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Development of Suitable Groundnut Genotypes for Summer Season Under Climate Change and to Food and Nutritional Security

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ABSTRACT: *The present study was under taken during summer seasons of 2007 and 2008 at Regional Research Station, Mainpuri. The experimental soil was sandy loam with poor fertility status. The main objective was to find out the suitable genotypes for cultivations during summer season with suitable physiological parameters. The twenty varieties of groundnut i.e. Dh86, Dh40, R9251, R8808, R2000-1, ICGS44, ICGS1, ICGS37, ICGS11, ICGS76, ICGV93468, ICGV86590, ICGV86325, ICGV00310, ICGV00298, ICGV99195, ICGV02099, ICGV02022, ICGV94361 and G201 (check) were tested for evaluating the suitable physiological parameters during summer season. The sowing was done in rows 30 cm apart with 10 cm plant spacing. Seed was seeded on 10 March, 2007 and 2008 and harvested after 90 days of sowing during both the experimental years. Cultivars Dh 86 (29.02 q/ha) and ICGV93468 (28.91 q/ha) gave highest pod yield, while genotypes Dh40 and G201 gave minimum pod yield. The increase or decrease in pod yield (q/ha) was due to increase or decrease in number of pod per plant, pod weight per plant, number of kernel per plant, weight of kernels per plant, number of kernel per pod, kernel weight per pod, weight of 100-kernel, dry matter accumulation in pods and harvest index. The better source-sink relationship was also responsible for higher pod yield. The aforementioned growth and yield contributing characters were found superior in Dh86 and ICGV93468 in summer season, resulted in, both cultivars gave highest yield under summer season in U.P. The important physiological parameters were found in favour of Dh86 and ICGV93468 in increasing the pod yield during summer season cultivation.*
KEYWORDS: Dh 86, ICGV 93468, physiological parameters, summer season, yield contributing characters.

INTRODUCTION

The warming trend in India over the past 100 years has indicated in increase of 0.60° C. The projected impacts are likely to further aggravate yield fluctuations of many crops thus impacting food security. There are evidences already of negative impacts on yield of groundnut in North India due to increased temperature, increased water stress and reduction in number of rainy days. Enhancing agricultural productivity, therefore, is critical for ensuring food and nutritional security for all, particularly the resource poor small and marginal farmers who would be affected most. In groundnut production, it consists of introducing drought/temperature tolerant varieties, advancement of planting date of rabi/zaid crop in areas with terminal heat stress, water saving, location specific, intercropping systems with high sustainable yield index. It is well known fact that groundnut is an important Kharif season oilseed crop of Uttar Pradesh. The area and production of rainy season groundnut declined after 1982-83 due to biotic and abiotic reasons specially increased temperature. Because genotype and environment interactions are often observed adoption of improved groundnut genotypes to varied environment particularly soil and climate is one of the major problems. There is a lot of scope for yield improvement in groundnut by selecting for physiological attributes contributing to yield advantages in a given environment and combining them to enable further identification of genotypes with desirable combination of traits. Scope also exists to enhance productivity of groundnut by developing varieties with specific traits to match agro-climatic requirements of the region.

The farmers of groundnut growing tract of U.P. have claimed the summer season varieties of groundnut, regularly, because the productivity of summer season groundnut is higher over rainy season due to low or nil effect of biotic and abiotic factors. Some cultivars of summer groundnut have been developed and identified by the scientists of Regional Research Station, Mainpuri. These genotypes gave yield by 25.00 q/ha to 30.00 q/ha in summer season without any natural hazard complexity in groundnut growing tract of U.P. under climate change (Singh, 2009).

With the consideration of above point the work on summer season groundnut under climate change was carried out at Regional Research Station, Mainpuri, C.S. Azad University of Agriculture and Technology, Kanpur for development of summer season groundnut genotypes with suitable physiological parameters.

MATERIALS AND METHODS

An experiment was under taken during summer season of 2007 and 2008 at Regional Research Station, Mainpuri, C.S. Azad University of Agriculture and Technology, Kanpur. The experimental soil was sandy loam, having pH 8.0, organic carbon 0.33, total nitrogen 0.03%, available phosphorus 10 kg/ha and available potassium 269 kg/ha, thus the nutrients of experimental soil were analyzed low in organic carbon,

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total nitrogen, available phosphorus and high in available potassium. The pH was determined by Electrometric glass electrode method (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta *et al.,* 1962). Total nitrogen was analyzed by Kjeldahl's method as discussed by Piper (1950). The available phosphorus and potassium were determined by Olsen's method (Olsen *et al.,* 1954) and Flame photometric method (Singh 1971), respectively. Twenty varieties of groundnut were tested, which are list in Table-1. The groundnut varieties were planted in 10 March and harvested on 12 June after 90 days of seeding during both experimental years as suggested by Singh (2004), Singh (2005), Singh (2006) and Singh (2009)..

The crop was fertilized with 20 kg N + 30 kg P_2O_5 and 45 kg K_2O + 200 kg gypsum/ha. The irrigations were given at 21, 41, 61 and 83 days of seeding. The crop was harvested on the residue moisture of irrigation given at 83 days of seeding. The recommended agronomical practices were followed as suggested by Singh (2004). The important physiological parameter data were recorded and analyzed.

The experimental data of both and pooled years were statistically analyzed as suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The pooled data of two years of yield, yield traits and physiological parameters recorded and reported in Table1 and Table-2 and discussed here under appropriate heads.

Growth Characters

Number of branches/plant was recorded higher in genotype ICGV 99195, which was statistically at par with genotype ICGV 00298. The minimum number of branches/plant was counted in genotype Dh 86, which was found statistically at par with genotype ICGV 93468. The branching behavior in different genotypes of groundnut was due to their genetically characters. These results are in agreement with those reported by Singh (2004) and Upadhyay *et al.* (2005).

Number of functioning leaves/plant was recorded higher in ICGV 99195, which was statistically at par with genotype ICGV 00298. The lowest number of functioning leaves/plant was noticed in genotype Dh 86 and ICGV 93468. The increase in number of functioning leaves/plant in ICGV 99195 and ICGV 00298 may be attributed to considerable increase in branches/plant. The branches/plant reduced considerably in Dh 86 and ICGV 93468, supported to the reduction in functioning leaves/plant in Dh 86 and ICGV93468. Singh (2011) also reported the similar results.

Yield traits:

Cultivars Dh 86 and ICGV 93468 produced significantly higher number of pods/plant than all other tested genotypes but ICGV 00298 and ICGV 99195 produced statistically at par pods/plant. The variation between genotypes in respect to pods/plant was due to genetic constitution of genotypes. Other research worker like Singh (2004), Singh (2006) and Vaghasia *et al.* (2010) have also reported variation in number of pods/plant between genotypes.

The maximum pods weight/plant was noted in varieties Dh86 and ICGV 93468, which was significantly superior to all other varieties but ICGV 00298 and ICGV 99195 produced statistically at par pods weight/plant to cultivars Dh 86 and ICGV 93468. The lowest pods weight/plant recorded in genotype Dh 40 closely followed by G 201. The increase in pods weight/plant in Dh 86 and ICGV 93468 may be attributed to the considerable increase in number of pods/plant and partitioning of more dry matter in pods.These results are in accordance to the findings of Singh (2004) and Jagtap *et al.* (2009).

The genotypes Dh 86 and ICGV 93468 gave higher number of kernels/plant than other tested genotypes except genotype ICGV 99195, which was statistically at par. The increase in number of kernels/plant in Dh 86 and ICGV 93468 may be attributed to increase in number of pods/plant. The lowest number of kernels/plant was counted in genotypes Dh 40 and G 201. The reduction in number of pods/plant in Dh 40 and G 201, supported to the lowest number of kernels/plant.These results are in agreement with those reported by Singh (2004) and Jagtap *et al*. (2009).

The cultivars Dh 86 and ICGV 93468 gave higher kernels weigh/plant. The higher number of kernels/plant and bold size of the kernels were responsible for higher kernels weight/plant in Dh 86 and ICGV 93468. The minimum weight of kernels/plant was weighed in genotype Dh 40 closely followed by genotype G 201. The lowest number of kernels/plant and small size of the kernels were responsible for lowest weight of kernels/plant in Dh 40 and G 201.Significant varietal differences in kernels weight/plant have also been reported by Singh (2004) and Jagtap *et al.* (2009).

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There had been considerable improvement in weight of 100-kernel in Dh 86 and ICGV 93468 over all other genotypes. The cultivars Dh 40 and G 201 were significantly reduced the 100-kernel weight in comparison to Dh 86 and ICGV 93468. The variation in 100-kernel weight of different genotypes was due to their genetic constitution.

Significant varieties in 100-kernels weight of groundnut cultivars have also been reported by Singh (2004), Singh (2006), Jagtap *et al.* (2009) and Vaghasia *et al.* (2010).

Harvest index worked out significantly higher in genotype Dh 86 and ICGV 93468 over all other genotypes. The higher pod yield ratio in total biomass production under genotypes Dh 86 and ICGV 93468 was responsible for highest harvest index. The lowest harvest index was noted in genotypes G 201, Dh 40 and ICGS 11. The lower pod yield ratio in total biomass production under cultivars G 201, Dh 40 and ICGS 11 was responsible for lowest harvest index.These results confirm the findings of Jagtap *et al.* (2009) and Vaghasia *et al.* (2010).

Physiological parameters under different genotypes:

Variety ICGV 99195 produced the maximum dry weight of stem per plant closely followed by variety ICGV 00298 (Table-2). The increase in number of branches/plant in genotypes ICGV 99195 and ICGV 00298 was responsible for considerable increase in dry weight of stem/plant. Cultivar Dh 86 produced minimum dry weight of stem/plant, which was statistically at par with cultivars ICGV 93468. The production of minimum, branches/plant in Dh 86 and ICGV 93468, supported to the minimum production of dry weight of stem/plant in Dh 86 and ICGV 93468.Similar results have also been reported by Singh (2011).

The cultivar ICGV 99195 produced highest dry weight of leaves/plant closely followed by variety ICGV 00298 than other tested genotypes (Table-2). The production of maximum dry weight of leaves/plant in genotypes ICGV 99195 and ICGV 00298 may be attributed to considerable increase in number of leaves/plant. Cultivar Dh 86 produced maximum dry weight of leaves/plant followed by variety ICGV 93468 over other genotypes. The production of minimum number of leaves/plant in Dh 86 and ICGV 93468, supported to the lowest production of dry weight of leaves/plant in Dh 86 and ICGV 93468.These results confirm the findings of Singh (2011).

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Cultivars Dh 86 and ICGV 93468 produced maximum dry weight of pods/plant, which was significantly higher than all other cultivars except ICGV 00298 and ICGV 99195 (Table-2). The increase in dry weight of pods/plant in Dh 86 and ICGV 93468 may be attributed to the increase in number of pods/plant and partitioning of more dry matter in pods. These genotypes accumulated about 55% of total dry matter in pods. Varieties Dh 40 and G 201 yielded the lowest dry weight of pods/plant in comparison to all other genotypes. The considerable reduction in dry weight of pods/plant and partitioning of poor dry matter in pods. Both these genotypes accumulated 39.70% of total dry matter in pods.Almost similar results have also been reported by Singh (2004) and Jagtap *et al.* (2009).

Cultivars Dh 86 (18.70%), and ICGV 93468 (18.98%) and ICGV 00310 (19.95%) accumulated minimum percent dry matter in stem and maximum in pods by 55.50%, 54.82% and 52.45%, respectively (Table-2).The maximum dry matter of 25.35% and 25.30% in stem and minimum dry matter of 39.60% and 39.80% in pods were accumulated by genotypes G 201 and Dh 40, respectively. Similarly, Dh 86 (25.80%) and ICGV 93468 (26.20%) accumulated minimum percent dry matter in leaves, while genotype G201 (35.05%) and Dh 40 (34.90%) accumulated maximum per cent dry matter in leaves. Such variation was associated with source-sink relationship capacity of genotypes. Higher dry matter accumulation in pods of some genotypes had strong source-sink relationship because most of the assimilates translocated to pods.The findings are in concordant to the results of Kumawat *et al.* (2009).

Pod Yield:

In the present study, cultivars Dh 86 (29.02 q/ha) and ICGV 93468 (28.91 q/ha) gave highest pod yield, which was significantly superior than other tested genotypes. The increase in pod yield of Dh 86 and ICGV 93468 may be attributed to the considerable increase in yield traits and also the other characters measured in term of percent dry matter accumulation in pods and harvest index, where the supremacy of genotypes Dh 86 and ICGV 93468 was maintained.

The cultivars Dh 40 (16.35 q/ha) and G 201 (16.32 q/ha) gave minimum pod yield as compared to other genotypes. The yield traits and other characters like percent dry matter accumulation in pods and harvest index declined considerably in Dh 40 and G 201, supported to the reduction of pod yield in Dh 40 and G 201during summer season (Table-1).These results confirm the findings of Singh (2004), Singh (2005), Singh (2008), Jagtap *et al.* (2009), Singh (2010) and Vaghasia *et al.* (2010).

Kernel yield:

The results displayed that the kernel yield was higher in cultivars Dh 86 (20.21 q/ha) and ICGV 93468 (20.10 q/ha) over all cultivars. The lowest kernel yield was recorded in cultivars G 201 (11.15 q/ha) and Dh 40 (11.21 q/ha). The increase in kernel yield was due to increase in pod yield in Dh 86 and ICGV 93468. The decrease in kernel yield in G 201 and Dh 40 was owing to fact that decrease in pod yield was commensurate with decrease in kernel yield.

CONCLUSION AND RECOMMENDATION

The tested cultivars Dh 86 and ICGV 93468 (AVTAR) proved superior and high yield, therefore, the groundnut growers of riverine tract may be advocated for adoption of these two cultivars to obtaining good productivity during summer season.

References:

Datta, N.P., Khera, M.S. and Saini, T.R. 1962. A rapid colorimetric procedure for the determination of organic carbon in soils. *Journal of Indian Society of Soil Sciences* 10: 67-74.

Gomez, K.A. and Gomez, A.A. 1984. Statistical procedures for agricultural research, *Johniwiley and Sons.*, New York.

Jagtap, D.T., Jadhav, D.J., Kanase, R.V. and Nalawade, R.G. 2009. Physiological basis of yield variation in groundnut genotypes in kharif season. *International Journal of Agricultural Sciences* 5(1): 120-122.

Kumawat, R.N., Mahajan, S.S. and Mestia, R.S. 2009. Growth and development of groundnut (*Arachis hypogaea*) under foliar application of punchagavya and leaf extracts of endemic plants. *Indian Journal of Agronomy* 54 (3): 324-331.

Olsen, S.R., Cole, C.V., Watanable, F.S. and Dean, L.A. 1954. Estimation of available phosphorus in soils by extraction with sodium bicarbonate U.S.D.A. Cire. 939 (Washington): 19.

Piper, C.S. 1950. Soil and Plant Analysis. *Univ. Adelaide* Aust.

Singh, A.L. 2004. Growth and physiology of groundnut. *Groundnut Research in India*. Publication of National Research Centre for Groundnut (ICAR) Junagadh, Gujarat, India: 178-212.

Singh, R.A. 2004. ICGV 93468 ushering in new hope for revival of groundnut in Uttar Pradesh, India. *International Arachis Newsletter* 24: 22-24.

Singh, R.A. 2005. Revival of groundnut production in U.P. NRCG newsletter IV (2-3): 1

Singh, R.A. 2006. Response of short duration varieties of groundnut in groundnut (*Arachis hypogaea*) – wheat (*Triticum aestivum*) – summer groundnut cropping system. *Farm Science Journal* 15(2): 130-132

Vol.3, No.1, pp.1-10, 2022
Print ISSN: 2517-276X
Online ISSN: 2517-2778
Published by European Centre for Research Training and Development UK

Singh, R.A. 2008. Parallel cropping of summer groundnut with spring cane- a new multiple cropping system for Uttar Pradesh. Abstract (In), National Symposium on Technology Innovations for Resource Starved Farmers in Global Perspective, organized by CSAUAT, Kanpur on 28-30 April: 66-67 p.

Singh, R.A. 2009. Summer groundnut holds a good promise as companion crop in guava plantation in U.P. DGR, Newsletter VIII (3-4): 2-3.

Singh, R.A. 2010. Development of summer groundnut varieties for different agro-climatic zone of Uttar Pradesh. Souvenir and Abstract (In), *National Symposium on Sustainable Agriculture for Rural Development,* organized by CSA University of Agriculture and Technology, Kanpur on 11 December : 40 p.

Singh, R.A., Kumar, M. and Haider, E. 2007. Synergistic cropping of summer groundnut with *Jatropha curcas* – A new two tier cropping system for Uttar Pradesh. *International Arachis Newsletter* 27: 38-39.

Singh, S.K. 2011. Studies on growth and development of different varieties of summer groundnut (*Arachis hypogaea* L.) for sustainable production in U.P. Ph.D. (Agronomy) thesis of Bundelkhand University, Jhansi.

Singh, T.A. 1971. A laboratory Manual for Soil Fertility and Fertilizer, *U.P. Agril. Univ. Pantnagar* (Nainital) : 71-74.

Upadhyay, H.D. Nigam, S.N., Reddy, A.G.S. and Yellaiah, N. 2005. Early maturing, large seeded and high yielding groundnut varieties ICGV 96466, ICGV 96468 and ICGV 96469. *An Open Access Journal of ICRISAT* 1(1): 1-4.

Vaghasia, P.M., Jadav, K.V. and Nadiyadhara, M.V. 2010. Effect of soil moisture stress at various growth stages on growth and productivity of summer groundnut (*Arachis hypogaea* L.) genotypes. International Journal of Agricultural Sciences 6(1): 141-143.

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Table-1: Growth, yield attributes, pod yield (q/ha), kernel yield (q/ha) and harvest index under different genotypes

(Pooled data of two years)

Variety	Branches/ plant	Functioning leaves/ plant	Pods/ plant	Pods weight/ plant	Kernels/ plant	Kernels weight/ plant (g)	100-kernel weight (g)	Pod yield (q/ha)	Kernels Yield (q/ha)	Harvest index (%)
Dh 86	11.27	111.83	31.99	26.53	56.05	18.02	49.21	29.02	20.21	45.32
Dh 40	13.60	118.99	18.05	14.98	31.71	10.17	31.58	16.35	11.21	27.45
R 9251	13.94	120.10	27.66	22.95	48.54	15.60	43.41	25.07	17.21	36.04
R 8808	11.93	115.16	21.66	17.97	37.99	12.20	37.24	19.57	13.38	34.19
R 2000-1	13.04	118.10	24.27	20.13	42.55	13.65	41.08	21.91	14.93	34.76
ICGS 44	12.27	116.22	23.44	19.43	41.16	13.20	40.41	21.30	14.60	35.48
ICGS 1	13.15	118.22	21.88	18.14	38.32	12.34	37.58	19.74	13.55	31.92
ICGS 37	12.60	117.33	20.94	17.36	36.77	11.79	36.41	18.96	12.93	32.10
ICGS 11	15.82	12293	21.21	17.60	37.16	11.95	36.54	19.07	13.05	27.22
ICGS 76	11.71	114.22	21.66	17.96	37.99	12.19	37.41	19.57	13.38	34.54
ICGV 93468	11.49	113.22	31.77	26.34	55.77	17.90	49.08	28.91	21.10	44.72
ICGV 86590	14.82	122.05	21.72	18.01	38.05	12.30	37.44	19.57	13.38	29.11
ICGV 86325	14.49	121.27	23.72	19.66	41.61	13.35	40.24	21.57	14.82	31.75
ICGV 00310	13.16	118.22	30.05	24.92	52.66	16.93	47.24	27.35	18.77	39.40
ICGV 00298	16.38	123.16	30.77	25.53	53.88	17.36	48.08	27.96	19.27	34.51
ICGV 99195	16.82	124.16	30.94	25.66	54.27	17.44	48.24	28.02	19.32	33.74
ICGV 02099	11.71	114.27	24.33	2018	42.61	13.70	41.08	22.07	15.27	37.50
ICGV 02022	11.71	117.33	23.66	19.61	41.54	13.32	40.08	21.46	14.82	36.94
ICGV 94361	13.71	120.16	25.27	20.97	44.32	14.26	43.41	22.91	15.71	34.38
G 201	14.38	121.27	18.21	15..11	31.94	10.26	32.28	16.32	11.15	26.88
S.E. (m±)	**0.16**	**0.93**	**0.59**	**0.42**	**0.64**	**0.17**	**0.32**	**0.38**	**0.36**	**0.34**
C.D. 5%	**0.45**	**2.62**	**1.66**	**1.18**	**1.80**	**0.47**	**0.90**	**1.07**	**1.01**	**0.95**

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Table-2: Dry weight of stem, leaves, pods and its percent distribution.

(Pooled data of two years)

Variety	Dry weight of stem/plant (g)	Dry weight of leaves/plant (g)	Dry weight of pods/ plant(g)	Distribution percent of total dry matter			
				Stem	Leaves	Pods	Total
Dh 86	8.93	12.34	26.53	18.70	28.80	55.50	100
Dh 40	9.53	13.18	14.98	25.30	34.90	39.90	100
R 9251	9.62	13.30	22.95	21.05	29.00	50.00	100
R 8808	9.25	12.79	17.97	23.12	31.96	44.92	100
R 2000-1	9.44	13.04	20.13	22.15	30.60	47.25	100
ICGS 44	9.35	12.92	19.43	22.42	30.98	46.60	100
ICGS 1	9.48	13.11	18.14	23.25	32.20	44.55	100
ICGS 37	9.40	12.98	17.36	23.65	32.65	43.70	100
ICGS 11	9.90	13.69	17.60	24.05	33.25	42.70	100
ICGS 76	9.20	12.73	17.96	23.05	31.90	45.05	100
ICGV 93468	9.12	12.59	26.34	18.98	26.20	54.82	100
ICGV 86590	9.82	13.56	18.01	23.75	32.75	43.50	100
ICGV 86325	9.72	13.43	19.66	22.70	31.35	45.95	100
ICGV 00310	9.48	13.11	24.92	19.95	27.60	52.45	100
ICGV 00298	9.95	13.76	25.53	20.20	27.95	51.85	100
ICGV 99195	10.00	13.82	25.66	20.20	27.95	51.85	100
ICGV 02099	9.16	12.66	20.18	21.80	30.15	48.05	100
ICGV 02022	9.20	12.73	19.61	22.15	30.65	47.20	100
ICGV 94361	9.67	1337	20.97	21.95	30.40	47.65	100
G 201	9.68	13.37	15.11	2535	35.05	39.60	100
S.E. (m±)	**0.16**	**0.16**	**0.42**	-	-	-	-
C.D. 5%	**0.45**	**0.45**	**1.18**	-	-	-	-

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