

Original Research Article

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Effect of Nutrient Management Practices on Yield and Yield Attributes of Groundnut and Available Nutrient Status in Soil after Harvest in Groundnut + Baby Corn Intercropping System under Changing Climate

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ABSTRACT

A field experiment was undertaken to study the effect of nutrient management on yield and yield attributes of groundnut and available nutrient status in soil after harvest in groundnut + baby corn (3:1) intercropping system at MARS Raichur, during the *kharif* 2018 with eight treatments replicated thrice in a randomized complete block design. Groundnut + baby corn (3:1) intercropping system receiving 125 per cent RDF only to groundnut produced the higher number of filled pods plant⁻¹ (14.08), 100 kernel weight (27.50 g), shelling percentage (65.08 %) and pod yield (1170 kg/ha), which was at par with the treatment that received 100 per cent RDF to both groundnut and baby corn with corresponding values of (13.90, 26.98 g, 64.62 % and 1126 kg/ha, respectively). Treatment fertilized with 100 per cent RDF to both the component crops in groundnut + baby corn (3:1) intercropping system resulted in higher groundnut equivalent yield (2237 kg/ha) and was at par with the groundnut + baby corn intercropping system receiving 50 per cent RDF of groundnut and 100 per cent RDF of baby corn with groundnut equivalent yield of 2104 kg/ha. Groundnut + baby corn (3:1) system with 100 per cent RDF to both the crops registered higher soil available nitrogen, phosphorus and potassium (214.4, 22.5 and 228.9 kg/ha, respectively).

Keywords

Intercropping, groundnut equivalent yield, RDF and shelling percentage

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Introduction

Time and space utilization in agriculture through intercropping is one of the viable options to produce a greater yield on a given

piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop. Legume in an intercropping system not only provides nitrogen to the associated crops but also

increased the amount of humus in the soil due to decaying of crop remains. Baby corn with shorter lifecycle and having single stem with upright growing habit is best suitable for intercropping and being a commercial crop, it fetches high net returns to the farmers and thereby gaining importance among the farming community in recent years. Demand of groundnut by 2020 is expected to reach nearly about 14 million tonnes whereas the present production level is around 6.9 million tonnes. Therefore, a gap of about 7.1 million tonnes needs to be filled and this can be possible if the production rate will increase by 2.2 percent per annum (Noman *et al.*, 2016). Sustainable groundnut production can be achieved by diversifying the groundnut-based cropping system and nutrient management. In cropping system, intensive use of fertilizers is practiced to enhance the productivity and profitability (Kumar *et al.*, 2008). Judicious use of fertilizers is highly necessary to save extra amount of fertilizers and to have favourable effect on crop environment

Materials and Methods

A field experiment was conducted at MARS, College of Agriculture, Raichur during *khari* 2018, on sandy clay loam soil with pH of 7.2, electrical conductivity of 0.31 dS m⁻¹ and available N, P and K of 226.8, 27.2 and 254.6 kg/ha, respectively. The groundnut variety K-9 maturing in 115 to 125 days and baby corn hybrid C.P. B-472 of 65-70 days duration were sown on 23 July, 2018 with a spacing of 30cm×10cm for groundnut (sole and intercrop) and 60cm×20cm for baby corn. Groundnut was intercropped with baby corn in 3:1. Required quantity of nitrogen, phosphorus and potassium were applied in the form of urea (46 % N), diammonium phosphate (18-46-0) and muriate of potash (60 % K₂O), respectively. Recommended dose of fertilizers for the sole crop of groundnut was 25-75-37.5 kg N, P₂O₅ and

K₂O/ha and for sole baby corn was 150-60-40 kg N, P₂O₅ and K₂O/ha. Eight treatments were replicated thrice in a Randomized Complete Block Design. The treatments were T₁ - Sole groundnut with 100 % RDF; T₂ - Sole baby corn with 100% RDF; T₃ - groundnut + baby corn (3:1) with 100% RDF to both the crops; T₄ - groundnut + baby corn (3:1) with 100% RDF only to groundnut; T₅ - groundnut + baby corn (3:1) with 125 % RDF only to groundnut; T₆ - groundnut + baby corn (3:1) with 100% RDF to groundnut and 50% RDF to baby corn; T₇ - groundnut + baby corn (3:1) with 50% RDF to groundnut and 100% RDF to baby corn; T₈ - groundnut + baby corn (3:1) with 50% RDF to both the crops. The crops were raised under rainfed condition with adequate plant protection measures.

Results and Discussion

Yield attributes *i.e.* number of filled pods per plant, 100 kernel weights (g) and shelling percentage of groundnut

Among the yield attributing characters, number of filled pods per plant (15.22) and 100 kernel weight (28.00 g) were significantly higher under sole crop of groundnut as compared to intercropping treatments (11.69 to 14.08 and 24.08 to 27.50 g, respectively). Highest shelling percentage also recorded under the sole groundnut crop fertilized with 100 per cent RDF. The lower yield attributes of groundnut under intercropping system may be due to increased plant population pressure of main and intercrop together resulting in increased competition for nutrients, water, space and light compared to sole crop.

Treatment receiving 125 per cent RDF only to groundnut in 3:1 groundnut + baby corn intercropping system (T₅) recorded higher number of filled pods per plant, highest kernel weight and it was at par with T₃ *i.e.* 100 % RDF to both groundnut and baby corn. It was

due to higher availability of nutrients to groundnut under these treatments. Due to higher availability of nutrients under these treatments made more vigorous growth of crop which was evident from higher leaf area and more dry matter production than rest of the intercropped treatments. These results are in line with those reported by Tomar *et al.*, (2007) and Sibhatu *et al.*, (2016). The same trend was also followed in case of shelling percentage of groundnut. Higher shelling percentage was due to more dry matter production and there after efficient translocation of food from source to sink (kernels). These results are in line with the results reported by Hussaini and Mohammed (2003).

Pod yield of groundnut (kg/ha)

The treatment receiving 100 per cent RDF to sole groundnut (T₁) resulted in significantly higher pod yield (1516 kg ha⁻¹) as compared to other treatments. Sole groundnut produced higher pod yield of 1516 kg/ha and was superior over intercropped treatments which ranged from 935 to 1170 kg/ha and the reduction in pod yield of groundnut due to intercropping with baby corn was 23 to 39 per cent as compared to the sole crop of groundnut.

The reasons attributed for higher yields in sole crop of groundnut over intercropped were due to superior growth parameters and yield attributing characters. Groundnut + baby corn 3:1 intercropping system with 125 per cent RDF only to groundnut (T₅) recorded higher pod yield and was at par with T₃ (100 % RDF to both crops in 3:1 groundnut + baby corn intercropping system). This was due to better growth attributes like more leaf area and dry matter production and yield attributing (*i.e.* number of pods per plant, pod weight plant⁻¹ and 100 kernel weight) characters over other treatments. Similar

results were reported by Bhagat *et al.*, (2007). Treatment receiving 50 % RDF to both crops in 3:1 groundnut + baby corn intercropping (T₈) system resulted in lowest pod yield of groundnut as compared to other treatments.

This was mainly due to 50 % reduction in supply of RDF to groundnut which resulted in non-availability of the nutrients especially phosphorous during critical crop growth stages, so as a result there might be reduction in root growth, improper development of gynophores, reduction in uptake of nutrients and led to the competition for the nutrient from both the component crops.

Groundnut equivalent yield (kg/ha)

Groundnut + baby corn (3:1) intercropping system produced 23.4 to 47.5 per cent higher groundnut equivalent yield than sole groundnut. But application of 100 per cent RDF to sole baby corn *i.e.* (T₂) produced the highest groundnut equivalent yield (2321 kg/ha) which was at par with groundnut + baby corn supplied with 100 per cent RDF to both the crops (2237 kg/ha). Higher yield potential and price of baby corn resulted in higher groundnut equivalent yield of sole baby corn fertilized with 100 per cent RDF.

In turn the latter treatment was at par with the groundnut + baby corn intercropping system receiving 50 per cent RDF of groundnut and 100 percent RDF of baby corn (T₇) with groundnut equivalent yield of 2104 kg/ha.

This was due to higher pod yields of groundnut and cob yields of baby corn owing to optimum nutrient availability coupled with higher price of both the crops which was in conformity with the findings of Priya *et al.*, (2011). Sole groundnut with 100 per cent RDF resulted in the lowest groundnut equivalent yield (1517 kg/ha) compared to any of the intercropping treatments.

Table.1 Number of filled pods plant⁻¹, number of unfilled pods plant⁻¹, 100-kernel weight and shelling percentage, pod yield and groundnut equivalent yield as influenced by nutrient management practices in groundnut + baby corn (3:1) intercropping system

| Treatments | No. of filled pods plant ⁻¹ | No. of unfilled pods plant ⁻¹ | Kernel wt. (g) | Shelling (%) | Pod yield of groundnut (kg/ha) | Groundnut equivalent yield (kg/ha) |
|---|--|--|----------------|--------------|--------------------------------|------------------------------------|
| T₁: Sole Groundnut with 100 % RDF | 15.22 | 2.42 | 28.00 | 68.86 | 1516 | 1517 |
| T₂: Sole Baby corn with 100 % RDF | - | - | - | - | - | 2321 |
| T₃: Groundnut + baby corn (3:1) with 100 % RDF to both the crops | 13.90 | 3.47 | 26.98 | 64.62 | 1126 | 2237 |
| T₄: Groundnut + baby corn (3:1) with 100 % RDF only to groundnut | 12.83 | 4.76 | 26.25 | 61.83 | 1088 | 1872 |
| T₅: Groundnut + baby corn (3:1) with 125 % RDF only to groundnut | 14.08 | 3.18 | 27.50 | 65.08 | 1170 | 1977 |
| T₆: Groundnut + baby corn (3:1) with 100 % RDF to groundnut and 50 % RDF to baby corn | 12.58 | 5.25 | 25.64 | 61.14 | 1062 | 2074 |
| T₇: Groundnut + baby corn (3:1) with 50 % RDF to groundnut and 100 % RDF to baby corn | 12.09 | 6.05 | 24.66 | 60.47 | 1011 | 2104 |
| T₈: Groundnut + baby corn (3:1) with 50 % RDF to both the crops | 11.69 | 6.18 | 24.08 | 60.01 | 935 | 1895 |
| S. Em. ± | 0.27 | 0.25 | 0.18 | 0.22 | 36 | 44 |
| C.D. (p= 0.05) | 0.81 | 0.77 | 0.54 | 0.68 | 110 | 135 |

Table.2 Effect of nutrient management practices on available soil nitrogen, phosphorus and potassium in soil after harvest in groundnut + baby corn (3:1) intercropping system

| Treatments | Available soil nitrogen (kg/ha) | Available phosphorous (kg/ha) | Available potassium (kg/ha) |
|---|--|--------------------------------------|-------------------------------------|
| T₁: Sole Groundnut with 100 % RDF | 224.7 | 19.3 | 198.6 |
| T₂: Sole Baby corn with 100 % RDF | 148.3 | 17.8 | 192.8 |
| T₃: Groundnut + baby corn (3:1) with 100 % RDF to both the crops | 212.4 | 22.5 | 228.9 |
| T₄: Groundnut + baby corn (3:1) with 100 % RDF only to groundnut | 176.5 | 17.2 | 193.8 |
| T₅: Groundnut + baby corn (3:1) with 125 % RDF only to groundnut | 182.3 | 18.2 | 195.2 |
| T₆: Groundnut + baby corn (3:1) with 100 % RDF to groundnut and 50 % RDF to baby corn | 202.3 | 20.6 | 210.4 |
| T₇: Groundnut + baby corn (3:1) with 50 % RDF to groundnut and 100 % RDF to baby corn | 214.6 | 21.1 | 218.5 |
| T₈: Groundnut + baby corn (3:1) with 50 % RDF to both the crops | 198.7 | 19.0 | 196.2 |
| S. Em. ± | 3.8 | 0.8 | 4.8 |
| C.D. (p= 0.05) | 11.4 | 2.5 | 14.3 |

Available nitrogen, phosphorus and potassium (kg/ha) after harvest of crops

Higher values of available soil nitrogen, phosphorus and potassium (224.7 and 19.3 and 228.2 kg/ha) were estimated under sole groundnut when fertilized with 100 per cent RDF (T₁). But among the intercropping treatments, groundnut + baby corn (3:1) system with 100 per cent RDF to both the crops registered higher soil available nitrogen, phosphorus and potassium (214.4, 22.5 and 228.9 kg/ha, respectively) but was at par with application of 50 per cent RDF to groundnut and 100 per cent RDF to baby corn (212.6, 21.1 and 218.5 kg/ha, respectively).

Higher nitrogen content in the soil might be due to the greater nitrogen fixing ability of groundnut crop. Similarly, phosphorus availability in soil was high due to release of more amount of fixed P by the action of rhizosphere micro-organisms. Overall improvement of available K status in surface soil might be due to the ability of tap root of groundnut to absorb K from deeper layer of soil and enriched surface soil by shedding nutrient rich leaves which upon decomposition release nutrients into the surface soil (Singh, 2005). However, application of 100 per cent RDF to sole baby corn resulted in lower values of available N, P and K (148.3 and 17.8 and 193.8 kg/ha) as compared to other treatments due to exhaustive nature of baby corn.

Treatment receiving 125 per cent RDF only to groundnut in 3:1 groundnut + baby corn intercropping system (T₅) recorded higher number of filled pods per plant, highest kernel weight and it was at par with the treatments that was fertilized with 100 per cent RDF to both groundnut and baby corn in groundnut + baby corn (3:1) intercropping system. Similar trend was also seen in case of pod yield of groundnut. Among the intercropping

treatments, groundnut + baby corn (3:1) system with 100 per cent RDF to both the crops registered higher soil available nitrogen, phosphorus and potassium (214.4, 22.5 and 228.9 kg/ha, respectively) but was at par with application of 50 per cent RDF to groundnut and 100 per cent RDF to baby corn (212.6, 21.1 and 218.5 kg/ha, respectively). Among the different intercropped treatments, groundnut + baby corn supplied with 100 per cent RDF to both the crops registered significantly higher groundnut equivalent yield (2237 kg/ha) and was at par with the groundnut + baby corn intercropping system receiving 50 per cent RDF of groundnut and 100 per cent RDF of baby corn (T₇) with groundnut equivalent yield of 2104 kg/ha. Thus, in groundnut + baby corn (3:1) intercropping system 50 per cent RDF can be save in case of groundnut and that will help to increase the net returns of the farmer and also in the changing climatic situation it reduces the excessive use of chemical fertilizer as a result it maintain the soil as well as the ecosystem healthy.

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