L ratio during *kharif* (0.912) and *summer* (0.858) at phenotypic level. There was non-significant association of oleic acid with all the productivity parameters during both the seasons indicating possibility for selection of both high yielding and high oleic types among the segregating lines under study (Table 3). Earlier results of Singkham *et al.,* 2010 also indicated positive association of oleic acid with O/L ratio in groundnut.

Evaluation of lines during *kharif* season at F_4 generation showed that only two lines (line number 2 and 14) had high oleic acid content (> 55 %) and O/L ratio (> 2.30) over female parent (1.80), but both of them had lower pod yield than their female parent (Table 4). Line number 14 had higher hundred seed weight compared to male parent.

During *summer* 2020, line numbers 1, 2 and 12 were having higher oleic acid (61-65 %) and O/L ratio (3-4 %) compared to female parent. Lines 1 and 2 had significantly higher pod (16 - 19 g) and kernel yield (9.6–11.35 g) than female parent ICGV 06189 (7.80 g pod and 4.75 g kernel yield). The line number 12 is significantly superior for protein content (32.85 %) over both the parents (Table 4). But, all the three lines had lower (60-61 %) shelling percentage than female (72 %) and male (68.50 %) parents at F_5 generation (Table 4). Across *kharif* and *summer* seasons, line number 2 was superior for oleic acid (62.8 %) over female parent ICGV 06189 (48.72) and had high O/L ratio (3.50) compared to female parent (1.77) (Table 4).

Among the segregating lines of ICGV 06189 × Sunoleic 95R cross, line number 10 and 17 were superior for pod yield (25.75 and 21.65 g, respectively) during *kharif,* 2019 based on mean + 1CD criterion. Both of these lines had numerically higher oil content (> 46 %) compared to female (45.60 %) and male parent (44.5 %; Table 5). Among these, line number 10 had higher pod yield per plant (26 g) than both the parents. However, these lines had low O/L ratio (1.7) than female (1.8) and male (6.8) parents during *kharif* 2019 (Table 5). During *summer*, 2020, line number 15 and 6 had significantly higher pod yield (> 20 g) compared to both the parents. Among these lines, line number 6 had higher O/L ratio (3.75) compared to female parent ICGV 06189 (1.77). Across the seasons, line number 17 had higher pod yield (19.92 g) but on par O/L ratio as that of female parent (Table 5).

Conclusion

Across two seasons, line number 17 had higher pod yield (19.92 g), kernel yield per plant (12 g) and oil content (47.45 %) than both the parents. But it had low O/L ratio (1.77) than male parent (6.72). Line number 2 was superior for oleic acid (62.80) across two seasons with on par pod yield (15.82 g) and kernel yield (10 g) to both the parents. These lines need to be studied over seasons, locations for their stable performance. Since these lines are having superiority for both pod yield and oil quality, they can be exploited for further breeding works to get superior lines both for pod yield and oil quality parameters.

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