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Original Research Article

Effect of Different Source and Level of Sulphur on Yield Attributes, Yield and Quality Parameter of Groundnut

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A B S T R A C T

A field experiment of two years was conducted in kharif season 2015 and 2016 at Holy cross farm Dipugarha Hazaribag, Jharkhand India to Effect of Different Source and Level of Sulphur on yield attributes, yield and quality parameter of groundnut crop. The experiment was laid out in split plat design with three replicates, two main factors, three and five sub factor consisting of three sources of sulphur viz., SSP (Single Super Phosphate), Phosphogypsum and Elemental sulphur (Bntonite Sulphur) and four levels of sulphur 10kg sulphur/ha, 20kg sulphur/ha, 30 kg sulphur/ha, 40 kg/ha and control. Sulphur application significantly influenced the yield, yield attributes and quality parameter like oil yield and protein yield over control. Application of sulphur through SSP recorded highest number of pod/plant, number of kernels/plant, pod yield, Kernels yield, oil yield and Protein yield. Addition of sulphur at 40 kg /ha has increase percentage the pod yield 13.72%, kernels yield16.59% and oil yield 24.24% over control. The highest protein yield recorded 466.23 kg/ha at 40 kg level of sulphur/ha.

Keywords

SSP, Phosphogypsum, Elemental sulphur, Yield, Oil, Protein, Quality and Groundnut

Introduction

Groundnut plays a vital role in Indian economy. In India, Groundnut account for total production of 7402 thousand MT & its share percentage is 26.90 % of total oil seeds production of 27510.8 thousand MT Groundnut occupies the third position in the area next to soybean (first) second to rapeseed& mustard and the second position in production next to soybean (First) (DAC&FW 2016-17). Oil crops area in Jharkhand is 267.5 thousand ha & production 177.6 thousand MT. Though the average yield (664 kg/ha) is much lower than national average yield (1075 kg/ha) .Groundnut is an important crop of Jharkhand. It is cultivated in the kharif season in upland and medium land soil condition. The cultivated soil is mostly sandy and sandy loam soil, acidic, low in organic carbon, low in available nitrogen, low to medium in available phosphorous, low to medium available potassium and deficient in available Sulphur.

Sulphur deficiency is widespread in many Indian soil crops .Sulphur resembles to nitrogen in its role and function in plant .It is required by crops as much to that of phosphorous. Sulphur performs many physiological function in oil seeds like synthesis of S containing amino-acid,

namely, cystine (21% S), systein(26% S) and methionine(21% S). Sulphur increases the oil content of oil seeds (Kumar and Trivedi 2012). The sulphur requirement of oil seeds is fairly high in comparison to other cereals and millets. There is drastic change in the production and nutritive value of crop production due to absent of sulphur. In sulphur deficient soils, generally all crops responds to sulphur application but in case of oilseed and pulses, the response is higher. Average removal of sulphur by 1tonne of oilseeds ranges between 8-12kg by pulses 4-8 kg as compared to 3.5 kg sulphur by cereals. Similarly, oilseeds from one ha remove sulphur between 10 and 25 kg and that of pulses 5-10 kg/ha annually which depends upon the crops, soil and environmental factors.

In Jharkhand condition Groundnut crop has drawn less attention for sulphur application. There is a great scope to increase the productivity and oil content of groundnut in Jharkhand by sulphur application .Therefore, the study was under taken to know a study on effect of sulphur fertilization on yield, quality and economics of Groundnut crop in Jharkhand soil.

Materials and Methods

A field experiment was conducted during the kharif season of 2015 and 2016 at Holy Cross Farm Hazaribag, Jharkhand .The soil of experimental field was sandy in texture low in available nitrogen, high in available phosphorous and low in available potash. The experiment was laid out in split plat design with three replicates, two main factors, three and five sub factor consisting of three sources SSP (Single Super Phosphate), Phosphogypsum and Elemental Sulphur (Bentonite Sulphur) and four levels of sulphur 10kg sulphur/ha, 20kg sulphur/ha, 30 kg sulphur/ha , 40 kg/ha and control.

Furrow was opened manually in each plot by keeping spacing (35cm X 15 cm) line to line 35 cm and plant to plant 15cm. Recommended dose of fertilizers uses for Groundnut was 25:60:25 NPK /ha. The crop was fertilized with full dose of nitrogen (25 kg/ha), phosphorous (60 kg/ha) and of potash (25 kg/ha) as the basal. The nitrogen, Phosphorous and Potash was applied through Urea, DAP (Di ammonium Phosphate) and MOP (Muriate of Potash). SSP was used as a source of sulphur and its Phosphorous content was adjusted with DAP as per treatment. The crop was raised following all the recommended agronomic practices and harvested in the last week of October during 2015 and 2016, respectively.

The protein content was determined by nitrogen content multiplied by conversion factor of 6.25

The oil yield and protein yield was calculated in kg/ha by the following formula

Oil yield in kg/ha = kernels yield (kg/ha) X Oil content in percentage

Protein in kg/ha = kernels yield (kg/ha) X Protein content in percentage

Results and Discussion

During the year of study, different sources and levels of sulphur significantly influenced the number of pod/plant, number of kernels/plant, pod yield, kernels yield, oil yield (kg/ha) and protein yield (kg/ha).Application of sulphur through SSP recorded highest number of pod/plant, number of kernels /plant, pod yield, kernels yield, oil yield and protein yield in groundnut. However it was significantly superior to application of sulphur through SSP compared to other sources i.e. Phosphogypsum and Elemental Sulphur

(Bentonite Sulphur). Highest number of pod/plant, number of kernels/plant, pod yield, kernels yield, oil yield (kg/ha) and protein yield (kg/ha) was observed with application of 40 kg/ha of sulphur in groundnut. Giri *et al.,* (2011) evaluated the effect of different levels of sulphur (0, 15 and 30 kg S/ha) on groundnut and found that application of sulphur @ 15 kg/ha significantly enhanced all the yield attributing characters *viz.,* number of pods/plant, number of kernels/pod in groundnut.

SSP as source of sulphur recorded maximum number of pod/plant (19.3 pod/ plant) in groundnut to other sources of sulphur i.e. Phosphogypsum and Elemental sulphur. Percentage increase in the number of pod /plant recorded was 8.42 and 9.66 with SSP application compared to Phosphogypsum and Elemental sulphur.

Application of sulphur levels up to 40 kg/ha recorded significantly higher pod yield in groundnut but it was at par with sulphur level at 20 kg/ha and 30 kg/ha. Maximum number of pod /plant recorded was 19.62 at 40 kg level of sulphur/ha. Percentage increase in the number of pod recorded were 14.73, 26.41 and 13.09, 24.61 with 40kg/ha and 30 kg/ha levels of sulphur over 10 kg sulphur/ha and control, respectively.

The number of kernels significantly increased with SSP application as source of sulphur in groundnut. The number of kernels recorded minimum 18.85 with Elemental sulphur as source of sulphur. However, it was at par with Phosphogypsum application as source of sulphur.

Number of kernels increased significantly with different level of sulphur in groundnut. The number of kernels recorded maximum 21.38 at 40 kg/ha level sulphur. It was at par with sulphur level at 20kg/ha and 30 kg /ha. Increase in number of kernels/plant was recorded 15.55% at 40 kg levels of sulphur over control.

The pod yield was recorded maximum with SSP application as source of sulphur. When SSP was applied as source of sulphur percentage increase in pod yield of groundnut was 11.15 and 11.42 over Phosphogypsum and Elemental Sulphur (Bentonite Sulphur). Phosphogypsum and Elemental Sulphur (Bentonite Sulphur) as sources of sulphur recorded pod yield of 20.7 q/ha and 20.65 q/ha in groundnut and were statistically at par.

The pod yield increased significantly with increasing levels of sulphur up to 40 kg /ha. The highest pod yield (22.46 q/ha) of groundnut recorded with 40kg sulphur /ha and this was significantly superior to control. When sulphur was applied at the rate of 20 kg/ha the pod yield of groundnut obtained was 22.04 q/ha and it was statistically at par with sulphur levels at 30 kg/ha and 40kg/ha but it was significantly higher over control. Percentage increase of pod yield recorded 13.72 % at 40kg/ha level of sulphur over control. Dash *et al.,* (2013) found that application of sulphur at 20 kg/ha significantly increased the pods/plant and pod yields in groundnut.

The kernel yield of groundnut increased significantly when sulphur was applied as source of SSP compare to other sources like Phosphogypsum and Elemental Sulphur. When sulphur was applied through SSP the kernel yield recorded was16.01q/ha and it was significantly superior to other sources like Phosphogypsum and Elemental Sulphur. The minimum kernel yield recorded was 14.31q/ha with Elemental Sulphur and it is at par with Phosphogypsum as source of sulphur.

Data presented in Table no.1 showed significant increase in the oil yield of kernels of groundnut with different sources of sulphur. Application of SSP as source of sulphur recorded highest oil yield of 817.61 kg/ha and it was statistically superior over Phosphogypsum application. The percentage increase in oil yield with application of SSP was 13.96 % and 16.03 % over Phosphogypsum and Elemental Sulphur (Bentonite Sulphur) respectively. Phosphogypsum as source of sulphur recorded oil yield of 717.42 kg/ha and it was at par over Elemental Sulphur (Bentonite Sulphur) as source of sulphur (704.6 kg/ha).Singh and Singh (2007) reported that gypsum sources of sulphur proved significantly superior to other sources for oil content of linseed.

Application of sulphur levels up to 40 kg sulphur/ha significantly influenced the oil yield of groundnut during the observation. Application of 40 kg sulphur /ha the oil yield of groundnut recorded was 807.53 kg/ha and it was statistically at par with levels of sulphur at 30kg /ha (794.82 kg/ha) and 20 kg /ha (782.26 kg/ha). The maximum oil yield was recorded at 40kg sulphur /ha and minimum oil yield was recorded with control (649.95 kg/ha). Percentage increase of oil yield recorded with application of 40 kg sulphur /ha was 24.24 % over control. Jat and Ahlawat (2009) noticed that application of sulphur at 70 kg/ha, being at par with 35 kg/ha significantly increased the oil content in kernel.

The application of different sources of sulphur significantly influenced the protein yield in seeds of groundnut. SSP application as source of sulphur recorded highest protein yield (473.49 kg/ha) in kernels of groundnut. It was significantly superior over Phosphogypsum and Elemental Sulphur (Bentonite Sulphur). Percentage increase of protein yield with application of SSP was 14.28% over Elemental Sulphur (Bentonite Sulphur), respectively. Phosphogypsum application recorded protein yield of 423.93 kg/ha and it was the second best source of sulphur after SSP.

Table.1 Effect of sources and levels of sulphur on number of pod, number of kernels and pod yield in groundnut.

Treatments Sources of sulphur	No. of pod/plant	No. of kernels/plant	Pod yield q/ha
SSP	19.3	22.03	23.01
Phosphogypsum	17.8	19.22	20.7
Elemental sulphur	17.6	18.85	20.65
CD Value	1.18	1.87	1.88
Levels of Sulphur kg/ha			
0	15.52	18.51	19.75
10	17.1	19.52	20.73
20	19.24	21.01	22.04
30	19.34	21.2	22.22
40	19.62	21.38	22.46
CD Value	0.87	1.21	1.21

Table.2 Effect of sources and levels of sulphur on kernels yield, oil yield and protein yield in groundnut

Treatments Sources of sulphur	Kernels yield q/ha	Oil yield Kg/ha	Protein yield Kg/ha
SSP	16.01	817.61	473.49
Phosphogypsum	14.4	717.42	423.93
BentoniteSulphur	14.31	704.6	414.29
CD Value	1.24	71.39	35.71
Levels of Sulphur kg/ha			
0	13.5	649.95	389
10	14.32	698.66	415.2
20	15.4	782.26	455.65
30	15.53	794.82	460.13
40	15.74	807.53	466.23
CD Value	0.84	43.12	28.34

Protein yield in seed of mustard significantly increased with application of sulphur up to 40 kg/ha. Application of sulphur at 40 kg/ha recorded highest protein yield (466.23 kg/ha) in kernels of groundnut and it was statistically superior over 10 kg sulphur/ha (415.2 kg/ha) and control (389.0 kg/ha). Percentage increase in protein yield recorded with application of 40 kg sulphur/ha were 1.06%, 2.3%, 12.29% and 19.85% over 30 kg/ha, 20 kg/ha ,10kg/ha of sulphur and control, respectively .Kumar and Trivedi (2011) found that protein content increased significantly with increasing level of sulphur up to the highest level of 60 kg S/ ha.

In conclusion, sources and levels of sulphur application significantly influenced the number of pod/plant, number of kernels/plant, pod yield, kernels yield, oil yield and protein yield of groundnut. Addition of sulphur at 40 kg/ha through SSP recorded maximum number of pod/plant, number of kernels/plant, pod yield, kernels yield, oil yield and protein yield of groundnut.

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