*IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*
*e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 9, Issue 5 Ver. I (May. 2016), PP 81-83*
*www.iosrjournals.org*

# Growth Characters and Yield of Early Kharif Groundnut As Influenced By Varieties and Plant Populations

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***Abstract:*** *A field experiment was conducted in sandy loam soils at S. V. Agricultural College, Tirupati campus of Acharya N.G. Ranga Agricultural University, Andhra Pradesh in randomized block design with factorial concept to study the performance of groundnut cultivars viz., 'Abhaya', 'TAG-24', 'Dharani' and 'Kadiri-6' under different plant populations viz., 3.33, 4.44, 5.00 and 6.66 lakh/ha during early kharif, 2013. The results revealed that the highest stature of growth parameters viz., plant height, LAI and DMP were higher with the groundnut cultivar 'Kadiri-6' while at their lowest with 'TAG-24.' However, the yield attributes viz., number of filled pods/plant, 100-pod, 100-kernel weight and pod yield were significantly higher with groundnut cultivar, 'Dharani' followed by 'TAG-24'. Among the plant populations tested, the growth parameters viz., plant height, LAI and DMP were significantly higher at plant population of 6.66 plants/ha where as the yield components viz., number of filled pods/plant, 100-pod and 100-kernel weight were significantly higher at plant population of 3.33 lakh/ha. However, the highest pod yield of groundnut was obtained at plant population of 5.00 lakh/ha, which was closely followed by 3.33 lakh/ha. The maximum net returns with higher benefit-cost ratio of groundnut cultivation during early kharif in sandy loam soil was obtained with groundnut cultivar 'Dharani' at plant population of 3.33 lakh/ha.*

***Keywords:*** *Cultivar, Dry matter production, Groundnut, Plant Population, Yield attributes, Yield*

## I. Introduction

The groundnut (*Arachis hypogaea* L.) is one of the major oilseed crops of the country, but its production and productivity needs to be significantly enhanced to meet the national shortage of availability of edible oil in India. India is the second largest producer of groundnut after Brazil, accounting for 22.98 per cent of the total area and 14.52 per cent of the production of the world. In India, Andhra Pradesh ranks second both in area (13.07 lakh hectares) and production (8.45 lakh tonnes) with an average productivity of 646 kg $ha^{-1}$. Growing of groundnut in early *kharif* is gaining importance in Southern Agro-climatic zone of Andhra Pradesh. Due to lack of suitable variety and standardization of optimum plant population for early *kharif*, the farmers are using heavy seed rate upto 200 kg $ha^{-1}$ even though it is a costly input in groundnut cultivation. The varieties which may be suited to early *kharif* is quite different from the rest of the seasons with respect to growth habit. Optimum plant population unit $area^{-1}$ for a given variety at specific situation not only reduce the cost of cultivation, but also augment the full yield potential of the cultivar.

## II. Material And Methods

An experiment was conducted at S.V. Agricultural College, Tirupati, during early *kharif* , 2013 on sandy loam soil. The soil was low in available nitrogen (225 kg N $ha^{-1}$) and medium in phosphorous (23.7 kg $P_2O_5$ $ha^{-1}$) and potassium (264 kg $K_2O$ $ha^{-1}$) and low in organic carbon (0.18 %). Sixteen treatment combinations of four groundnut varieties (Abhaya, TAG-24, Dharani and Kadiri-6) and four levels of plant populations (3.33, 4.44, 5.00 and 6.66 lakh $ha^{-1}$) were laid out in randomized block design with factorial concept in three replications. The crop was shown on 13th May, 2013 according to the specific treatments. 20 kg N, 40 kg $P_2O_5$ and 50 kg $K_2O$ $ha^{-1}$ were applied as basal and 10 kg N $ha^{-1}$ was applied as top dressing at 30 DAS and gypsum @ 500 kg $ha^{-1}$ was applied at 40 DAS. The water requirement of groundnut is around 400 mm. The rainfall during crop growing period contributed to the extent of 220.7 mm with 20.0 rainy days.

## III. Results And Discussion

***Effect on growth:*** The results indicated that the plant height at harvest, LAI at 75 DAS and dry matter production (DMP) at harvest were significantly higher with Kadiri-6 followed by Dharani, Abhaya and TAG-24. SPAD chlorophyll meter reading (SCMR) at harvest was higher with Dharani followed by Abhaya, TAG-24 and Kadiri-6 which were comparable with each other. Duration taken for 50 per cent flowering and days to maturity were significantly lower with TAG-24. These results are in conformity with the findings of Ramesh (2002). The maximum number of days taken to 50 per cent flowering and days to maturity was registered with Abhaya.

**Table1. Growth parameters of groundnut as influenced by varieties and plant populations**

| Treatments | Plant height (cm) | LAI | DMP (kg ha$^{-1}$) | SCMR | Days to 50 % flowering | Days to maturity |
|---|---|---|---|---|---|---|
| **Varieties** | | | | | | |
| Abhaya | 34.8 | 2.64 | 7574 | 37.7 | 34.09 | 110.40 |
| TAG-24 | 24.8 | 2.62 | 7455 | 37.2 | 32.04 | 103.80 |
| Dharani | 39.1 | 2.75 | 7675 | 38.5 | 33.57 | 105.06 |
| Kadiri-6 | 44.3 | 2.78 | 7950 | 36.0 | 33.30 | 105.01 |
| SEm± | 0.32 | 0.006 | 25.0 | 0.67 | 0.10 | 0.10 |
| CD (P=0.05) | 0.92 | 0.018 | 71.5 | NS | 0.29 | 0.33 |
| **Plant Population (lakh ha$^{-1}$)** | | | | | | |
| 3.33 | 27.6 | 2.41 | 5902 | 38.3 | 36.17 | 106.5 |
| 4.44 | 32.9 | 2.61 | 7397 | 37.8 | 34.16 | 106.2 |
| 5.00 | 39.2 | 2.75 | 7810 | 37.5 | 32.16 | 106.0 |
| 6.66 | 43.2 | 3.01 | 9544 | 35.9 | 30.52 | 105.7 |
| SEm± | 0.32 | 0.006 | 25.0 | 0.67 | 0.10 | 0.10 |
| CD (P=0.05) | 0.92 | 0.018 | 71.5 | NS | 0.29 | 0.33 |
| **Varieties x Plant Population** | | | | | | |
| SEm± | 0.64 | 0.013 | 49.0 | 1.35 | 0.20 | 0.20 |
| CD (P=0.05) | 2.04 | 0.041 | 158.3 | NS | 0.65 | NS |

Plant height increased with each increasing level of plant population (*i.e,* 3.33, 4.44, 5.00 and 6.66 lakh/ha) significantly and the maximum was obtained at plant population of 6.66 lakh/ha. The higher plant density might have resulted in mutual shading of the plants with increased competition for light and forced the plants to grow taller by increasing the inter-nodal length in search of light. Similar findings were reported by Rama Jyothi *et al*. (2004). The LAI and dry matter production also followed the same trend as that of the plant height, due to more number of plants unit area$^{-1}$ that resulted in higher LAI and dry matter production. The present results are in conformity with the findings of Kaul (1999) and Kathirvelan and Kalaiselvan (2006). The maximum SPAD chlorophyll meter reading was recorded with plant population of 3.33 lakh/ha followed by 4.44, 5.00 and 6.66 lakh/ha which were comparable with each other. The plant population of 3.33 lakh/ha recorded significantly more number of days for 50 per cent flowering and maturity followed by 4.44, 5.00 and 6.66 lakh/ha in order of descent with significant disparity between any two of them.

***Effect on yield:*** The maximum pod yield as well as oil yield was obtained with Dharani, which was significantly higher than rest of the varieties studied and the next best variety in producing higher pod yield was the TAG-24 followed by Kadiri-6 and Abhaya. Lower pod yield as well as oil yield was obtained with Abhaya due to less number of filled pods plant$^{-1}$ and lower hundred kernel weight. The highest haulm yield was obtained with Kadiri-6, which was significantly higher than rest of the varieties tried, due to increased vegetative growth interms of plant height, leaf area index and dry matter production resulting in increased haulm yield. Dharani was the next best variety in producing higher haulm yield followed by Abhaya and TAG-24, with significant disparity between any two of them. The lowest haulm yield was obtained with TAG-24 among all the varieties compared due to its compact nature with short **inter-nodal** length leads to reduced plant height, leaf area index and dry matter production leading to reduced haulm yield. These results are in accordance with the findings of Ramesh (2002). The highest harvest index was computed with the groundnut variety TAG-24 due to its compact growth habit leads to reduced plant height resulted in lower dry matter production. Similar results were also reported by Deshmukh *et al.* (1993). The next best variety in recording higher harvest index was Dharani followed by Kadiri-6 and Abhaya, with a significant disparity between any two of them. The lowest harvest index was registered with Abhaya.

**Table 2. Pod yield (kg ha$^{-1}$) of groundnut varieties under different plant populations**

| Treatments | Plant Population (lakh ha$^{-1}$) | | | | |
|---|---|---|---|---|---|
| **Varieties** | **3.33** | **4.44** | **5.00** | **6.66** | **Mean** |
| Abhaya | 1969 | 1910 | 2191 | 1878 | 1987 |
| TAG-24 | 2896 | 2861 | 3018 | 2674 | 2862 |
| Dharani | 3571 | 3237 | 3906 | 3089 | 3450 |
| Kadiri-6 | 2556 | 2497 | 2205 | 2092 | 2337 |
| **Mean** | 2748 | 2626 | 2830 | 2433 | |
| | | **SEm±** | **CD (P=0.05)** | | |
| Varieties (V) | | 28.0 | 80.8 | | |
| Plant Population (P) | | 28.0 | 80.8 | | |
| V x P | | 56.0 | 179.1 | | |

The highest pod yield as well as oil yield of groundnut was obtained with plant population of 5.00 lakh/ha and followed by 3.33, 4.44 and 6.66 lakh ha$^{-1}$ with significant disparity between any two of them. The lowest pod yield as well as oil yield was obtained with plant population of 6.66 lakh/ha due to severe competition for growth resources at higher plant population leads to reduced yield components because of

maintenance of poor source-sink relationship. The haulm yield was increased significantly with increasing plant population from 3.33 to 6.66 lakh/ha, due to increased plant height and more quantity of dry matter production unit area$^{-1}$ because of increased plant population unit area$^{-1}$. These findings are in agreement with the results reported by Hirwe *et al.* (2006) and Soumya *et al.* (2011). The lowest haulm yield was obtained with the plant population of 3.33 lakh/ha. These results are in conformity with those of Jadhav *et al.* (2000). The harvest index was significantly reduced with increasing plant population from 3.33 to 6.66 lakh/ha and the highest harvest index was noticed with 3.33 lakh ha$^{-1}$ followed by 4.44, 5.00 and 6.66 lakh/ha. The highest harvest index with lesser plant population was mainly due to lesser total biological yield/unit area compared to higher plant population, where more quantity of biological yield was produced/unit area. Similar results were reported by Meena *et al.* (2011).

**Table 3. Yield and economics of groundnut cultivation as influenced by varieties and plant populations**

***Economics:*** Among the groundnut varieties, the highest net returns and benefit-cost ratio were obtained with

| Treatments | Haulm yield (kg ha$^{-1}$) | Harvest Index (%) | Oil yield (kg ha$^{-1}$) | Net returns (` ha$^{-1}$) | B:C ratio |
|---|---|---|---|---|---|
| **Varieties** | | | | | |
| Abhaya | 5274 | 27.6 | 703 | 53060 | 2.07 |
| TAG-24 | 3822 | 43.5 | 1055 | 96258 | 2.96 |
| Dharani | 5608 | 36.4 | 1265 | 121239 | 3.22 |
| Kadiri-6 | 6151 | 29.2 | 801 | 69651 | 2.38 |
| SEm± | 103.0 | 0.31 | 18.3 | 1515 | 0.028 |
| CD (P=0.05) | 296.2 | 0.88 | 52.7 | 4374 | 0.081 |
| **Plant Population (lakh ha$^{-1}$)** | | | | | |
| 3.33 | 4372 | 38.3 | 1008 | 95793 | 3.11 |
| 4.44 | 4784 | 35.3 | 949 | 84964 | 2.69 |
| 5.00 | 5437 | 33.5 | 1012 | 93096 | 2.75 |
| 6.66 | 6263 | 27.9 | 857 | 66355 | 2.09 |
| SEm± | 103.0 | 0.31 | 18.3 | 1515 | 0.028 |
| CD (P=0.05) | 296.2 | 0.88 | 52.7 | 4374 | 0.081 |
| **Varieties x Plant Population** | | | | | |
| SEm± | 205.0 | 0.61 | 36.5 | 3030 | 0.056 |
| CD (P=0.05) | NS | 1.96 | 116.8 | 9692 | 0.180 |

Dharani followed by TAG-24 and Kadiri-6, with significant disparity between any two of them, while these economic parameters were at their lowest with Abhaya. Among the plant populations tried, the highest net returns were calculated with the plant population of 5.00 lakh ha$^{-1}$, which was at par with 3.33 lakh/ha. The lowest values of the above said economic parameter (net returns) was realized with the plant population of 6.66 lakh/ha. The maximum and minimum benefit-cost ratio was obtained with 3.33 and 6.66 lakh/ha respectively.

The interaction effect of varieties and plant populations was found significant in case of plant height and dry matter production at harvest, LAI at 75 DAS, days to 50 per cent flowering, pod yield, harvest index, oil yield and economic parameters. Maximum plant height, dry matter production at harvest and LAI at 75 DAS was recorded with Kadiri-6 with plant population of 6.66 lakh/ha. Maximum pod yield and oil yield was obtained with Dharani at plant population of 5.00 lakh/ha. **The highest** harvest index was recorded with TAG-24 at plant population of 3.33 lakh/ha while the lowest was with Kadiri-6 at plant population of 6.66 lakh/ha.

## IV. Conclusion

The results indicated that for realizing maximum pod yields, Dharani variety at plant population of 5.00 lakh ha$^{-1}$ may be adopted in sandy loam soils of Southern Agro-climatic zone of Andhra Pradesh.

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