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*International Journal of Current Research*
*Vol. 10, Issue, 06, pp.70347-70349, June, 2018*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

**ISSN: 0975-833X**

## RESEARCH ARTICLE

# COMBINED EFFECTS OF SOWING TECHNIQUES AND INTERCROPPING ON PRODUCTIVITY OF GROUNDNUT (*Arachis hypogaea* L.)

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**ARTICLE INFO**

***Article History:***
Received 14th March, 2018
Received in revised form
05th April, 2018
Accepted 26th May, 2018
Published online 30th June, 2018

***Key words:***
Sowing methods;
Ridges and Furrows;
Intercropping; Pod Yield.

**ABSTRACT**

Rupture of A field experiment was conducted on sandy loam soil of Kodukkanpalayam village, Cuddalore, Tamilnadu under irrigated condition during 2016-2017 to study the effects of planting techniques and intercropping in groundnut. The experiments were laid out in split plot design replicated thrice with two main and five sub treatments viz., M1 – flat bed method of sowing, M2 – ridges and furrow method of sowing, S1 – sole groundnut, S2 – groundnut + black gram, S3 – groundnut + green gram, S4 – groundnut + sesame and S5 – groundnut + cowpea. The study revealed that when groundnut seeds were sown in ridges and furrows recorded the maximum growth, yield and yield parameters. In sub plots (intercrops), groundnut intercropped with blackgram, recorded the highest growth, yield and yield parameters. Hence, this study clearly revealed that yield maximization in groundnut could be achieved by adopting ridges and furrows, intercropped with blackgram proved to be effective, economically feasible and eco-friendly approach for better returns in groundnut rather than traditional methods of sowing.

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**Citation: Kalaimathi, P., Kumarimanimuthu Veeral, D., Krishnamoorthy, R. and Sangameshwari, P., 2018.** "Combined effects of sowing techniques and intercropping on productivity of groundnut (Arachis hypogaea L.)", *International Journal of Current Research*, 10, (06), 70347-70349.

## INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the major edible oilseed crops extensively cultivated in India. It is an annual legume containing an excellent source of plant nutrients containing 45-50% edible oil, 27-33% protein as well as essential minerals and vitamins (Pandeeswari and Kalaiarasu, 2017). It is a promising oilseed crop and it is known as '*king of oilseeds'* by virtue of its special attention as the source for most important edible oil used in India. It is safer, cheaper and short stature crop. Being a leguminous crop, fixes atmospheric nitrogen and adds enormous organic matter through leaf litter, root and root nodules there by increasing the soil fertility status after groundnut and therefore profitable for agriculture and eco-friendly for environment. The crop also has potential to check soil erosion along with meeting the requirement of vegetable oil and protein. The features of this crop offer a potential scope for intercropping to exploit the land and resources more efficiently. There is an urgent need to modernize the traditional production system and to develop production oriented and economic based cropping system with new geometric forms for sustainable development in agriculture sector, which will meet the increasing demand for food, feed and forage by effective utilization of agricultural resources (Elavazhagan, 2011).

Intercropping is an advanced agro-technique and is considered to be an effective and potential means of increasing crop productivity and thus it provides an efficient utilization of natural resources, decreases the cost of production, provides financial stability, decreases the pest and disease incidence, improves soil fertility and increases crop yield along with improves quality of produce. Substantial increase in total production over space and time by means of simple expedient of growing crops together are the unique advantages associated with intercropping as mainly micro-climatic manipulation is possible in intercropping when compared to sole cropping system (Bhuva *et al*., 2017). Intercropping in intensively cultivated areas is one of the most promising options for crop diversification of sustainable agricultural production system in groundnut growing areas. Groundnut, being a closely spaced crop provides ample amount of options to grow short duration crops in the inter row space, which will give additional yield in spatial and temporal terms. Planting / sowing methods influence the crop yield through its influence on light interception, rooting pattern and moisture extraction pattern (Mkandawire and Sibuga, 2002). For good germination and higher pod yields open and aerated seed bed is needed. It is more efficient in utilization of solar energy, water, nutrients, and prevents water logging. During the intercultivation practices, at 40 DAS, shallow ridges could be formed for pegging. It is very difficult to do earthing up in the closely

spaced crop. But sowing of seeds in the ridges enables intercultivation practices *i.e*., earthing up of the row crops and rectification of the irrigated furrows. If the seeds are planted on the crests of ridges, it promotes the germination and easy intercultivation practices (At 40 DAS) which leads to proper pegging (Kadam *et al*., 2000). Now-a-days intercropping is common in intensive agriculture, although it is practiced to maximize the land use, but it has significant effects in minimizing weed growth (Prasad *et al*., 2007). The present study were undertaken to assess the effects of different methods of sowing along with intercrops in groundnut for yield maximization in Cuddalore district.

## MATERIALS AND METHODS

A field experiment was conducted at farmer's field of Kodukkanpalayam village, Cuddalore, Tamilnadu under irrigated condition during 2016-2017. The farm is located at $11^0$ 46'29.2'' N latitude, $79^0$40'1.38'' E longitude and an altitude of about 20.65 m above MSL. The soil was sandy loam in texture. The experiment was carried out in split plot design with two main plots and five sub- plots of three replications. The observations recorded during the experiments were analyzed statistically using the procedure outlined by Gomez and Gomez (1984).

### Treatment details

There were two main plots involving $M_1$ - flat bed, $M_2$ - ridges and furrows and five sub treatments namely $S_1$ - Groundnut (sole crop), $S_2$ - Groundnut + Blackgram, $S_3$ - Groundnut + Greengram, $S_4$ - Groundnut + Sesame and $S_5$ - Groundnut + cowpea.

**Growth components:** The growth and yield of groundnut was significantly influenced due to method of sowing (flat bed and ridges and furrows) and intercrops (Blackgram, greengram, sesame and cowpea). Ridges and furrow method of sowing showed a positive influence on groundnut yield. Taller plants of groundnut were obtained in ridges and furrow method of sowing and it may be due to proper aeration and pulverization of soil. Intercropping system of groundnut + blackgram also showed a positive influence on groundnut yield. This may be due to complementary interaction between component crops in the critical stages. The ridges and furrow method of sowing influenced the plant growth physiologically by providing loose soil structure, aeration and rectifies the microbial properties of the soil. It ultimately increased plant height and dense plant canopy. This is the reason for enhancing the DMP and LAI in groundnut and it helped in producing highest LAI at flowering. Groundnut intercropped with blackgram recorded the taller plants due to lesser competitive effect of blackgram at all the stages of the crop. It leads to production of more number of functional leaves that owing to increased plant height, LAI and DMP obtained in this system (Kumar *et al*., 2010). The yield and yield components were positively influenced by methods of sowing (ridges and furrow). This treatment ridges and furrow method excelled the traditional method of sowing, because the soil is always pulverized in nature, loose and easy for peg formation at 60 DAS. In addition, labour cost was reduced for earthing-up at 40 DAS. Moreover, when the groundnut is cultivated in ridges and furrow method of sowing the number of pods per plant was higher than flat method.

**Table 1. Effect of sowing techniques and intercropping on productivity of groundnut on plant height**

| Main plot / Sub plot | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | Mean |
|---|---|---|---|---|---|---|
| $M_1$ | 65.27 | 71.33 | 70.05 | 60.34 | 55.41 | 64.48 |
| $M_2$ | 72.59 | 80.97 | 79.45 | 65.77 | 58.43 | 71.44 |
| Mean | 68.93 | 76.15 | 74.75 | 63.06 | 56.92 | 67.96 |

| | M | S | M*S | S*M |
|---|---|---|---|---|
| SEd | 0.78 | 2.04 | 2.69 | 2.88 |
| CD (0.05) | 3.36 | 4.33 | 6.21 | 6.12 |

**Table 2. Effect of sowing techniques and intercropping on productivity of groundnut on dry matter production in Kg ha$^{-1}$**

| Main plot / Sub plot | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | Mean |
|---|---|---|---|---|---|---|
| $M_1$ | 2438 | 2675 | 2624 | 2239 | 1934 | 2382 |
| $M_2$ | 2452 | 2841 | 2809 | 2128 | 1869 | 2420 |
| Mean | 2445 | 2758 | 2717 | 2184 | 1902 | 2410 |

| | M | S | M*S | S*M |
|---|---|---|---|---|
| SEd | 29.76 | 71.53 | 95.25 | 101.16 |
| CD (0.05) | 128.06 | 151.64 | 222.22 | 214.45 |

## RESULTS AND DISCUSSION

There are numerous factors which are responsible for the success of any crop. The result of the present study indicated that method of sowing with crop. The result of the present study indicated that appropriate method of sowing with intercropping system is an eco-friendly approach for groundnut

Moreover, the kernel size and weight were increased upto the shell, and it seemed to be difficult to separate the shell and kernel. When groundnut was intercropped with blackgram adopting ridges and furrows method of sowing exerted least competition and contributed to the adequate plant growth environment or requirement of the base crop. The existing agronomic practice (flat bed) recorded the least yield attributes

**Table 3. Effect of sowing techniques and intercropping on productivity of groundnut on nodule number plant$^{-1}$**

| Main plot / Sub plot | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | Mean |
|---|---|---|---|---|---|---|
| $M_1$ | 67.21 | 85.67 | 83.51 | 49.07 | 32.18 | 63.53 |
| $M_2$ | 82.39 | 99.14 | 95.33 | 65.41 | 48.03 | 78.06 |
| Mean | 74.80 | 92.41 | 89.42 | 57.24 | 40.11 | 70.80 |

| | M | S | M*S | S*M |
|---|---|---|---|---|
| SEd | 0.96 | 2.16 | 2.90 | 3.06 |
| CD (0.05) | 4.14 | 4.49 | 6.86 | 6.50 |

**Table 4. Effect of sowing techniques and intercropping on productivity of groundnut on pod number plant$^{-1}$**

| Main plot / Sub plot | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | Mean |
|---|---|---|---|---|---|---|
| $M_1$ | 20.36 | 31.40 | 29.89 | 12.72 | 6.72 | 20.22 |
| $M_2$ | 44.10 | 56.51 | 53.47 | 33.98 | 24.35 | 42.48 |
| Mean | 32.23 | 43.96 | 41.68 | 23.35 | 15.54 | 31.35 |

| | M | S | M*S | S*M |
|---|---|---|---|---|
| SEd | 0.39 | 1.04 | 1.37 | 1.47 |
| CD (0.05) | 1.68 | 2.20 | 3.15 | 3.11 |

**Table 5. Effect of sowing techniques and intercropping on productivity of groundnut on pod yield in Kg ha$^{-1}$**

| Main plot / Sub plot | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | Mean |
|---|---|---|---|---|---|---|
| $M_1$ | 1982 | 2150 | 2095 | 1809 | 1660 | 1939 |
| $M_2$ | 2316 | 2570 | 2502 | 2134 | 1937 | 2292 |
| Mean | 2149 | 2360 | 2299 | 1972 | 1799 | 2116 |

| | M | S | M*S | S*M |
|---|---|---|---|---|
| SEd | 24.01 | 63.89 | 84.31 | 90.35 |
| CD (0.05) | 103.34 | 135.45 | 193.67 | 191.55 |

*viz.,* total number of pods plant$^{-1}$, pod yield, kernel yield, haulm yield, test weight, shelling percentage and comparatively least pod yield. This may be due compaction of soil throughout the crop growth especially at 40 DAS, even though hoeing / earthing up was adopted at this stage. From the above result, it was concluded that groundnut intercropped with blackgram along with the adoption of ridges and furrow method of cultivation is an economically feasible and eco-friendly viable approach to realize better returns in groundnut, rather than traditional method.

## Conclusion

Intercropping and sowing techniques are becoming more popular and there are many combinations practiced worldwide. Main reason for using this system is to diversify agro system, improve land use and increase income through higher productivity. It could be concluded that intercropping of groundnut with blackgram in ridges and furrows is a biologically and economically sustainable system for groundnut growers.

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