*The Andhra Agric. J* 61(2):463-467, 2014

# Evaluation of Groundnut Varieties under Different Nutrient Management Practices during *Kharif* in North Coastal Zone of Andhra Pradesh

**Key words :** Groundnut, Fertility Levels, Varieties, Yield Attributes.

Groundnut (*Arachis hypogaea* L.) is a principle oil seed crop in India. Among the various biotic and abiotic factors influencing groundnut production, nutrient management is most important. During *kharif* excessive vegetative growth and the consequent lower production in North Coastal Zone of Andhra Pradesh has been identified as one of the key factors influencing the productivity of groundnut . Hence, varieties suitability under such conditions of fairly high rainfall and high relative humidity needs to be verified along with the optimal dose of major and minor nutrients for breaking the yield barrier. Keeping this in view, the present experiment was conducted to evaluate the effect of varieties and different fertility levels on yield of groundnut .

The field experiment was conducted at Agricultural college farm, Naira in *kharif* 2011-12. The soil of experimental plot was loamy sand having pH 5.8. The experiment was laid out in Split Plot design with three replications. The treatments comprised of four varieties *viz.,* JL 24 9 ($V_1$), TAG 24 ($V_2$), Abhaya ($V_3$) and K9 ($V_4$) with five fertility levels *viz*., NPK @ 20-40-50 kg ha$^{-1}$ ($F_1$), $F_1$ + 10 t ha$^{-1}$ FYM ($F_2$), $F_2$ + 500 kg gypsum ha$^{-1}$ ($F_3$), $F_3$ + 0.5% $FeSO_4$ as foliar application ($F_4$), $F_4$ + 25 kg $ZnSO_4$ ha$^{-1}$ ($F_5$). Crop was sown on June 22$^{nd}$, 2011 by dibbling with spacing of 30x10 cm. Recommended dose of 20:40:50 kg ha$^{-1}$ NPK was applied to treatmental plots through urea, single super phosphate (SSP) and muriate of potash (MOP), respectively. Entire quantity of phosphorus and potassium were applied as basal, whereas, nitrogen was applied in two equal splits; one as basal, and another at 30 days after sowing . Gypsum @ 500 kg ha$^{-1}$ was applied at flower initiation stage i.e. 26 days after sowing except in $F_1$, $F_2$. Zinc @ 25 kg ha$^{-1}$ was applied as basal($ZnSO_4$) and Iron was applied as foliar spray @ 0.5 per cent ($FeSo_4$) at 30 days after sowing in $F_4$, $F_5$. Farm yard manure was applied as per treatments and it was incorporated into the soil one month before sowing except in $F_1$. A total rainfall of 472.8 mm was received in 33 rainy days during the entire crop growth period.

Plant height of the varieties increased with advancement in age of the crop. The taller plants were noticed with JL 24 ($V_1$) at maturity which was significantly superior to rest of the varieties(Table1). The lowest plant height was recorded with TAG 24 which was on a par with Abhaya ($V_3$) and K9 ($V_4$). Difference in plant height with different varieties was also observed by Samui *et al*. (2004).

Significantly taller plants were observed with application of $ZnSO_4$ @ 25 kg ha$^{-1}$ ($F_5$) at maturity, which was significantly superior to rest of the fertility levels. Application of NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) recorded highest plant height compared to NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ ($F_3$), NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ ($F_2$) and NPK @ 20-40-50 kg ha$^{-1}$ ($F_1$). The lowest plant height was recorded with $F_1$ which was on a par with $F_2$ and $F_3$. This might be due to continuous supply of nutrients from organic and inorganic source of nutrients, led to higher uptake of nutrients and increased plant height. This was in agreement with the findings of Panwar and Munda (2007).

The dry matter accumulation with TAG 24 ($V_2$) recorded highest at maturity and significantly superior to rest of the varieties. The lowest dry matter accumulation with JL 24 ($V_1$) which was on a par with Abhaya ($V_3$). Highest dry matter accumulation in TAG 24 ($V_2$) might be due to highest leaf area index.

Application of NPK @ 20-40-50 kg $ha^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg $ha^{-1}$ ($F_5$) produced the highest dry matter accumulation, which was on a par with NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) at maturity. The dry matter accumulation with NPK @ 20-40-50 kg $ha^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ ($F_3$), which was comparable with NPK @ 20-40-50 kg $ha^{-1}$ + FYM @ 10 t $ha^{-1}$ ($F_2$) and significantly superior than NPK @ 20-40-50 kg $ha^{-1}$ ($F_1$). The lowest dry matter accumulation with NPK @ 20-40-50 kg $ha^{-1}$ ($F_1$), which was on a par with NPK @ 20-40-50 kg $ha^{-1}$ + FYM @ 10 t $ha^{-1}$ ($F_2$). The highest dry matter production might be due to highest LAI recorded at harvest. Photosynthetically active leaf area and also for longer period might have helped in production of higher photosynthates resulting in higher dry matter accumulation. These results were in accordance with the findings of Krishna Murthy *et al*. (2009).

Highest peg to pod ratio was recorded with TAG 24 ($V_2$), which was comparable with K9 ($V_4$) and significantly superior to rest of the varieties. The lowest peg to pod ratio was noticed with JL 24 ($V_1$). The highest peg to pod ratio with TAG 24 ($V_2$) might be due to lower plant height leads to most of the pegs easily penetrates in to the soil and converted into pods.

The highest peg to pod ratio was recorded with application of NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg $ha^{-1}$ ($F_5$), which was significantly higher than rest of the fertility levels. The peg to pod ratio with NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) comparable with NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + gypsum @ 500 kg $ha^{-1}$ ($F_3$), which was significantly superior than NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ ($F_2$) and NPK @ 20-40-50 kg $ka^{-1}$ ($F_1$).Increase in peg to pod ratio was due to continuous supply of organic and inorganic source of nutrients which tend to enhance the Biological Nitrogen Fixation (BNF) along with facilitation of proper proliferation of roots and pegging. These results were in accordance with the findings of Thomas Abraham and Thenua (2010).

Number of pods per plant with TAG 24 ($V_2$) significantly superior to rest of the varieties. The number of pods per plant with K9 ($V_4$) comparable with Abhaya ($V_3$) and significantly superior than JL 24 ($V_1$). The lowest number of pods per plant with JL 24 ($V_1$). The highest number of pods per plant TAG 24 ($V_2$) might be due to production of higher pegs and peg to pod ratio. The results are in conformity with the findings of Samui *et al*. (2004).

Among the various treatments, application of NPK @ 20-40-50 kg $ha^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg $ha^{-1}$ ($F_5$) resulted in highest number of pods per plant, which was on a par with NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) and significantly superior to rest of the fertility levels. The lowest number of pods per plant recorded with NPK @ 20-40-50 kg $ha^{-1}$ ($F_1$). The highest number of pods per plant might be due to adequate and continuous supply of macro and micro nutrients had positively influence on number of pods per plant.

The higher test weight was recorded with TAG 24 ($V_1$), which was comparable with K9 ($V_4$)(Table2). The lowest 100 kernel weight recorded with Abhaya ($V_3$). Samui *et al*. (2004) also reported varietal variations in test weight.

The highest test weight was recorded with application of NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg $ha^{-1}$ ($F_5$) followed by NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$), NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ ($F_3$). The lowest 100 kernel weight recorded with NPK @ 20-40-50 kg $ka^{-1}$ ($F_1$), which was on a par with NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ ($F_2$). The increase in 100 kernel weight might be due to translocation of more or photosynthates from source to sink, due to adequate supply of both macro and micro nutrients. These results were in conformity with those of Samui *et al*. (2004); Jayanta Sarkar *et al*. (2006); Akbari *et al*. (2010); Mohapatra and Dixit (2010).

Among the varieties, TAG 24 ($V_2$) yielded highest followed by K9 ($V_4$), Abhaya ($V_3$) and JL 24 ($V_1$). The highest pod yield could be attributed by highest peg to pod ratio, number of pods per plant, 100 kernel weight and number of kernels per

Table1. Various Growth parameters, yield attributes of groundnut as influenced by varieties and nutrient management practices.

| Treatment | Plant heightat maturity (cm) | Dry matter accumulation at harvest (kg $ha^{-1}$) | Peg to pod ratio | Number of pods per plant |
|---|---|---|---|---|
| **Varieties** | | | | |
| $V_1$ : JL 24 | 68.6 | 10920 | 54.8 | 18.8 |
| $V_2$ : TAG 24 | 60.8 | 11891 | 65.5 | 24.9 |
| $V_3$ : Abhaya | 62.3 | 10994 | 58.3 | 20.1 |
| $V_4$ : K9 | 64.4 | 11540 | 62.4 | 21.1 |
| S.Em± | 0.6 | 89.4 | 0.9 | 0.3 |
| CD (P=0.05) | 2.4 | 309.3 | 3.3 | 1.2 |
| **Nutrient management practices** | | | | |
| $F_1$: RDF | 61.3 | 10655 | 56.6 | 18.8 |
| $F_2$: $F_1$+FYM | 63.6 | 10990 | 58.9 | 20.4 |
| $F_3$: $F_2$+Gypsum | 64.8 | 11225 | 60.3 | 21.8 |
| $F_4$: $F_3$+$FeSO_4$ | 65.5 | 11706 | 61.7 | 22.3 |
| $F_5$: $F_4$+$ZnSO_4$ | 66.5 | 12106 | 63.8 | 22.8 |
| S.Em± | 0.4 | 187.3 | 0.5 | 0.2 |
| CD (P=0.05) | 1.3 | 539.6 | 1.7 | 0.7 |

pod in TAG 24 ($V_2$). Similar results in different varieties were noticed by various researchers viz., Ramesh thatikunta and Durgaprasad (2003); Samui *et al*. (2004); Samui *et al*. (2007).

The highest pod yield was recorded with application of NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg $ha^{-1}$ ($F_5$) followed by NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$), NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ ($F_3$), NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ ($F_2$) and NPK @ 20-40-50 kg $ha^{-1}$ ($F_1$). The highest pod yield could be attributed by higher peg to pod ratio, number of pods per plant, number of kernels per pod and 100 kernel weight.

Integrated application of NPK @ 20-40-50 kg $ka^{-1}$ + FYM @ 10 t $ha^{-1}$ + Gypsum @ 500 kg $ha^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg $ha^{-1}$ ($F_5$) recorded significantly higher pod yield over all other fertility levels might be due to adequate and continuous supply of macro and micro nutrients had positively influence on pod yield over application of NPK alone. Farm yard manure improved the physic-chemical condition of soil, provided favorable environment, stimulated the uptake of nutrients and increased the pod yield over the treatments where FYM was not added. Combination of FYM with gypsum had better effect in increasing pod yield of groundnut. This significant improvement due to gypsum application could be ascribed due to the fact that gypsum is a source of sulphur and calcium. Application of $FeSO_4$ might have enhanced the availability of iron to the plant which was required for chlorophyll synthesis. Higher chlorophyll had improved photosynthesis and ultimately the yield. The involvement of micronutrients viz., iron and zinc in metalloenzyme systems, regulatory functions in auxin production, chlorophyll content and uptake of major nutrients might be the reason for yield improvements. Superiority of these fertility level over other fertility levels might be attributed to application of critical nutrients like calcium, sulphur, iron and zinc along with NPK improves the pod yield. These results were in conformity with those of Thakur *et al*. (2010)

Table 2. 100 kernel weight, pod yield, haulm yield and oil content of groundnut as influenced by varieties and nutrient management practices.

| Treatment | 100 kernel weight (g) | Pod yield (kg ha$^{-1}$) | Haulm yield (kg ha$^{-1}$) | Oil content (%) |
|---|---|---|---|---|
| | | **Varieties** | | |
| $V_1$ : JL 24 | 37.7 | 1840 | 6870 | 49.7 |
| $V_2$ : TAG 24 | 39.5 | 2422 | 4683 | 49.4 |
| $V_3$ : Abhaya | 37.0 | 2095 | 6718 | 51.5 |
| $V_4$ : K9 | 38.0 | 2245 | 6603 | 53.8 |
| S.Em± | 0.4 | 36.5 | 264 | 0.9 |
| CD (P=0.05) | 1.5 | 126.4 | 915 | 3.3 |
| | | **Nutrient management practices** | | |
| $F_1$: RDF | 34.5 | 1830 | 5557 | 49.4 |
| $F_2$: $F_1$+FYM | 35.8 | 1971 | 5972 | 49.9 |
| $F_3$: $F_2$+Gypsum | 38.3 | 2214 | 6097 | 51.4 |
| $F_4$: $F_3$+$FeSO_4$ | 39.9 | 2303 | 6537 | 52.1 |
| $F_5$: $F_4$+$ZnSO_4$ | 41.8 | 2434 | 6929 | 52.8 |
| S.Em± | 0.5 | 22.2 | 300 | 0.4 |
| CD (P=0.05) | 1.4 | 64 | 662 | 1.3 |

Highest haulm yield was recorded with JL 24($V_1$) which was comparable with Abhaya($V_3$),K9($V_4$) and significantly superior to TAG-24($V_2$).The lowest haulm yield with TAG-24($V_2$). Significant effect on haulm yield of varieties might be due to their significant influence on plant height, though the plant height of TAG-24 was less than other varieties . The haulm yield as affected by different varieties was also reported by Samui *et al.* (2004)

The highest haulm yield was produced with application of NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg ha$^{-1}$ ($F_5$) which was comparable with application of NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) and significantly superior than rest of the fertility levels. This might be due to highest nutrient uptake and growth characters like plant height and dry matter production .Significant increase in the haulm yield with adequate supply of macro and micro nutrients was reported by Saren and Sarkar(2007). The haulm yield with NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) comparable with NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$($F_3$) and NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$($F_2$). The lowest haulm yield with NPK @ 20-40-50 kg ha$^{-1}$($F_1$) which was on par with NPK @ 20-40-50 kg ha$^{-1}$ + FYM @ 10 t ha$^{-1}$($F_2$).

Oil content was highest with K9 ($V_4$), which was comparable with Abhaya ($V_3$). The results are in close conformity with those of Chatterjee *et al*. (2005).

The highest oil content was recorded with application of NPK @ 20-40-50 kg ka$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ + $FeSO_4$ @ 0.5% + $ZnSO_4$ @ 25 kg ha$^{-1}$ ($F_5$), which was comparable with NPK @ 20-40-50 kg ka$^{-1}$ + FYM @ 10 t ha$^{-1}$ + Gypsum @ 500 kg ha$^{-1}$ + $FeSO_4$ @ 0.5% ($F_4$) and significantly superior than rest of the treatments. This might be due to application of Gypsum provided S and Ca. Sulphur is the integral part of aminoacids like cysteine, cystine and methionine recorded 6.8 % higher oil content over application of NPK @ 20-40-50 kg ha$^{-1}$ ($F_1$). These results were in conformity with those of Dutt and Mondal (2006). The lowest oil content was recorded with NPK @ 20-40-50 kg ka$^{-1}$ ($F_1$), which was on a par with NPK @ 20-40-50 kg ka$^{-1}$ + FYM @ 10 t ha$^{-1}$ ($F_2$).

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(Received on 13.06.2012 and revised on 11.10.2012)