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STUDIES ON EFFECT OF FOLIAR NUTRITION OF MICRO NUTRIENTS ON YIELD ATTRIBUTES AND YIELD OF GROUNDNUT (*Arachis hypogaea* L.)

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ABSTRACT
A field experiment was conducted in the farmer field at Bodidhasampatti village of Andipatti Block, Theni, Tamil Nadu during Rabi season 2018-2019. The experiment was laid out in a randomized block design and replicated thrice with following eight treatments; T_1 - Control, T_2 –RDF (25:50:75 kg ha^{-1}) + Gypsum (400 kg ha^{-1}), T_3 - T_2 + foliar spray of $ZnSO_4$ @ 0.2 %, T_4 - T_2 + foliar spray of $ZnSO_4$ @ 0.5%, T_5 - T_2 + foliar spray of $FeSO_4$ @ 0.2 %, T_6 - T_2 + foliar spray of $FeSO_4$ @ 0.5 %, T_7 - T_2 + foliar spray of MN mixture @ 0.2%, T_8 - T_2 + foliar spray of MN mixture @ 0.5%. The Ground nut variety Co 6 was used in this experiment. After experimental layout gypsum was applied before dibbling of groundnut seeds and well mixed in surface soil. Observations on yield attributes and yield were recorded in randomly selected plants. Among the different treatments tried application of T_2 + foliar spray of MN mixture @ 0.5 % (T_8) resulted higher yield and yield attributes *viz.*, number of pods per plant (24.2), 100 - kernel weight (45.0), shelling percentage (72.1), pod yield (2720 kg ha^{-1}) and haulm yield (3450 kg ha^{-1}). Highest B: C ratio was recorded with the treatment T_8. It was comparable with the application of T_2 + foliar spray of MN mixture @ 0.2 % (T_7). Based on the experimental results, it could be concluded that T_2 + foliar spray of MN mixture @ 0.2 % (T_7) could be considered as a better option for achieving higher productivity and profitability and improved quality of Groundnut (*Arachis hypogaea* L.)

KEYWORDS: Foliar nutrition, MN mixture, yield attributes, ground nut and B:C ratio.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is also known as peanut is a crop of global importance and it's an annual legume. It is classified as both a grain legume and an oilseed crop because of its high oil content. India ranks 2nd in production with 33% of world's total production. It is the 13th most important food crop, 4th important source of vegetable oil and 3rd main source of vegetable protein in the world. As regards the nutritional value of groundnut, its seed contain high quality of edible oil about 48 %, easily digestible protein about 26% with carbohydrates content of about 20% (Singh and Basu, 2004). The productivity of Tamil Nadu (950 kg ha^{-1}) is much lower compared to national average (1750kg ha^{-1}) (INDIASTAT, 2015). There are several production constraints which could be attributed to lower productivity. Mainly the crop is grown on low fertility marginal lands with low input supply and rainfed conditions. The productivity enhancement target is still elusive. With limited scope of bringing additional area under oilseeds, bulk of the future increase in production has to come through crop nutrition. Therefore, it is most essential to pay a great attention to the nutrition of the groundnut to enhance its productivity

Among the oilseed crops, groundnut responds well to secondary and micronutrient fertilization. The supplementation of these essential nutrients through soil application is a common practice. Since the micronutrients applied to soil may undergo different physico-chemical transformations. Depletion of secondary and micronutrients necessitates periodic or yearly supply of these nutrients. The nutrient requirement of groundnut is high especially at pegging and pod development stages. The requirement at these stages cannot be fulfilled merely by soil application alone and need to be supplemented through foliar application. Foliar spray enables plants to absorb the applied nutrients from the solution through their leaf surface and thus, may result in the economic use of fertilizer. Foliar absorption is most effective and the rate of absorption is generally higher in younger points of branches or stem tips (Helmy and Shaban, 2008). The foliar application of nutrients is feasible, economically viable and environmentally friendly approach of nutrient management. It is often the most effective and economical way to correct plant nutrient deficiencies at critical growth stages. Hence, the present study was conducted to see the effect of micronutrients on yield attributes and yield of groundnut.

MATERIALS AND METHODS

A field experiment was conducted in the farmer field at Bodidhasampatti village of Andipatti Block, Theni, Tamil Nadu during Rabi season 2018 - 2019. The experimental site is situated in subtropical region. The soil in the experimental field was sandy loam in texture, with pH 7.24 (neutral), available N 214 kg ha^{-1} (low), available P 11.8 kg ha^{-1} (low), available K 242 kg ha^{-1} (high) and organic matter content 0.39 %. The experiment was laid out in a randomized block design and replicated thrice with following eight treatments; T_1 - Control, T_2 –RDF (25:50:75 kg ha^{-1}) + Gypsum (400 kg ha^{-1}), T_3 - T_2 + foliar

spray of $ZnSO_4$ @ 0.2 %, T_4 - T_2 + foliar spray of $ZnSO_4$ @ 0.5 %, T_5 - T_2 + foliar spray of $FeSO_4$ @ 0.2 %, T_6 - T_2 + foliar spray of $FeSO_4$ @ 0.5 %, T_7 - T_2 + foliar spray of MN mixture @ 0.2 %, T_8 - T_2 + foliar spray of MN mixture @ 0.5 %. The Groundnut variety Co 6 variety was used in this experiment. After experimental layout gypsum was applied before dibbling of groundnut seeds and well mixed in surface soil. Different levels of recommended dose of fertilizer were applied at the time of field preparation as a basal dose. The 50% of N & K were applied as basal. Remaining dose of 25% N and K were applied at 20 DAS. Finally, the last 25% N and K were applied at 45 DAS. Observations on yield attributes and yield were recorded in randomly selected plants. The data on various parameters were subjected to statistical analysis following the method of analysis of variance for the simple randomized block design (Panse and Sukhatme, 1978).

RESULTS AND DISCUSSION

Effect of foliar nutrition of micronutrients on yield attributes of Ground nut

The foliar nutrition of micronutrients had significant effect on yield attributes (Table 1). Yield attributes *viz.*, number of pods per plant, 100 - kernel weight and shelling percentage were found to be significantly increased in treatment that received foliar nutrition of micronutrients along with recommended dose of fertilizer (RDF) and gypsum (400 kg ha^{-1}).

TABLE 1: Effect of foliar application of micronutrients on yield attributes of groundnut

Treatments	Yield attributes		
	Number of pods per plant	100-kernel weight (g)	Shelling percentage (%)
T_1 - Control (Absolute control)	13.0	28.2	46.1
T_2 - RDF (25:50:75 kg ha^{-1}) + Gypsum (400 kg ha^{-1})	15.6	32.2	52.6
T_3 - T_2 + foliar spray of $ZnSO_4$ @ 0.2 %	19.9	39.6	62.2
T_4 - T_2 + foliar spray of $ZnSO_4$ @ 0.5 %	20.8	41.5	65.4
T_5 - T_2 + foliar spray of $FeSO_4$ @ 0.2 %	17.5	35.2	56.1
T_6 - T_2 + foliar spray of $FeSO_4$ @ 0.5 %	18.0	36.7	58.3
T_7 - T_2 + foliar spray of MN mixture @ 0.2 %	22.9	43.9	69.0
T_8 - T_2 + foliar spray of MN mixture @ 0.5 %	24.2	45.0	72.1
SE d	0.86	1.02	1.64
CD	1.84	2.15	3.44

Number of pods per plant:

The number of pods per plant was significantly affected by foliar nutrition of micronutrients along with recommended dose of fertilizer (RDF) and gypsum (400 kg ha^{-1}). The highest number of pods per plant (24.2) was recorded in the treatment (T_8) that received T_2 + foliar spray of MN mixture @ 0.5 % which was on a par with the treatment T_2 + foliar spray of MN mixture @ 0.2 %. The lowest number of pods per plant was recorded with control (13.0). This might be due to adequate supply of secondary and micronutrients along with NPK enhanced the dry matter accumulation which subsequently improved the number of filled pods per plant. (Nayak *et al.*, 2009).

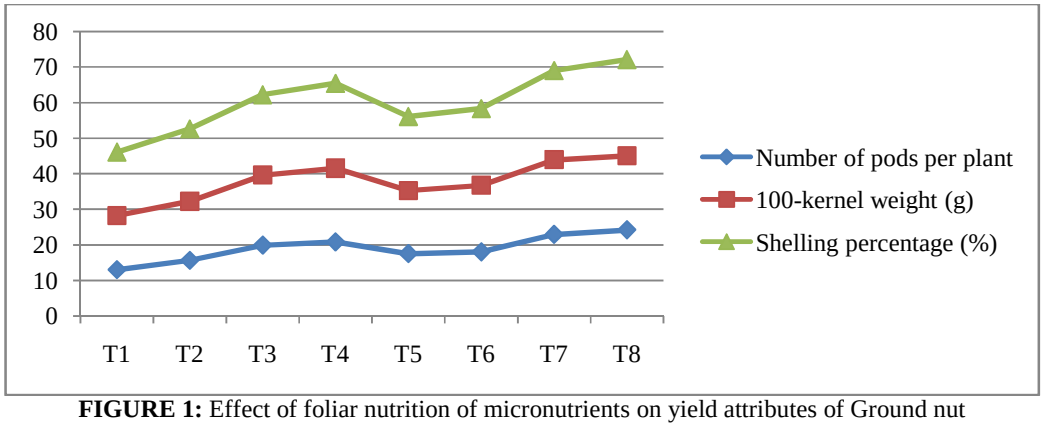

FIGURE 1: Effect of foliar nutrition of micronutrients on yield attributes of Ground nut

100-kernel weight (g)

100-kernel weight in ground nut was significantly affected by foliar nutrition of micronutrients along with recommended dose of fertilizer (RDF) and gypsum (400 kg ha^{-1}) (Table.1). There was significant difference among the treatments for 100-kernel weight. The highest 100-kernel weight of 45.0 g was recorded the treatment (T_8) that received T_2 + foliar spray of MN mixture @ 0.5 %. However, it was on a par with T_7 (43.9 g) that received T_2 + foliar spray of MN mixture @ 0.2 %. The lowest 100-kernel weight of was recorded with control (28.2 g). This might be due to the availability of sufficient amount of plant nutrients throughout the growth period by adequate supply of secondary and micronutrients along with NPK, resulting in better lateral root growth, catalyzing the metabolism of carbohydrates, increase in enzyme activity,

other biological oxidation reactions and yield advantage (Nayak *et al.,* 2009).

Shelling percentage (%):

The data pertaining to shelling percentage (%) revealed that the shelling percentage (%) was significantly affected by foliar nutrition of micronutrients along with recommended dose of fertilizer (RDF) and gypsum (400 kg ha^{-1}). The maximum shelling percentage 72.1 % was recorded in the treatment (T_8) that received T_2 + foliar spray of MN mixture @ 0.5 % which was on a par with T_7 (69.0) that received T_2 + foliar spray of MN mixture @ 0.2 %. The lowest shelling percentage (%) was recorded with control (46.1). This might be due to adequate supply of micronutrient enhanced the metabolic activity which results in increased yield characters (Mohapatra and Dixit, 2010).

Effect of foliar nutrition of micronutrients on yield of Ground nut:

The highest pod yield (2720 kg ha^{-1}) and haulm yield (3450 kg ha^{-1}) was recorded in the treatment that received T_2 + foliar spray of MN mixture @ 0.5 %. However, it was on a par with T_{11} that received T_2 + foliar spray of MN mixture @ 0.2 %. The lowest pod yield (1210 kg ha^{-1}) and haulm yield (1920 kg ha^{-1}) was recorded with control (T_1). This might be due to foliar spray of micronutrients especially zinc involvement in plant metabolism, auxin production which ultimately improves the vegetative growth of the plant and nutrient assimilation resulted in increased pod yield and haulm yield (Fakeerappa Arabhanvi *et al.,* 2015).

TABLE 2: Effect of foliar application of micronutrients on yield of groundnut

Treatments	Yield (kg ha^{-1})	
	Pod yield	Haulm yield
T_1 - Control (Absolute control)	1210	1920
T_2 - RDF (25:50:75 kg ha^{-1}) + Gypsum (400 kg ha^{-1})	1771	2494
T_3 - T_2 + foliar spray of $ZnSO_4$ @ 0.2 %	2305	3009
T_4 - T_2 + foliar spray of $ZnSO_4$ @ 0.5 %	2510	3165
T_5 - T_2 + foliar spray of $FeSO_4$ @ 0.2 %	2131	2669
T_6 - T_2 + foliar spray of $FeSO_4$ @ 0.5 %	2227	2759
T_7 - T_2 + foliar spray of MN mixture @ 0.2 %	2640	3330
T_8 - T_2 + foliar spray of MN mixture @ 0.5 %	2720	3450
SE d	59.3	76.5
CD	124	160

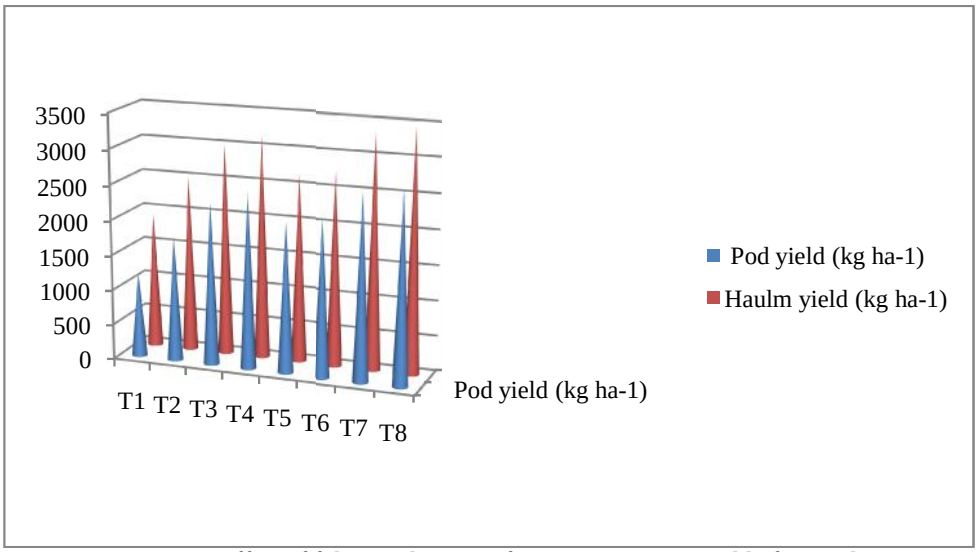

FIGURE 2: Effect of foliar application of micronutrients on yield of groundnut

Economics

Economics of raising a particular crop plays a vital role in making recommendations for adoption of a technology to the farmers.

The data pertaining to gross returns, net returns and B: C ratio as influenced by foliar spray of secondary and micronutrients are presented in Table 3. The highest gross return (Rs. 163200 ha^{-1}) and net return (Rs. 1165820 ha^{-1}) were recorded in the treatment that received T_2 + foliar spray of MN mixture @ 0.2 % (T_8). The highest B:C ratio (2.52) was recorded in the treatment that received T_2 + foliar spray of MN mixture @ 0.5 % (T_8). Higher gross, net returns and B: C ratio was due to more pod yield than other treatments.

TABLE 2: Effect of foliar application of micronutrients on economics of groundnut

Treatments	Cost of cultivation (Rs. ha^{-1})	Gross returns (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	B:C Ratio
T_1 - Control (Absolute control)	35400	72600	37200	1.05
T_2 - RDF (25:50:75 kg ha^{-1}) + Gypsum (400 kg ha^{-1})	40200	106260	66060	1.64
T_3 - T_2 + foliar spray of $ZnSO_4$ @ 0.2 %	43150	138300	95150	2.21
T_4 - T_2 + foliar spray of $ZnSO_4$ @ 0.5 %	44550	150600	106050	2.38
T_5 - T_2 + foliar spray of $FeSO_4$ @ 0.2 %	42800	127860	85060	1.99
T_6 - T_2 + foliar spray of $FeSO_4$ @ 0.5 %	43240	133620	90380	2.09
T_7 - T_2 + foliar spray of MN mixture @ 0.2 %	45100	158400	113300	2.51
T_8 - T_2 + foliar spray of MN mixture @ 0.5 %	46350	163200	116850	2.52

Data statistically not analysed

CONCLUSION

Over all, from the experimental results, it could be concluded that T_2 + foliar spray of MN mixture @ 0.2% could be considered as a better option for achieving higher productivity and profitability and improved quality of Ground nut (*Arachis hypogaea* L.).

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