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Research Article

Evaluation of Different Groundnut Genotypes to Identify the High Yielding Genotypes through Nepal Agricultural Research Council (NARC) System

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Abstract

Groundnut (*Arachis hypogaea*) is an important food and oil crop grown during rainy season in Nepal. Ground nut has high potential in context to Nepal especially in terai and low hilly area. Ground nut is grown in upland in rain fed condition during rainy season and it is also grown in river basin as well. In context to Nepal, there are no high yielding varieties as other countries India and China. The Experiment conducted was done according to the NARC Research System. Different exotic genotypes and local Landraces were collected and Series of trail were conducted in successive year in different location under IET, CVT, CFFT and FAT. All trials were conducted in Random Complete Block Design (RCBD). In IET, the result depicted that ICGV 07240 genotypes was highest yielding genotypes (2416 kg/ha) among all the genotypes. In CVT, ICG 07240 showed high yielding genotypes in wide range of location with an average yield of 2128 kg/ha. Similarly, ICGV 07240 showed high yielding performance among 4 elite genotypes with an average yield of 2504 kg/ha. In GGE biPlot ICGV 07240 was best performing genotypes overall the tested location. In 2018, ICGV 07240 was release as Sambriddhi with 52.88 % fat and 27.32 % protein. . This variety may be a new variety for the ground nit growing farmers and in future this variety may play pivotal role to meet the national demand of the groundnut.

Keywords: Groundnut; high yielding varieties; rain fed condition, Nepal

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Background

Groundnut (*Arachis hypogaea*) is an important food and oil crop grown during rainy season in Nepal. During seventies, groundnut cultivation in Nepal was confined only in kitchen garden. However, this crop was commercially grown in the beginning of early eighties (Chaudhary, 2010). Ground nut has high potential in context to Nepal especially in terai and low hilly area. Ground nut is grown in upland in rain fed condition during rainy season and it is also grown in river

basin as well (Thakur et al., 2013). In Nepal, it is grown in 2836 ha, with the production of 42220 tons with the productivity of 1.4 ton/ ha which is very low to that of china (3.7 ton/ha) and India (5.2 ton/ha) (MoALD, 2017). In context to Nepal, there are no high yielding varieties as other countries India and China. Owing to strong demand of oil in Nepal, groundnut can be a potential crop to meet the demand of the oil as it has higher oil content than other

oilseed crops being grown in Nepal. Therefore, it is indispensable to develop the high yielding varieties using groundnut diversity. Based on the reports of land resource mapping project, over 572000 ha of land is potential for groundnut cultivation in Nepal (Chaudhary, 2010). Before 2015 A.D., 6 varieties were released and are being successfully adopted by groundnut growers. Systematic research and development activities in groundnut were initiated after the signing of memorandum of understanding between NARC and ICRISAT in 1987 and conducting various activities under AGLOR (Asian grain legumes on-farm research) project. After launching of IFAD-532-ICRISAT project and IFAD-954-ICRISAT Project area of groundnut have increased. Nepal Agricultural Research Council has been regularly contributing in screening of high yielding genotypes of different crops. Oilseed research program Sarlahi, Nawalpur has been conducting different trials like initial evaluation trial (IET), co-ordinated varietal trial (CVT), co-ordinated farmers field trial (CFFT) and farmers acceptance trial (FAT). All these trials seem to be effective to screen out promising genotypes.

Method and Methodology

The Experiment conducted was done according to the NARC Research System. Different exotic genotypes and local Landraces were collected and Series of trial were conducted in successive year in different location. The details of the trial conducted are mention in Table 1. Here IET were conducted in Random Complete Block Design (RCBD) trial with 3 replications with 12 genotypes. The individual plot size for the IET was 10 m². Similarly, CVT were also conducted in RCBD design with 3 replications in 4 locations with 9 genotypes. The plot size for CVT was 20 m² CFFT were also conducted in RCBD were farmers were considered as replication with 4 genotypes. FAT was also conducted in RCBD were location were considered as Replication. The plot size for CFFT was 50 m². Regarding the agronomical practice, Planting was done with spacing row to row 30cm and plant to plant 15cm. Agronomic practice for groundnut cultivation as recommended from ORP was used with the fertilizer dose of 20:40: 20 kg/ha. Data on parameters days to flowering (DF), days to maturity (DM), grain yield (GY), shelling % and 100 grain weight

(100 GW) were recorded and analysis of variance (ANOVA) was done using crop stat. GGE by Plot was done Through Meta R to find the overall best yielding variety over all the location over all the year.

Result

In the ANNOVA of IET (Table 2), the result depicted that ICGV 07240 genotypes was highest yielding genotypes (2416 kg/ha) among all the genotypes. In the trial, other genotypes like ICGV 05155 (2182 kg/ha) Jayanti (2068 kg/ha) ICGV 07213 (1831 kg/ha), ICGV 03189 (1685 kg/ha) were consider as other high yielding genotypes. From this trial, 9 promising genotypes were selected and forwarded for the CVT in different location for several location. (ORP Annual Report, 2011.)

In mean data of pod yield of cvt, conducted in 3 different year (2011/12, 1012/13, 2013/14) in different location (Nawalpur, Surkhet, Doti and Nepalgunj), ICG 07240 showed high yielding genotypes in wide range of location with an average yield of 2128 kg/ha. Similarly, other genotypes like ICGV 05155 (1564 kg/ha), ICGV 98077 (1565kg/ha), ICGV 98089 (1501 kg/ha) were identified as other promising high yielding genotypes. (ORP Annual Report, 2012, 2013, 2014). From the CVT, ICGV 07240 was introduce for CFFT in order to find it real performance in the farmers' field.

In CFFT at different year, at different location, ICGV 07240 showed high yielding performance among 4 elite genotypes with an average yield of 2504 kg/ha (ORP Annual Report, 2015, 2016, 2017). While analyzing the percentage increase in the yield among the genotypes over year, all other genotypes have negative increase rate whereas ICGV 07240 has positive increase rate with the rate of 33.5 %. In GGE biPlot ICGV 07240 was best performing genotypes overall the tested location (Fig. 1). A total of 42 FAT of ICGV 07240 were distributed to Hajaria of Barhathwa Municipality by ORP, Nawalpur and at Bandipur of Sirha district by ARs/ Belachapi.. Yield range of ICGV 07240 was 2200-2750 kg/ha against local check 1800-2225 kg/ha. In the nutrient analysis, ICGV 07240 was found to have fat percentage (52.8 %) which is presented in Table 5.

Table 1: Description of Trials in different Years.

S.N.	Name of Trials	Year	Locations	References
1	IET	2010/11	NORP, Nawalpur	Annual report 2010/11
2	CVT	2011/12, 2012/13, 2013/14	NORP, RARS Parwanipur, Nepalgunj, Surkhet	Annual report 2012/13 and 2013/2014
3	CFFT	2014/15, 2015/16, 2016/17	NORP, RARS Parwanipur, Nepalgunj, Surkhet	Annual report 2014/15, 2015/16, 2016/17.
4	FAT	2015	OR sites, Barhathwa, Bandipur, Sirha	Annual report 2015

Table2: Yield and yield attributing traits of Groundnut Early at ORP, Nawalpur in IET 2010/11.

EN	Genotypes	DF	DM	Pods/pl	SH%	100SW	Pod yield kg/ha
1	ICGV 2005	32	115	21	70.6	52.4	942
2	ICGV 7211	32	115	27	72.6	38.3	1145
3	ICGV 07213	34	120	30	71.6	41.1	1831
4	ICGV 06319	30	112	30	73.2	41.8	1634
5	ICGV 07214	32	116	43	73.3	38.8	1578
6	ICGV 00338	32	116	23	74.6	39.8	1487
7	ICGV 07240	34	118	40	73.9	43.9	2416
8	ICGV 05155	36	120	22	71.3	35.5	2182
9	ICGV02022	28	111	29	73	38.6	1443
10	ICGV 03189	27	110	27	76	41	1685
11	Baidehi	30	114	24	73	42	1626
12	Jayanti	30	114	31	73.2	40	2068
	F test	Ns	**	*	Ns	**	**
	GM	0.1	1.46	24	3.6	5.8	20.9
	Lsd 0.05	-	1.4	6	-	2	295

Table 3. Mean of pod yield at different locations in CVT Groundnut early, 2011/12,2012/13 and 2013/14.

EN	Varieties	Nawalpur	Surkhet	Doti	Nepalganj	Mean
1	ICGV 95358	994	2310	1195	1352	1463
2	ICGV 07243	761	1861	805	1343	1193
3	ICGV 03179	746	1523	833	1158	1065
4	ICGV 98077	1569	2048	786	1854	1565
5	ICGV 98089	1353	1938	1325	1390	1501
6	ICGV 07213	1586	2038	1220	1066	1478
7	ICGV 07240	3296	2215	819	2182	2128
8	ICGV 05155	1739	2135	901	1482	1564
9	Jayanti	1559	2073	930	1529	1523

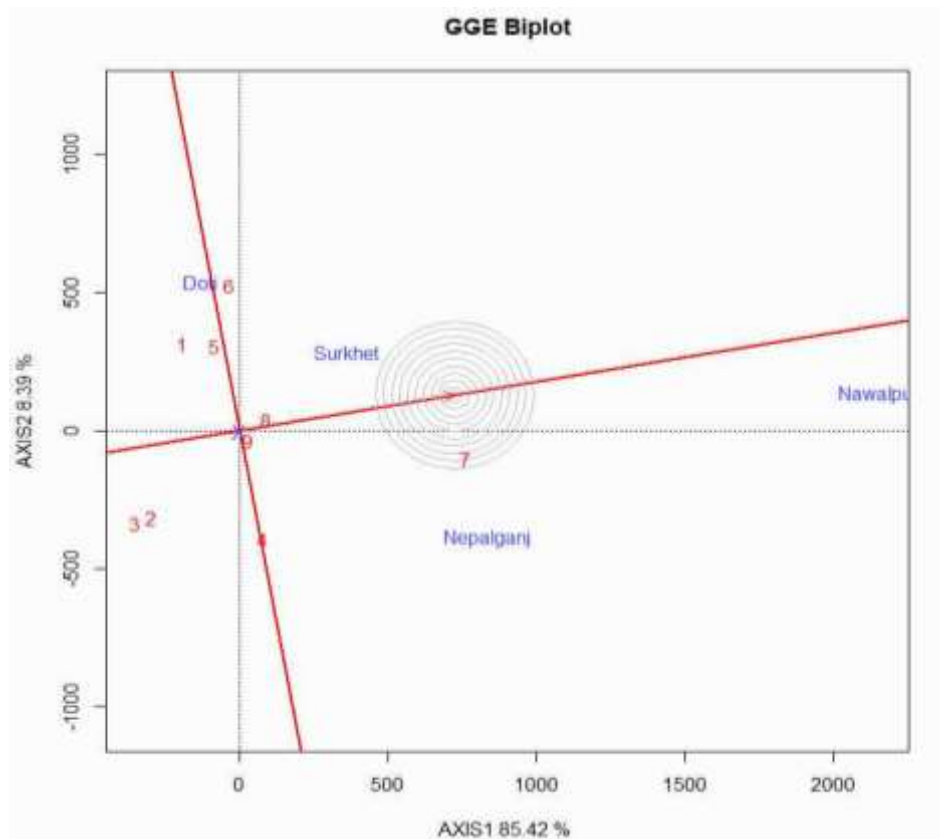


Fig 1: GGE biplot of different genotypes in different location

Table 4: CFRT on Groundnut at different stations in different years.

S.N.	Variety	2014/15	2015/16	2016/17	Mean pod yield (kg/ha)	% increase
1	ICGV 87885	1200	1576	2032	1603	-15.51
2	ICGV 91058	1422	1890	2226	1846	-1.54
3	ICGV 07240	2036	2600	2876	2504	33.5
4	Baidehi	1540	1862	2222	1875	15

Table 5: Nutritional quality of new variety ICGV- 07240

Variety	Fat percentage	100 Seed wt (g)
ICGV 07240	52.8	43-55
Baidehi	49	44-48
Jayanti	48	40-45
Jyoti	50	50-62
Rajarshee	51.2	47-55
B4	48	38-42
Janak	50	60-65

Conclusion

In context to Nepal, there are no any high advance technologies for the breeding of high yielding crops. The Introduction of exotic genotypes and testing of these genotypes in NARC Research System is the best way to identify high yielding genotypes. After series of trial (IET, CVT, CFFT and FAT) Genotype ICGV 07240 was found to be the best genotypes among all. Proposal was submitted in Seed Quality and Control Centre for the release of ICGV 07240. Finally, ICGV 07240 was released in 2018 as Sambriddhi variety. This variety may be a new variety for the ground nit growing farmers and in future this variety may play pivotal role to meet the national demand of the groundnut.

Conflict of Interest

The authors declare that there is no conflict of interest with present publication.

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