

# Performance of new summer groundnut varieties in different agro-climatic zones of Uttar Pradesh

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**ABSTRACT:** The experiments were laid out from 2006 to 2008 at Regional Research Station, Mainpuri, C.S. Azad University of Agriculture and Technology, Kanpur, RATDSs, Hardoi and Mathura on varietal performance. The main objective was to find out the high yielding suitable groundnut varieties to summer season cultivation. ICRISAT supplied six groundnut genotypes for evaluation during summer season of 2006. Genotype ICGV 99195 registered significantly higher pod yield (2.78 t ha<sup>-1</sup>) compared with all the test varieties except ICGV 00298 (2.77 t ha<sup>-1</sup>). Local check (G 201) reduced pod yield by a margin of 1.17 t ha<sup>-1</sup> and 1.16 t ha<sup>-1</sup> in comparison to ICGV 99195 and ICGV 00298, respectively at Regional Research Station, Mainpuri. The order of performance of the cultivars at Regional Agricultural Testing and Demonstration Station, Hardoi was ICGV 99195 (1.66 t ha<sup>-1</sup>), ICGV 02099 (1.58 t ha<sup>-1</sup>), ICGV 00298 (1.57 t ha<sup>-1</sup>), ICGV 00310 (1.55 t ha<sup>-1</sup>), ICGV 02022 (1.51 t ha<sup>-1</sup>), ICGV 94361 (1.25 t ha<sup>-1</sup>) and Kaushal (1.04 t ha<sup>-1</sup>). At Regional Agricultural Testing and Demonstration Station, Mathura, the highest pod yield of 1.63 t ha<sup>-1</sup> was reaped from genotype ICGV 00298 compared with other test genotypes during summer season. Local check ICGS 44 gave pod yield of 1.33 t ha<sup>-1</sup>. Therefore, the order of performance of the genotypes was ICGV 00298 (1.63 t ha<sup>-1</sup>), ICGV 00310 (1.57 t ha<sup>-1</sup>), ICGV 99195 (1.51 t ha<sup>-1</sup>), ICGV 02099 (1.39 t ha<sup>-1</sup>), ICGV 94361 (1.36 t ha<sup>-1</sup>), ICGS 44 (1.33 t ha<sup>-1</sup>) and ICGV 02022 (1.30 t ha<sup>-1</sup>). The both high yielder varieties were found suitable under low fertility and moisture stress conditions and negligible losses under both optimum and late sown conditions was seen.

**Key Words :** Agro-climatic zone, Bunch, Non-dormant, Spanish, Valencia, Virginia

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**G**roundnut (*Arachis hypogaea* L.) is a major oil seed crop of the world. The commercial cultivation of groundnut is confined between 40°N and 40°S latitudes of the world. Groundnut is essentially a tropical crop which requires long and warm growing seasons. It can be successfully grown in areas having a rainfall as low as 50 cm to as high as 125 cm per annum between mean temperatures of 21°C to 27°C. It grows well in a variety of soil ranging from light textured red soils to well drained black soils. The majority of groundnut area in India falls under sub-humid, arid and semi-arid regions. In general, requirements for this crop are dependent much in aerial (temperature, radiation, humidity etc.), edaphic (soil, moisture and aeration etc.), pedologic (soil depth,

soil reaction etc.), technological (fertilizers, pesticides) and other factors. The cultivated groundnut (*Arachis hypogaea* L.) has three distinct botanical groups namely Spanish, Valencia and Virginia. The Spanish and Valencia types popularly called as bunch, grow erect, possess light green foliage and produce pods in cluster at the base of the plant. The seeds are non-dormant and round with light rose testa. The Virginia group which includes both Virginia bunch (semi-spreading) and Virginia runner (spreading) types, on the other hand, possess dark green foliage and the branches trail on the soil surface either partially or completely. The main stem is devoid of flower and pods are scattered all along the branches. The seeds are dormant, oblong in shape with brown testa. In general, semi-

spreading and spreading varieties mature late as compared with the bunch varieties (Basu and Rathnakumar, 2004).

Groundnut is cultivated commercially in *Kharif* as well as *Rabi* summer seasons. In rainy season, the crop is grown under rain fed condition by planting varieties belonging to different habit groups. In contrast, during *Rabi* summer (post rainy) season, the varieties belonging to Spanish bunch and Valencia are preferred for their shorter duration and are grown under residual moisture regime/irrigated conditions. In addition, groundnut is also being grown to a limited extent during spring season after the harvest of potato, toria etc especially in the northern parts of the country.

So far, groundnut is an important *Kharif* season oil seed crop of Uttar Pradesh. In early 1980's ground nut was grown in U.P. on 0.30 million ha during rainy season with a production of 0.19 million tones. Since then both area and production have shown a steady decline due to biotic and abiotic reasons. During 1997-98 groundnut area declined from 0.30 millions ha to 0.13 millions ha and production from 0.19 million tones to 0.12 million tones. In 2011-12 this area was reduced 0.09 millions ha with total production of 0.09 million tones and an average productivity of 1001 kg/ha. Efforts to arrest decline in area and production did not succeed. A strong need was felt to develop a suitable technology for ground nut cultivation under moisture stress condition to revive ground nut in Uttar Pradesh. The author developed a plan for introducing summer cultivation of ground nut in the state for the area vacant in summer season after harvesting of potato (0.51 millions ha), mustard (0.61 million ha) and field pea (0.32 million ha) after discussion with S.N. Nigam, Principal Scientist and Regional Theme Co-ordinator (ground nut), The International Crops Research Institute for the Semi-Arid-Tropics, Patancheru, Andhra Pradesh, India in 1997-98. The seed material of different genotypes supplied by ICRISAT for the exploring the possibilities of groundnut cultivation during summer season were tested in 1998 under the leadership of author at Regional Research Station, Mainpuri. This was the first unprecedented success for possibilities of dissemination and diffusion of ground nut cultivation during summer season in U.P. Among all the varieties supplied by ICRISAT, ICGV 93468 has given excellent performance at Regional Research Station, Mainpuri and RATDSs, Hardoi, Mathura and Bareilly and released this variety by U.P. State Varietals Research Sub Committee in 46<sup>th</sup> meeting held on 16.02.2008 for cultivation in whole U.P. This is first release summer ground nut varieties of U.P. (Singh, 2009). The research work lead on summer ground nut for release of other varieties to the different agro-climatic zone has been done, which is subject matter of this paper.

## RESEARCH PROCEDURE

The experiments were laid out from summer season of 2006 to 2008 at Regional Research Station, Mainpuri, C.S. Azad University of Agriculture and Technology, Kanpur on varieties

performance. The main objective was to find out the high yielding suitable groundnut varieties to the different agro-climatic zone of U.P. for summer season cultivation. ICRISAT supplied six improved genotypes for evaluation during summer season of 2006. A varietal trial of six genotypes and a local check G 201 (Kaushal) was laid out during summer season of 2006 and 2007 at the Regional Research Station, Mainpuri. The trial was sown on 11 March in 2006 and 10 March in 2007. It was harvested after 90 days during both experimental season on 09 June and 08 June during 2006 and 2007, respectively. The sowing was done in rows 30 cm apart with 10 cm plant spacing. Recommended dose of 20 kg N ha<sup>-1</sup> + 30 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> + 45 kg K<sub>2</sub>O ha<sup>-1</sup> was applied at the time of sowing in furrows. Gypsum was applied at 200 kg ha<sup>-1</sup> with 50 per cent quantity at sowing and the remaining 50 per cent top dressed between flowering and pegging stage to create the fragile condition at pegging and conservation of moisture *in situ*. Four irrigations were given to summer groundnut.

In agro-climatic zone-V (Central Plain) of U.P., the trial was conducted at Regional Agricultural Testing and Demonstration Station, Hardoi during summer season of 2007 and 2008. Trial of same six improved groundnut genotypes including local check G-201 (Kaushal) was sown on 10th April in 2007 and 18th March in 2008 and harvested after 95 days on 14 July and 21 June, respectively. The other agronomical practices were followed same to the Regional Research Station, Mainpuri.

In agro-climatic zone IV (South-Western-Semi-Arid) of U.P., the experiment was carried out at Regional Agricultural Testing and Demonstration Station, Mathura during summer season of 2007. The experiment with same six improved genotypes with local check ICGS 44 was sown on 7 April and harvested after 95 days of sowing on 13 July 2007. The other agronomical practices were same to the RRS, Mainpuri.

The trials were conducted in RBD with four replications at Regional Research Station, Mainpuri and in three replications at Regional Agriculture Testing and Demonstration Stations, Hardoi and Mathura.

## RESEARCH ANALYSIS AND REASONING

The result obtained from the different agro-climatic zones of Uttar Pradesh are discussed below:

### Response of new varieties at Regional Research Station, Mainpuri:

A varietals trial was laid out during summer season of 2006 and 2007 under National Agricultural Research Project, Mainpuri with the objective to judge the production potential of different new genotypes on denuded and degraded sandy soil of U.P., India. Six cultivars including local check G 201 (Kaushal) were tested. It is clear from the data available in

Table 1 that the genotype ICGV 99195 registered significantly higher pod yield ( $2.78 \text{ t ha}^{-1}$ ) compared with all the test varieties except ICGV 00298 ( $2.77 \text{ t ha}^{-1}$ ). Local check (G 201) reduced pod yield by a margin of  $1.17 \text{ t ha}^{-1}$  and  $1.16 \text{ t ha}^{-1}$  in comparison to ICGV 99195 and ICGV 00298, respectively. The other genotypes gave pod yield between these two limits.

**Table 1 : Response of groundnut cultivars during summer season in Uttar Pradesh at Zonal Agricultural Research Station, Mainpuri (Under normal sown condition)**

Sr. No.	Genotype	Yield (q/ha)			Rank
		2006	2007	Average	
1.	ICGV 00310	26.90	26.50	26.70	I
2.	ICGV 99195	27.60	28.00	27.80	
3.	ICGV 94361	22.40	22.90	22.70	
4.	ICGV 02022	21.00	21.50	21.20	
5.	ICGV 00298	27.50	28.00	27.70	
6.	ICGV 02099	21.60	22.10	21.80	
7.	Kausal (Local check)	15.90	16.20	16.10	

**Table 2 : Response of groundnut cultivars during summer season in Central Plain Zone-V of Uttar Pradesh at RATDS, Hardoi (Department of Agriculture, Lucknow)**

Sr. No.	Genotype	Yield (q/ha)			Rank
		2007	2008	Average	
1.	ICGV 00310	9.90	21.12	15.51	I
2.	ICGV 99195	12.27	21.12	16.69	
3.	ICGV 94361	8.77	16.28	12.52	
4.	ICGV 02022	8.31	22.00	15.15	
5.	ICGV 00298	10.29	21.12	15.70	
6.	ICGV 02099	11.08	20.68	15.88	
7.	Kausal (Local check)	9.90	11.00	10.45	

**Table 3 : Response of groundnut cultivars during summer season under late sown condition at RATDS, Hardoi and Mathura (Department of Agriculture, Lucknow)**

Sr. No.	Genotype	Yield (q/ha)			Rank
		Hardoi	Mathura	Average	
1.	ICGV 00310	9.90	15.76	12.83	
2.	ICGV 99195	12.27	15.17	13.72	I
3.	ICGV 94361	8.77	13.68	11.22	
4.	ICGV 02022	8.31	13.09	10.70	
5.	ICGV 00298	10.29	16.36	13.32	
6.	ICGV 02099	11.08	13.98	12.53	
7.	Kausal (Local check)	9.90	-	-	
8.	ICGV 44 (Local check)	-	13.38	-	

These genotypes were sown after harvest of barely as well as early maturing wheat

**Table 4 : Response of groundnut cultivars during summer season in South Western-Semi Arid Zone-IV of Uttar Pradesh at RATDS, Raya, Mathura (Department of Agriculture, Lucknow)**

Sr. No.	Genotype	Yield (q/ha)			Rank
		2007	2008	Average	
1.	ICGV 00310	15.76	-	15.76	I
2.	ICGV 99195	15.17	-	15.17	
3.	ICGV 94361	13.68	-	13.68	
4.	ICGV 02022	13.09	-	13.09	
5.	ICGV 00298	16.36	-	16.36	
6.	ICGV 02099	13.98	-	13.98	
7.	ICGV 44 (Local check)	13.38	-	13.38	

### Performance of new summer groundnut genotypes at Regional Agricultural Testing and Demonstration Station, Hardoi :

Regional Agricultural Testing and Demonstration Station, Hardoi is situated in agro-climatic zone-V of Uttar Pradesh. The ICRISAT varieties with local check G 201 (Kaushal) were tested during summer season of 2007 and 2008. Genotype ICGV 99195 gave higher average pod yield ( $1.66 \text{ t ha}^{-1}$ ) compared to all other genotypes (Table 2). The genotype ICGV 99195 gave 59.71 per cent more pod yield than local check G 201. The order of performance of the cultivars in agro-climatic zone V of Uttar Pradesh was ICGV 99195 ( $1.66 \text{ t ha}^{-1}$ ), ICGV 02099 ( $1.58 \text{ t ha}^{-1}$ ), ICGV 00298 ( $1.57 \text{ t ha}^{-1}$ ), ICGV 00310 ( $1.55 \text{ t ha}^{-1}$ ), ICGV 02022 ( $1.51 \text{ t ha}^{-1}$ ), ICGV 94361 ( $1.25 \text{ t ha}^{-1}$ ) and Kaushal ( $1.04 \text{ t ha}^{-1}$ ). Cultivar ICGV 99195 is high yielder genotype under both timely and late sown condition and most suitable for cultivation during summer season (Table 3). This is also suitable for loamy sand and sandy loam soils having low fertility status, low moisture holding capacity and can be dug easily in light soil without pods losses due to bunch type genotype. The maturity duration ranges from 95-96 days from seed to seed. Cultivar ICGV 99195 possess high harvest index during summer season in Uttar Pradesh.

### Performance of new genotypes at Regional Agricultural Testing and Demonstration Station, Mathura :

Regional Agricultural Testing and Demonstration Station, Mathura is located in agro-climatic zone-IV of Uttar Pradesh. The ICRISAT genotypes with local check ICGS 44 were tested during 2007. The highest pod yield of  $1.63 \text{ t ha}^{-1}$  was reaped from genotype ICGV 00298 compared with other test genotypes during summer season of 2007. Local check ICGS 44 gave pod yield of  $1.33 \text{ t ha}^{-1}$ , which was reduced the pods yield of  $0.30 \text{ t ha}^{-1}$  or 22.27 per cent in comparison to ICGV 00298. Therefore, the order of performance of the genotypes was ICGV 00298 ( $1.63 \text{ t ha}^{-1}$ ), ICGV 00310 ( $1.57 \text{ t ha}^{-1}$ ), ICGV 99195 ( $1.51 \text{ t ha}^{-1}$ ), ICGV 02099 ( $1.39 \text{ t ha}^{-1}$ ), ICGV 94361 ( $1.36 \text{ t ha}^{-1}$ ), ICGS 44 ( $1.33 \text{ t ha}^{-1}$ ) and ICGV 02022 ( $1.30 \text{ t ha}^{-1}$ ) in agro-climatic zone IV of U.P. (Table 4). ICGV 00298 is high yielder cultivar and most suitable for cultivation during summer season. This is also suitable under low fertility, limited irrigation and degraded soil, viz., loamy sand. This bunch variety can be dug easily in light soil with negligible losses under both optimum and late sown condition in agro-climatic zone-IV of Uttar Pradesh. Similar work related to groundnut topic was also previously done by Agasimani and Babalad (1991); Akbari *et al.* (2002) worked on the effect of phosphorus fertilization with and without FYM on groundnut Angadi *et al.* (1990); Chavan and Patil (1995); Chawale *et al.* (1993); Deshmukh *et al.* (2005); Dutta *et al.* (2003); Geethalakshmi *et al.* (1993); Deshmukh *et al.* (1992); Kumawat *et al.* (2009); Mehta *et al.* (1996) and Singh *et al.* (1994) also worked on the related topic.

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