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**Research Article**

# RESPONSE OF *KHARIF* GROUNDNUT (*ARACHIS HYPOGAEA*) TO LAND LAYOUTS, MULCHES AND NUTRIENT MANAGEMENT

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**ABSTRACT**

A field experiment was conducted during rainy (*kharif*) seasons of 2010 and 2011 to study the effect of land configurations, mulches and nutrient management on growth and yield of groundnut (*Arachis hypogaea* L.) at Junagadh (Gujarat). Alternate furrow and bed increased growth, yield attributes and yield over flat bed. Wheat straw and plastic mulch proved beneficial in improving growth and yield. Application of 100 % RDF + IBA @ 50 ppm + urea @ 1 % spray at 40 and 60 DAS increased yield as well as growth and yield components

**Keywords:** Groundnut, Arachis hypogaea,land layout, mulch, nutrient management.

## INTRODUCTION

About 88 per cent of groundnut area in India is sown in kharif season and is rainfed. The Saurashtra region of Gujarat, the oil bowl of the country, is being highly influenced by vagaries of monsoon which results in low and unstable yields. The region faces twin problems of poor fertility and inadequate moisture availability for successful crop production that results in partial/total failure of crop with occurrence of mild to severe drought. Land configurations like ridges and furrows, alternate furrows with bed, deep ploughing reduce the runoff loss of soil water and improve infiltration rate of water which in turn helps in storage of moisture in soil profile for plant growth than the traditional method of flat bed. Mulches also help in moisture conservation and delay the drying of soil surface. Balanced application of nutrients through organic and inorganic sources besides biofertilizers and growth hormones may supply all the nutrients in suitable proportion thereby enhances groundnut yields. Keeping these points in view, the present investigation was undertaken.

## MATERIALS AND METHODS

The field experiment was conducted at Instructional Farm, Gujarat Agricultural University, Junagadh for two consecutive *kharif* seasons of 2010 and 2011. The soil of experimental site was medium black clayey in texture having bulk density 1.45 g/cm$^3$, field capacity 28.1 %, permanent wilting point 13.2 % with organic carbon 0.65 %, available N 223 kg/ha, available $P_2O_5$ 21 kg/ha, available $K_2O$ 235 kg/ha, pH 8.1 and E.C. 0.27 dS/m. The experiment was laid out in split plot design with three replications. The main plots comprised land configurations ($L_0$= flat bed, $L_1$= ridges and furrows and $L_2$= alternate furrow and bed) and mulches ($M_0$= control, $M_1$= wheat straw @ 5 t/ha and $M_2$= white plastic mulch) while sub plots comprised four levels of nutrient management [$N_0$= control, $N_1$= 100 % recommended dose of fertilizers (RDF) i.e. 12.5 kg N + 25 kg $P_2O_5$/ha, $N_2$= 50 % RDF + 5 t FYM + Rhizobium + phosphate solubilizing microorganism (PSM) and $N_3$= 100 % RDF + IBA @ 50 ppm + urea 1 % spray at 40 and 60 days after sowing (DAS)]. A semi spreading groundnut variety 'GG 20' was sown at 60 cm row spacing on 24$^{th}$ June, 2010 and 1$^{st}$ July, 2011 with a seed rate of 120 kg/ha. Fertilizers as per treatments were applied at sowing, while IBA @ 50 ppm and urea @ 1 % were sprayed twice at 40 and 60 DAS. Rainfall received during the crop growing season was 1558.0 and 962.7 mm in 64 and 45 rainy days during 2010 and 2011, respectively.

## RESULTS AND DISCUSSION

### Land configuration

Both pod and haulm yields varied significantly due to different land configurations (Table 1). Alternate furrow and bed ($L_2$) recorded higher pod and haulm yields over flat bed ($L_0$) during both the years as well as in pooled results, but remained at par with ridges and furrow ($L_1$) in individual years. On an average alternate furrow and bed increased 16.8 % pod yield and 13.8 % haulm yield over flat bed. Alternate furrow and bed ($L_2$) and ridges and furrow ($L_1$) significantly improved growth and yield attributes viz., plant height, dry matter/plant, pods/plant, 100-pod weight, 100-seed weight and shelling per cent (Table 2) which ultimately resulted in higher pod and haulm yields over flat bed ($L_0$). These both the treatments were also found more economical as they recorded higher B:C ratio over flat bed (Table 1). These findings are in close vicinity of those reported by Jadhav *et al.* (2008) and Suryawanshi *et al.* (2008).

### Mulches

Application of mulches exerted significant influence on pod and haulm yields of groundnut (Table 1). Further, wheat straw mulch ($M_1$) produced significantly higher pod and haulm yields as compared to control (M0) but remained at par with plastic mulch ($M_2$). The per cent increase in pod and haulm yield with wheat straw mulch was 10.9 and 11.2, respectively. Both these mulches also improved growth and yield attributes viz., plant height, dry matter/plant, pods/plant, 100-pod weight, 100-seed weight and shelling per cent (Table 2) and resultantly reflected in higher pod and haulm yields over control ($M_0$). However, both these mulches recorded lower B:C ratio as compared to control. The results were in conformity of those reported by Basu (1999) and Shinde *et al.* (2000).

### Nutrient management

Pod and haulm yields of groundnut were significantly influenced by different nutrient management treatments (Table 1). Application of 100 % RDF + IBA @ 50 ppm + urea 1 % spray ($N_3$) recorded significantly the highest pod and haulm yield during both the years as well as in pooled results, but found at par with 100 % RDF ($N_1$) in individual years. Application of 100 % RDF + IBA @ 50 ppm + urea 1 % spray ($N_3$) significantly increased growth and yield parameters viz., plant height, branches/plant, nodules/plant, LAI, dry matter/

plant, pods/plant, 100-pod weight, 100-seed weight and shelling per cent (Table 2) as compared to control ($N_0$) but remained at par with treatments $N_1$(100 % RDF) and $N_2$ (50 % RDF + 5 t FYM + Rhizobium + PSM). However, treatment $N_1$ (100 % RDF) was found most economical as it realized higher B:C ratio over control ($N_0$). Singh and Hiremath (1998) and Dhadage *et al.* (2008) also reported similar results.

**Table 1. Effect of different treatments on pod and haulm yield of groundnut and B:C ratio.**

| Treatment | Pod yield (q/ha) | | | Haulm yield (q/ha) | | | B:C ratio | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | Pooled | 2010 | 2011 | Pooled | 2010 | 2011 | Pooled |
| **Land configuration** | | | | | | | | | |
| $L_0$ | 12.46 | 16.06 | 14.26 | 18.89 | 24.16 | 21.52 | 1.04 | 1.81 | 1.42 |
| $L_1$ | 13.87 | 18.00 | 15.94 | 20.46 | 26.21 | 23.33 | 1.19 | 2.07 | 1.63 |
| $L_2$ | 14.63 | 18.66 | 16.65 | 21.70 | 27.27 | 24.49 | 1.29 | 2.10 | 1.69 |
| CD (P=0.05) | 0.93 | 1.03 | 0.67 | 1.41 | 1.56 | 1.01 | 0.14 | 0.16 | 0.11 |
| Mulch | | | | | | | | | |
| $M_0$ | 12.80 | 16.49 | 14.64 | 19.08 | 24.25 | 21.67 | 1.38 | 2.30 | 1.94 |
| $M_1$ | 14.19 | 18.30 | 16.24 | 21.18 | 26.98 | 24.08 | 1.17 | 1.89 | 1.53 |
| $M_2$ | 13.98 | 17.94 | 15.96 | 20.79 | 26.41 | 23.60 | 0.97 | 1.79 | 1.38 |
| CD (P=0.05) | 0.93 | 1.03 | 0.67 | 1.41 | 1.56 | 1.01 | 0.14 | 0.16 | 0.11 |
| Nutrient management | | | | | | | | | |
| $N_0$ | 11.47 | 14.46 | 12.97 | 17.95 | 22.61 | 20.28 | 1.12 | 1.95 | 1.53 |
| $N_1$ | 14.16 | 18.47 | 16.31 | 20.82 | 26.69 | 23.76 | 1.39 | 2.30 | 1.85 |
| $N_2$ | 13.92 | 17.96 | 15.94 | 20.67 | 26.40 | 23.53 | 1.17 | 1.99 | 1.58 |
| $N_3$ | 15.07 | 19.41 | 17.24 | 21.96 | 27.82 | 24.89 | 1.00 | 1.74 | 1.37 |
| CD (P=0.05) | 0.94 | 1.05 | 0.71 | 1.16 | 1.58 | 0.97 | 0.15 | 0.17 | 0.11 |

**Table 2. Effect of different treatments on growth and yield components of groundnut (pooled over two years).**

| Treatment | Plant height (cm) | Branches /plant | Nodules /plant | LAI at 90 DAS | DM at harvest (g/plant) | Pods /plant | 100-pod weight (g) | 100-seed weight (g) | Shelling (%) |
|---|---|---|---|---|---|---|---|---|---|
| **Land configuration** | | | | | | | | | |
| $L_0$ | 26.81 | 5.85 | 112.7 | 4.55 | 26.34 | 8.04 | 123.9 | 51.7 | 41.01 |
| $L_1$ | 28.91 | 5.93 | 114.1 | 4.59 | 28.47 | 10.60 | 127.7 | 53.3 | 72.58 |
| $L_2$ | 29.19 | 6.03 | 115.2 | 4.67 | 28.75 | 10.81 | 128.8 | 53.6 | 72.80 |
| CD (P=0.05) | 0.88 | NS | NS | NS | 0.76 | 0.43 | 2.4 | 0.7 | 0.73 |
| Mulch | | | | | | | | | |
| $M_0$ | 26.64 | 5.90 | 112.9 | 4.56 | 26.83 | 9.06 | 124.3 | 52.1 | 71.60 |
| $M_1$ | 29.08 | 5.96 | 114.8 | 4.63 | 28.35 | 10.21 | 128.0 | 53.3 | 72.38 |
| $M_2$ | 29.20 | 5.96 | 114.3 | 4.63 | 28.39 | 10.19 | 128.1 | 53.4 | 72.41 |
| CD (P=0.05) | 0.88 | NS | NS | NS | 0.76 | 0.43 | 2.4 | 0.7 | 0.73 |
| Nutrient management | | | | | | | | | |
| $N_0$ | 24.05 | 5.58 | 99.5 | 3.91 | 24.83 | 7.39 | 122.31 | 51.7 | 71.36 |
| $N_1$ | 29.73 | 6.07 | 118.3 | 4.85 | 28.82 | 10.67 | 128.3 | 53.3 | 72.40 |
| $N_2$ | 29.41 | 5.97 | 120.1 | 4.76 | 28.47 | 10.46 | 127.7 | 53.1 | 72.22 |
| $N_3$ | 30.03 | 6.13 | 118.1 | 4.90 | 29.31 | 10.77 | 129.0 | 53.5 | 72.55 |
| CD (P=0.05) | 0.67 | 0.25 | 3.9 | 0.18 | 0.58 | 1.14 | 2.4 | 0.5 | 0.45 |

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