RESEARCH ARTICLE

CORRELATION AND PATH COEFFICIENT ANALYSIS IN GROUNDNUT (*ARACHIS HYPOGAEA* L.) UNDER MONSOON AND POST MONSOON.

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Manuscript Info	*Abstract*

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Direct selection based on crop yield is often a paradox in breeding programs because yield is a complex character, influenced by its component traits. Breeding programs should, therefore, take into consideration character association of various component traits with yield and among themselves. Field experiments were carried out to study the association of yield and some characters among the tested groundnut genotypes and to estimate direct and indirect effects of selected traits on yield. Field experiments were conducted at Oilseed Crops Section, Department of Agricultural Research (DAR),Yezin in monsoon season and post monsoon season (2012-2013). High heritability (broad sense) was observed for yield plant^{-1} , hundred pod weight, specific leaf area, days to maturity and plant height in both seasons, it is indicating that the possibility of success in trait selection for breeding. High heritability estimates generally enable the breeder to select plants on the basis of phenotypic expression. The genotypic correlation coefficient indicated that hundred pod weight, hundred seed weight, shelling percent, specific chlorophyll meter reading, days to maturity, plant height and number of pod plant^{-1} had the significant positive association on yield plant^{-1} in both seasons. Therefore, it can be suggested that the selection of these traits will lead to yield improvement. Specific leaf area showed negative genotypic correlation with yield plant^{-1} in both seasons. The path coefficient analysis based on yield, as a dependent variable implicated that hundred seed weight, days to maturity and plant height had a positive direct effect on yield under monsoon and post monsoon. These result suggested that improvement in yield could be attained by selecting groundnut genotypes for higher hundred seed weight, days to maturity and plant height. Among the tested groundnut genotypes, Padamyar, ICGV-00350, ICGV-00351 exhibited high mean performances of yield per plant, shelling percent and harvest index in both seasons. Thus these varieties should be considered as high yield varieties while selecting groundnut varieties for breeding program.

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Introduction:-
Cultivated groundnut (*Arachis hypogaea* L.), also known as peanut, is an important source of plant oil and protein worldwide. This leguminous crop has been extensively cultivated in more than 100 countries between latitudes 40° N and 40°S since the late 19th century. Oilseed crops play a vital role according to Myanmar's high consumption of cooking oil component compared to other neighboring countries. As the inadequate amount of edible oil has been produced for local consumption, several tonnes of palm oil are being imported annually to fulfill the local edible oil requirement. Among oilseed crops, groundnut is one of the major oilseed crops grown in Myanmar and occupying almost 26 percent of the total sown area in Myanmar is about 1.9 million acres and 40 percent of the groundnut area as monsoon crop lies in the climatically disadvantage Central Dry Zone (MOAI, 2014).

Yield is determined by many related traits and a complex character and is highly affected by environmental variation. The knowledge of genetic variability existing within the different parameters contributing to yield is also an important criterion for yield enhancement. The efficacy of selection depends upon the magnitude of genetic variability for yield and yield contributing traits in the breeding materials (Muhammad et al. 2006).

Correlation coefficient is an important statistical procedure to evaluate breeding programs for high yield as well as to examine direct and indirect contribution of the yield variable. The direct selection on yield basis may be misleading. Yield and yield contributing characters are themselves interrelated. Specification of causes and measuring the relative importance of each of the yield components can be achieved by using the method of path analysis, as a mean of separating the direct effects from the indirect ones through other characters. To increase the groundnut production, it is needed to extend growing area and to obtain a high yield per unit area. Groundnut breeding program has to be done extensively to obtain the high yielding adapted varieties. To initiate an effective breeding program, knowledge of genetic association among yield attributes, direct and indirect effect of different traits on yield are useful (Tyagl et al. 1980).

Therefore, the study was carried out to study the association of yield and some characters among the tested groundnut genotypes and to estimate direct and indirect effects of selected traits on yield.

Materials and Methods:-
Field experiments were conducted at Oilseed Crops Section, Department of Agricultural Research (DAR), Yezin in monsoon and post monsoon (2012-2013). This region is situated at 90° 51' N latitude and 96° 7' E longitude and the temperature ranges between 22° C to 34° C. A total of twenty groundnut genotypes were used in these experiments (Appendix. 1). Genotypes were obtained from DAR and a randomized complete block design with three replications was used in monsoon and post monsoon seasons. All experimental plots at growing season were done with recommended agronomic practices. In both seasons, ten randomly selected plants from each plot were randomly selected from the middle ridges for collecting data on hundred pod weight (g), hundred seed weight (g), shelling percent, specific chlorophyll meter reading, specific leaf area, harvest index, days to maturity, days to 50 percent flowering, plant height, number of mature pod plant[-1] and yield. The data from each season were statistically analyzed separately to determine the significant differences among the tested groundnut genotypes. Mean values were computed for combined analysis of variances following Gomez (1984). Path coefficients were worked out by the following the procedure suggested by Dewey and Lu (1959). Variance due to phenotype (σ^2_p), variance due to genotype (σ^2_g), phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV) as suggested by Burton and De Vane (1953), heritability in broad sense (h^2) and correlation coefficient were estimated by Singh and Chaudhary (1985). Correlation and Path analysis were conducted for both seasons by using SPSS software ver. 16.0 (2007), separately.

Results and Discussion:-
In monsoon season, the mean square values provided for the characters namely yield plant[-1], hundred pod weight, hundred seed weight, shelling percent, specific chlorophyll meter reading, specific leaf area, harvest index, days to maturity, days to 50 percent flowering, plant height and number of mature pod plant[-1] were highly significant at one percent probability level. In post monsoon season, the results suggest that the presence of sufficient genetic variability in the genotypes under investigations. The mean squares of combined analysis for different traits indicated that significant (P <0.01) differences in traits which included yield plant[-1] , hundred pod weight, hundred

seed weight, shelling percent, specific chlorophyll meter reading, specific leaf area, harvest index, days to 50 percent flowering, days to maturity, plant height and number of mature pod plant^{-1} . Highly significant different was observed among seasons for some traits except hundred pod weight, hundred seed weight, shelling percent, specific chlorophyll meter reading and harvest index. Genotype by season interactions, there was significant differences except yield plant^{-1}, hundred seed weight, specific leaf area and harvest index and indicated that inconsistent environmental conditions prevailed across seasons. For significant differences traits found in genotype by season interaction, varietal trials should be conducted in both seasons. Significant of genotype by season interactions mentioned different genotypes' responses to varying seasons.

Mean performances of yield and agronomic characters of tested groundnut genotypes in monsoon season and post monsoon season showed Padamyar the highest mean yield plant^{-1} with early flowering, early maturity, and mean values of yield components such as hundred seed weight and shelling percent in both seasons. The variety should be selected as promising variety or parental line because they have better yield components. Genotype ICGV-00350 and ICGV-00351(medium duration varieties) showed the high mean yield with hundred seed weight, shelling percent in both seasons. The varieties should be also selected as promising varieties or parental line for future breeding program.

Yield and some characters of twenty groundnut genotypes were evaluated for coefficient of variation in order to further access the extent of variability among the genotypes. PCV and GCV values were classified as high (> 20 percent), medium (10-20 percent) and low (< 10 percent) in groundnut (Deshmukh et al. 1986). Since PCV percent and GCV percent values are more closely related to crop yield, thus more emphasis should be given to these characters while screening varieties for yield character. The difference in PCV percent and GCV percent was less in hundred pod weight, specific leaf area, shelling percent, harvest index and days to maturity in monsoon season and days to maturity in post monsoon season. This also showed that high genetic influences than that of environment upon these characters. The high phenotypic coefficient of variance (PCV percent) was observed for plant height (31 percent) in monsoon season and number of mature pod plant^{-1} (41.53 percent) in post monsoon season. The highest environmental coefficient of variation (ECV) was observed for number of mature pod plant^{-1} (14 percent) and plant height (11 percent), showing the sensitivity of these characters to the environmental fluctuation in both seasons. The medium PCV percent was observed for harvest index (11.57 percent) followed by days to maturity (10.53 percent) and hundred pod weight (10 percent) in monsoon season and yield plant^{-1} (11.27 percent), harvest index (16.17 percent), days to maturity (10.1 percent) and hundred pod weight (10.95 percent) in post monsoon season. The medium GCV percent was observed for harvest index (10.87 percent) in monsoon season and yield plant^{-1} (10 percent), harvest index (10.23 percent) and plant height (19.54 percent) in post monsoon season. The value of PCV, GCV and ECV were high or medium for some characters. The result suggested that these characters could be improved by selection.

In monsoon season and post monsoon season, days to 50 percent flowering, specific leaf area, hundred seed weight, specific chlorophyll meter reading and shelling percent possessed the lowest PCV percent. The low GCV percent was found for hundred pod weight (9.9 percent) followed by days to maturity (9.79 percent), yield plant^{-1} (8.33 percent), number of mature pod plant^{-1} (9 percent), specific leaf area (7.48 percent), days to 50 percent flowering (5.84 percent), hundred seed weight (5.49 percent), shelling percent (4.79 percent) and specific chlorophyll meter reading (4.44 percent) in monsoon season and hundred pod weight (9.63 percent), hundred seed weight (6.53 percent), shelling percent (4.42 percent), days to maturity (9.39 percent), specific leaf area (7.97 percent), days to 50 percent flowering (5.64 percent) and specific chlorophyll meter reading (4.37 percent) in post monsoon season. The value of PCV, GCV and ECV were low for some characters. These data indicated that selection should be carefully considered to improve these characters. Further studies will be needed to confirm more information.

Heritability estimates can be low (<40 percent), medium (40-59 percent) and moderately high (60-79 percent) and very high (>80 percent) (Robinson et al. 1951). Accordingly heritability estimates were very high for hundred pod weight (98 percent), specific leaf area (96 percent), shelling percent (93 percent), harvest index (88 percent), plant height (87 percent) and days to maturity (86 percent) in monsoon season indicating the possibility of success in selection. Heritability estimates were high for yield plant^{-1} (79 percent), hundred pod weight (77 percent), specific leaf area (77 percent), days to maturity (86 percent) and number of mature pod plant^{-1} (71 percent) indicating the possibility of success in these trait selection for post monsoon season. High heritability estimates generally enable the breeder to select plants on the basis of phenotypic expression. Low heritability estimates were also recorded for specific chlorophyll meter reading (41 percent) in monsoon season and harvest index (40 percent) and specific

chlorophyll meter reading (27 percent) in post monsoon season. It is indicating the limited scope of improvement of these traits through selection. Johnson (1955) pointed out that in a selection program; heritability value as well as genetic advance was more useful than heritability alone. High genetic advance associated with high heritability value indicated additive gene effect in controlling the characters and had considerable value to the breeder for selection (Panse, 1957).

Yield plant^{-1}, hundred pod weight, specific leaf area, harvest index, days to maturity, plant height and number of mature pod plant^{-1} could be improved by individual selection for monsoon season and yield plant^{-1}, hundred pod weight, number of mature pod plant^{-1}, days to maturity and specific leaf area could be improved by individual selection for post monsoon season. The success of breeders in selecting genotypes possessing higher yield and growth trait depend largely on the existence and exploitation of genetic variability of the extent.

The correlation coefficient for most of the pairs of characters revealed the presence of strong association between yield and some characters under monsoon and post monsoon seasons. Yield plant^{-1} had significantly and positively genotypic correlation with hundred pod weight, hundred seed weight, shelling percent, specific chlorophyll meter reading, days to maturity and plant height in both seasons. Therefore, it can be suggested that the selection of these traits will lead to yield improvement for both seasons The results from the present study were in agreement with other findings that positive correlation of yield plant^{-1} with hundred seed weight, harvest index, shelling percent, mature pod plant^{-1} and plant height (Kumar et al. 2012), and yield plant^{-1} showed positive correlated with number of mature pod plant^{-1} and plant height (Makinde and Ariyo, 2013). The results from the present study were similar with other findings that positive correlation of pod yield plant^{-1} with mature pod plant^{-1} (Khan et al. 2000; Rao et al. 2012), with shelling percent (Khan et al. 2000; Parameshwarappa et al. 2005; Narasimhulu et al. 2012, Rao et al. 2012), with hundred pod weight (Khan et al. 2000; Parameshwarappa et al. 2005; Rao et al. 2012).

Hundred pod weight had a negative direct effect (-0.17) in monsoon season and positive direct effect (0.72) in post monsoon season. According to Singh and Chaudhary (1985), the indirect effects might be the causal factor of correlation. In both seasons, hundred seed weight had a positive direct effect on yield (0.11 in monsoon and 0.49 in post monsoon, respectively). In two seasons, shelling percent showed negative direct effect (-0.22 in monsoon and -0.36 in post monsoon respectively) on yield. In both seasons, days to maturity had a positive direct effect (1.01 in monsoon and 0.63 in post monsoon, respectively) on yield. Days to 50 percent flowering had negative direct effect (-1.09 in monsoon season and -0.56 in post monsoon season) on yield in both seasons. In monsoon and post monsoon seasons, plant height had positive direct effect (0.29 in monsoon and 0.02 in post monsoon, respectively) on yield.

In monsoon season, selection on the basis of these characters (hundred seed weight, days to maturity and plant height) had the advantage which gave an opportunity to the breeder to select the genotype along with a highly correlated trait with yield. In post monsoon season, these characters (hundred pod weight, hundred seed weight, days to maturity, plant height and shelling percent) will be regarded in selection for crop improvement. The direct effects of days to maturity were of higher magnitude than those suggested by the correlation in both seasons. On the other hand, direct effect of hundred pod weight, shelling percent, days to 50 percent flowering and plant height were low magnitude than that suggested by the correlation in both seasons. It was indicated that correlation simply measures the apparent mutual association between the two characters without regard to the cause, where as path coefficient specifies the causes and measures their findings that correlation alone may not give complete information but when used in conjunction with path coefficient analysis will give a better measure of cause and effect relationship existing between different pairs of characters. Some other factors which had not been considered here, will need to be included in this analysis to account fully for the variation in yield.

Conclusion:-

Yield per plant, hundred pod weight, specific leaf area, days to maturity and number of mature pod plant^{-1} could be improved by the individual plant selection in both seasons. Yield plant^{-1} is positively and significantly correlated with hundred pod weight, hundred seed weight, shelling percent, specific chlorophyll meter reading, harvest index, days to maturity and plant height at genotypic level. Therefore, it can be suggested that the selection of these traits will lead to yield improvement in both conditions. It could be concluded from this study that in monsoon and post monsoon seasons, hundred seed weight, plant height and days to maturity were the most important yield components, as pointed out by path analysis. It could be suggested that simultaneous improvement in these characters might be easy. Besides that it can be noted that among the tested groundnut genotypes, Padamyar, ICGV-

00350, ICGV-00351 exhibited high mean performances of yield per plant, shelling percent and harvest index in both seasons. Thus these varieties should be considered as high yield varieties while selecting groundnut varieties for breeding program.

Table 1:- Mean squares for yield and some characters of selected groundnut genotypes in monsoon season (2012-13)

S.V	d.f	YPP	HPW	HSW	S %	SCMR	SLA	HI	DM	DF	PH	NPP
Geno type	19	13.42 **	353.81 **	19.00 **	34.06 **	11.94 **	444.21 **	0.01 **	405.98 **	8.75 **	934.09 **	224.88 **
Replicat ion	2	0.46ns	20.65ns	47.87 ns	2.45ns	2.43ns	4.87ns	0.02 ns	5.01ns	31.67*	0.07ns	5.60ns
Error	38	1.37	2.70	3.79	0.86	3.87	5.52	0.01	20.19	2.61	43.02	18.83
CV %		4.88	1.50	4.75	1.33	5.33	1.45	3.73	3.88	6.59	11.16	14.65

ns,*,** = non significant, significant at 5 percent and 1 percent probability levels, respectively
YPP= Yield plant[-1] (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g), S %= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height, NPP= Number of mature pod plant[-1]

Table 2:- Mean squares for yield and some characters of selected groundnut genotypes in post monsoon season (2012-13)

S.V	d.f	YPP	HPW	HSW	S %	SCMR	SLA	HI	DM	DF	PH	NPP
Geno-type	19	15.340 **	352.24 **	28.33 **	37.93 **	15.36 **	469.03 **	0.01 **	405.98 **	09.77 **	381.89 **	166.95 **
Replica-tion	2	1.35ns	332.11 ns	55.39 ns	1.44ns	1.47ns	41.65ns	0.04 ns	5.02ns	32.06*	11.41ns	13.35ns
Error	38	1.32	30.46	6.49	11.50	6.72	44.24	0.01	20.19	2.56	75.59	20.00
CV %		5.25	5.18	6.28	4.90	7.09	4.43	12.56	3.72	5.82	16.81	17.01

ns,*,** = non significant, significant at 5 percent and 1 percent probability levels, respectively.
YPP= Yield plant[-1] (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g), S %= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height,   NPP= Number of mature pod plant[-1]

Table 3:- Mean squares of combined analysis of variance for yield and some characters of 20 groundnut genotypes across tested seasons (2012-13)

Traits	Season(S)	Replications within season	Genotype(G)	G × S	Pooled Error	CV %
YPP	37.25**	0.91ns	28.58**	0.18ns	1.34	5.1
HPW	241.10ns	176.38**	635.42**	70.63**	16.58	3.8
HSW	4.73ns	51.63**	40.10**	7.23ns	5.14	5.6
S%	1.85ns	1.94ns	54.34**	17.65**	6.18	3.6
SCMR	4.80ns	1.95ns	27.13**	0.17**	5.29	6.3
SLA	3982.00**	23.26ns	901.80**	11.44ns	24.88	3.2
HI	0.13ns	0.30**	0.15**	0.55ns	0.17	8.7
DMP	750.00**	5.02ns	811.96**	0.48**	20.19	3.8
DF	264.00**	31.87**	18.44**	0.86**	2.59	6.2
PH	1493.69**	5.74ns	1121.62**	194.37**	59.30	13.9
NPP	333.33**	9.48ns	353.24**	38.60**	19.41	15.8

ns,*,** = non significant, significant at 5 percent and 1 percent probability levels, respectively.

YPP= Yield plant[-1] (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g), S %= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height,   NPP= Number of mature pod plant[-1]

Table 4:- Mean, range and parameters of variability for yield and some characters of selected groundnut genotypes in monsoon season (2012-13)

Character	Mean	Range		σ^2_p	σ^2_g	σ^2_e	PCV %	GCV %	ECV %	h^2 (%)	CV %
		Minimum	Maximum								
YPP	24.03	22.28	28.03	5.38	4.01	1.37	9.65	8.33	4.87	75	4.88
HPW	109.30	91.90	125.00	119.73	117.03	2.70	10.01	9.90	1.50	98	1.51
HSW	40.998	36.93	43.31	8.86	5.07	3.79	7.26	5.49	4.75	57	4.75
S %	69.51	63.68	73.76	11.93	11.07	0.86	4.97	4.79	1.33	93	1.33
SCMR	36.95	34.46	40.00	6.56	2.69	3.87	6.93	4.44	5.32	41	5.33
SLA	161.60	161.20	172.70	151.75	146.23	5.52	7.62	7.48	1.45	96	1.45
HI	0.50	0.44	0.59	0.01	0.01	0.01	11.57	10.87	3.97	88	3.74
DM	115.80	94.50	132.50	148.79	128.60	20.19	10.53	9.79	3.88	86	3.88
DF	24.52	22.28	26.49	4.66	2.05	2.61	8.80	5.84	6.59	44	6.60
PH	58.77	21.94	93.52	340.05	297.03	43.02	31.38	29.33	11.16	87	11.16
NPP	29.63	10.32	40.92	87.51	68.68	18.83	19.00	9.00	14.00	78	14.65

σ^2_p = Phenotypic variance, σ^2_g = Genotypic variance, σ^2_e = Environmental variance, PCV %= Phenotypic Coefficient of Variation,

GCV% = Genotypic Coefficient of Variation , ECV% = Environmental Coefficient of Variation, h^2 (%)= Heritability (%),   YPP= Yield plant[-1] (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g),S %= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific Leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height, NPP= Number of mature pod plant[-1]

Table 5:- Mean, range and parameters of variability for yield and some characters of selected groundnut genotypes in post monsoon season (2012-13)

Character		Range		σ^2_p	σ^2_g	σ^2_e	PCV %	GCV %	ECV %	h^2 (%)	CV %
	Mean	Minimum	Maximum								
YPP	21.86	19.50	26.13	6.07	4.80	1.27	11.27	10.02	5.16	79	5.16
HPW	106.50	90.10	123.50	136.09	105.23	30.86	10.95	9.63	5.22	77	5.21
HSW	40.66	35.87	43.17	13.09	7.04	6.05	8.90	6.53	6.05	54	6.05
S %	69.16	64.61	73.33	20.07	9.34	10.73	6.48	4.42	4.74	47	4.74
SCMR	36.60	34.50	39.16	9.51	2.56	6.95	8.43	4.37	7.20	27	7.20
SLA	150.00	131.00	180.00	185.65	143.00	42.65	9.08	7.97	4.35	77	4.35
HI	0.44	0.39	0.49	0.01	0.01	0.01	16.17	10.23	12.53	40	12.56
DM	120.80	99.50	137.5	148.79	128.60	20.19	10.10	9.39	3.72	86	3.72
DF	27.48	24.42	29.59	4.96	2.40	2.56	8.10	5.64	5.82	48	5.82
PH	51.71	28.36	70.55	177.69	102.10	75.59	25.78	19.54	16.91	57	16.81
NPP	26.30	10.68	31.28	68.98	48.98	20.00	41.53	34.99	35.00	71	17.01

σ^2_p = Phenotypic variance, σ^2_g= Genotypic variance, σ^2_e= Environmental variance, PCV**%** = Phenotypic Coefficient of Variation,

GCV**%**= Genotypic Coefficient of Variation , ECV**%**= Environmental Coefficient of Variation, h^2(**%**)= Heritability (**%**), YPP= Yield plant[-1] (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g), S%= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific Leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height, NPP= Number of mature pod plant[-1]

Table 6:- Phenotypic and genotypic correlation coefficients of yield and some characters of selected groundnut genotypes in monsoon season (2012-13)

	HPW	HSW	S	SCMR	SLA	HI	DM	DF	PH	YPP
HPW		0.63**	0.30*	0.24	0.32*	0.72**	0.03	0.15	0.38**	0.53**
HSW	0.84**		0.47**	0.27*	0.19	0.59**	0.11	0.18	0.18	0.38**
S	0.30*	0.66**		0.27*	-0.05	0.45**	0.12	0.08	0.25*	0.53**
SCMR	0.33*	0.57**	0.42**		-0.09	0.54**	0.25	0.33**	0.24	0.41**
SLA	0.33**	0.28*	-0.06	-0.05		0.14	-0.27*	0.10	0.15	-0.13
HI	0.79**	0.85**	0.48**	0.84**	0.52**		0.36**	0.41**	0.35**	0.68**
DM	0.03	0.15	0.16	0.43**	-0.30*	0.45**		0.50**	0.33**	0.27*
DF	0.18	0.44**	0.07	0.48**	0.14	0.66**	0.86**		0.07	0.08
PH	0.41**	0.18	0.28*	0.33**	0.18	0.36**	0.38**	0.21		0.42**
YPP	0.65**	0.55**	0.62**	0.85**	-0.17	0.83**	0.31**	0.27*	0.51**	

ns,*,** = non significant, significant at 5 percent and 1 percent probability levels, respectively. The values in upper triangular are the phenotypic and in the lower ones are genotypic correlation coefficient

YPP= Yield plant⁻¹ (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g), S %= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height, NPP= Number of mature pod plant⁻¹

Table 7:- Phenotypic and genotypic correlation coefficients of yield and some characters of selected groundnut genotypes in post monsoon season (2012-13)

	HPW	HSW	S	SCMR	SLA	HI	DM	DF	PH	YPP
HPW		0.63**	0.57**	0.45**	0.28*	0.56**	0.15	0.16	0.56**	0.64**
HSW	0.02**		0.53**	0.34**	0.14	0.56**	0.27*	0.181	0.51**	0.49**
S	0.11**	1.08**		0.31*	0.23	0.48**	0.17	0.20	0.39**	0.57**
SCMR	0.84**	0.84**	0.95**		-0.14	0.41**	0.14	0.17	0.21	0.42**
SLA	0.32*	0.34**	0.36**	-0.05		0.12	-0.16	0.19	0.25	0.01
HI	1.13**	1.15**	1.52**	0.87**	0.37**		0.40**	0.23	0.38**	0.52**
DM	0.17	0.40**	0.35**	0.23	-0.20	0.51**		0.51**	0.26*	0.28*
DF	0.19	0.48**	0.38**	0.31*	0.22	0.68**	0.29*		0.08	0.11
PH	0 .81**	0.82**	0.99**	0.48**	0.33**	1.14**	0.41**	0.32*		0.50**
YPP	0 .84**	0.85**	1.01**	0.76**	-0.04	1.00**	0.37**	0.20	0.74**	

ns,*,** = non significant, significant at 5 percent and 1 percent probability levels, respectively. The values in upper triangular are the phenotypic and in the lower ones are genotypic correlation coefficient.

YPP= Yield plant⁻¹ (g), HPW= hundred pod weight (g), HSW= hundred seed weight (g), S %= Shelling percent, SCMR= Specific chlorophyll meter reading, SLA= Specific leaf area, HI= Harvest index, DM= Days to Maturity, DF= Days to 50 percent flowering, PH= Plant height, NPP= Number of mature pod plant⁻¹

Table 8:- Path Coefficient Analysis of the Direct (Diagonal) and Indirect Effects of yield components and their genotypic correlation   coefficient with yield of groundnut in monsoon season (2012-13)

	HPW	HSW	S	DM	DF	PH	Genotypic correlation
HPW	**-0.17**	0.94	-0.07	0.03	-0.20	0.12	0.65**
HSW	-0.15	**1.11**	-0.14	0.15	-0.47	0.05	0.55*
S	-0.05	0.73	**-0.22**	0.16	-0.08	0.08	0.62**
DM	-0.01	0.16	-0.03	**1.01**	-0.94	0.11	0.31
DF	-0.03	0.48	-0.02	0.87	**-1.09**	0.06	0.27
PH	-0.07	0.20	-0.06	0.38	-0.23	**0.28**	0.51*

Residual effect =   0.581   Bold letters are direct effects

HPW= hundred pod weight, HSW= hundred seed weight, S= Shelling percent, DM= Days to maturity, DF= Days to 50 percent flowering, PH= Plant height, YPP= Yield plant ⁻¹

Table 9:- Path Coefficient Analysis of the Direct (Diagonal) and Indirect Effects of yield components and their genotypic correlation coefficient with yield of groundnut in post monsoon season (2012-13)

	HPW	HSW	S	DM	DF	PH	Genotypic correlation
HPW	**0.72**	0.50	-0.39	0.10	-0.11	0.02	0.84**
HSW	0.73	**0.49**	-0.38	0.25	-0.25	0.02	0.85**
S	0.80	0.53	**-0.36**	0.22	0.22	0.02	1.01**
DM	0.12	0.20	-0.12	**0.63**	0.63	0.01	0.37
DF	0.14	0.23	-0.13	0.52	**-0.56**	0.01	0.20
PH	0.58	0.40	-0.35	0.26	0.26	**0.02**	0.74**

Residual effect =   0.451   Bold letters are direct effects
HPW= hundred pod weight, HSW= hundred seed weight, S= Shelling percent, DM= Days to maturity, DF= Days to 50 percent flowering, PH= Plant height, YPP= Yield plant $^{-1}$

Appendix 1:- List of tested groundnut genotypes, pedigree and their sources

No.	Genotype	Pedigree	Source
1	Padamyar	-	China
2	YZG-04123	Sinpadetha-7x ICGV-91167	Myanmar
3	YZG-08021	ICGV-94361 x YZG-99005	Myanmar
4	YZG-00020	Sinpadetha-1 x ICGV-86240	Myanmar
5	YZG-08075	J-11	Myanmar
6	Sinpadetha-1	M-28 x Mutation	Myanmar
7	Sinpadetha-5	ICGV-87160	Myanmar
8	Sinpadetha-6	YZG-91062	Myanmar
9	Sinpadetha-8	ICGV-94310	Myanmar
10	Sinpadetha-9	ICGV-94361	Myanmar
11	Sinpadetha-10	ICGV-91167	Myanmar
12	Sinpadetha-11	YZG-00019	Myanmar
13	Sinpadetha-12	Myaypalnet x ICGV-87160	Myanmar
14	Magwe-11	Shruth-216	Myanmar
15	Magwe-15	UPLB x Kyaunggone	Myanmar
16	ICGV-00350	-	ICRISAT (India)
17	ICGV-00351	-	ICRISAT (India)
18	ICGV-99181	-	ICRISAT (India)
19	Tontani	-	Myanmar
20	Sinpadetha-7	ICGV-93382	Myanmar

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