The Pharma Innovation Journal 2021; 10(11): 1119-1123

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(11): 1119-1123

www.thepharmajournal.com
Received: 17-08-2021
Accepted: 30-10-2021

Shivaji Suryavanshi
Agronomy Section, Dr. D.Y. Patil College of Agriculture, Talsande, Kolhapur, Maharashtra, India

Vikas Patil
Agronomy Section, R.C.S.M. College of Agriculture, Kolhapur, Maharashtra, India

Poonam Gunjal
Agronomy Section, R.C.S.M. College of Agriculture, Kolhapur, Maharashtra, India

Corresponding Author:
Shivaji Suryavanshi
Agronomy Section, Dr. D.Y. Patil College of Agriculture, Talsande, Kolhapur, Maharashtra, India

Effect of potassium & sulphur on growth attributing characters during different growth sages of summer groundnut

Shivaji Suryavanshi, Vikas Patil and Poonam Gunjal

Abstract
The present field experiment was carried on the Effect of potassium and sulphur on growth attributing characters during different growth sages of summer groundnut during summer season of 2018 at the RCSM College of Agriculture, Kolhapur (M.S.), India. The field trial was laid out in FRBD with three replications and twelve treatment combinations. The soil of experimental field was sandy loam in texture, low in available nitrogen (238.84 kg ha^{-1}), moderately high in available phosphorus (23.65 kg ha^{-1}) and moderately high in available potassium (249.10 kg ha^{-1}). The soil was slightly alkaline in reaction (pH 7.7). The growth attributing characters i.e. plant height, plant spread, number of branches and dry matter observed during different growth stages *viz.*, 30, 45, 60, 75 DAS and at harvest were maximum with the application of 45 kg K_2O ha^{-1} followed by 30 kg K_2O ha^{-1} in case of potassium and 40 kg S ha^{-1} which is comparable with 20 kg S ha^{-1} in case of sulphur.

Keywords: Groundnut, potassium, sulphur, plant height, plant spread, dry matter, number of branches

Introduction
In India groundnut is grown in 11 states and accounts for 29% of total area and 36% of total production of oilseed. India rank first in area (7.6 million ha) and second in production (7.8 million tonnes) in world. The groundnut production in India was 71.805 lakh tonnes in 2015-16. It decreased by -2.212 lakh tonnes as compared to the groundnut production of 74.017 lakh tonnes in the year 2014-15. Thus, the annual decrease recorded in the year 2015-16 was -2.99%. There were 9 States having groundnut production of more than 1 lakh tonnes *viz*. Gujarat, Rajasthan, Tamil Nadu, Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, West Bengal and Telangana in 2015-16. The average productivity of groundnut in India is just about 1000 kg ha-1 as against world's average yield of 1340 kg ha-1. Eighty percent of total groundnut area in India is confined to five states *viz*. Gujarat, Andhra Pradesh, Tamilnadu, Karnataka and Maharashtra which accounts for 84% total production.
The groundnut oil is generally used in the preparation of vanspati tup, soap, cosmetics and cold creams besides as cooking medium. This contains 20 per cent saturated and 80 per cent unsaturated fatty acid. Poly saturated fatty acid has two types i.e. oleic (40-50%) and linoleic (24-35%) (Mathur and Khan, 1997) [5].
The potassium is also one of the major plant nutrients, which is important for growth and development of plants. Potassium application is not regularly practiced, it plays equally important role as nitrogen and phosphorus in plants metabolic activities. It helps the plants in using the water economically. Sulphur is a now recognized, as the fourth major plant nutrient, along with Nitrogen, Phosphorous and Potassium, therefore sulphur is now very much a part of balanced fertilization and nutrition for oilseed crops in general and for groundnut crop in particular. It is one of the important pre-requisites for enhance productivity and quality of groundnut. Sulphur as plant nutrients is becoming increasingly important in dry land agriculture as it is master nutrient of all oilseed crops. Among the field crops, oilseeds and pulses are more responsive to sulphur.

Material and Methods
An field experiment was laid out at Post Graduate Research Farm, R.C.S.M. College of Agriculture, Kolhapur during summer, 2018. The topography of experimental field was fairly uniform and leveled. The soil was vertisol (medium black) in nature and about one meter deep with good drainage. The soil of experimental field has pH 7.7, EC 0.31 d Sm^{-1}, organic carbon

0.18%, available N, P_2O_5, K_2O 238.84, 23.65 and 249.10 kg ha^{-1}, respectively. The treatments comprising of twelve treatment combinations of three potassium levels (K_0- 00 kg K_2O ha^{-1}, K_1- 15 kg K_2O ha^{-1}, K_2- 30 kg K_2O ha^{-1}, K_3- 45 kg K_2O ha^{-1}) and three sulphur levels (S_1- 10 kg S ha^{-1}, S_2- 20 kg S ha^{-1}, S_3- 40 kg S ha^{-1}) and these treatments were replicated three times in factorial randomized block design (FRBD). Application of organic manure through farmyard manure was done well before 15 days of dibbling. The Phule Chaitanya (KDG-160) variety was used for sowing. The groundnut crop was fertilized with 25 kg N and 50 kg P_2O_5 ha^{-1}. The application of N through urea, P_2O_5 through Diammonium phosphate, K_2O through Muriate of Potash and S through Gypsum was done as per the treatments. The quantity of Sulphur and Potassium were applied as per treatment to each plot at the time of sowing. The plant samples were analyzed to estimate the NPKS content in the plant for estimation of total uptake. The soil samples were analyzed to estimate the NPKS content in soil. Five plants were randomly selected from each net plot each treatment, replication wise and labelled by fixing bamboo pegs. These plants were further used for recording biometric observations and yield contributing characters. The final yield was recorded from net plot area of each treatment and converted in hectare basis. The data obtained from various characters under study were analyzed by the method of analysis of variance as described by Panse, V.G. and Sukhamate, P.V. 1967 [7]. Fertilizers were applied uniformly at the rate of 25 kg N and 50 kg P_2O_5 ha^{-1} and K_2O- as per treatments.

Result and Discussion

Effect on plant height

The data on plant height recorded during various growth stages are presented in Table 4.2. Plant height was increased during every growth stages of groundnut till maturity. The mean plant height was increased progressively with an advancement of crop age and reached maximum at harvest. The rate of increase in height was rapid up to 75 days. The mean plant height $plant^{-1}$ recorded at 30, 45, 60, 75 DAS and at harvest was 9.49, 13.92, 19.29, 24.96 and 31.28 cm respectively.

Effect of Potassium Levels

The application of 45 kg K_2O ha^{-1} was recorded the highest plant height during all growth stages and it was significantly superior over rest of the treatments during all growth stages, however on par with treatment 30 kg K_2O ha^{-1}. The potassium @ 45 kg ha^{-1} gave maximum plant height, which may be due to its profound influence stress resistance and the vegetative crop growth resulting in higher plant height. Similar results were also reported by Ponnuswami *et al.,* (1993) [10] at Tamil Nadu (India), Patra *et al.,* (1995) [9] at Research farm, IGKV, Raipur (C.G.) and Shahid *et al.,* (1999) [12] at VNMKV, Parbhani.

Effect of Sulphur Levels

Among the sulphur levels the application of 40 kg S ha^{-1} recorded the highest plant height during all growth stages and it was significantly superior over rest of the treatments during all growth stages, however on par with treatment 20 kg S ha^{-1}. Similar results were also reported by Reddy *et al.,* (1992) [11] at PDKV, Akola, Shahid *et al*., (1999) [12] at VNMKV, Parbhani.

Effect of Interaction

Effect of interaction of potassium and sulphur levels were non-significant in respect of mean plant height of groundnut during all the crop growth stages.

Effect on plant spread

The data on mean plant spreads $plant^{-1}$ was recorded at various crop growth stages are presented in Table 4.3. The plant spreads was found to be increased during every crop growth stage till maturity. The increase in plant spread was till maturity. The plant spreads recorded at 30, 45, 60, 75 DAS and at harvest was 6.55, 11.40, 16.30, 20.16 and 23.79 cm respectively.

Effect of Potassium Levels

Mean plant spreads was influenced significantly during various crop growth stages due to different effect of potassium levels. Maximum plant spreads was recorded at application of 45 kg K_2O ha^{-1}, which was significantly superior over rest of treatments during all growth stages and it was on par with treatment 30 kg K_2O ha^{-1}. Similar result was also reported by Aruna *et al.,* (2001) [1] at Tirupati, Andhra Pradesh, (India) and Hadwani and Gundalia (2005) [3] at Model Farm, Junagadh Agricultural University, Junagadh (Gujarat, India).

Effect of Sulphur Levels

The maximum plant spreads was recorded due to application of 40 kg S ha^{-1}, which was significantly superior over rest of treatments during all growth stages, however comparable with treatment 20 kg S ha^{-1}. Similar results were also reported by Khanpara *et al.,* (1993) [4] at Udaipur (Rajasthan), Singh *et al.,* (1993) [14] at Pantnagar (U.P.) and Patra *et al.,* (1995) [9] at Research farm, IGKV, Raipur (C.G.).

Effect of Interaction

Effect of interaction of potassium and sulphur levels were non-significant in respect of mean plant spreads of groundnut during all growth stages.

Effect on number of branches $plant^{-1}$

The data on mean number of branches $plant^{-1}$ are recorded and presented in Table 4.4. The mean number of branches $plant^{-1}$ recorded at 30, 45, 60, 75 DAS and at harvest was 5.90, 7.83, 8.28, 12.03 and 12.98 respectively.

Effect of Potassium Levels

Among the potassium levels the application of 45 kg K_2O ha^{-1} was recorded highest plant height during all growth stages and it was significantly superior over rest of the treatments during all growth stages, however comparable with treatment 30 kg K_2O ha^{-1}. Less number of branches $plant^{-1}$ was recorded at 0 kg K_2O ha^{-1}, it might be due to less availability of plant nutrients. Similar results were also reported by Nadia (2015) [6] at Ali Moubarak Experimental Farm of the South Tahrir Research Station, Egypt, Siddaramappa *et al.,* (1993) [13] and Ponnuswami *et al.,* (1993) [10].

Effect of Sulphur Levels

The application of 40 kg S ha^{-1} recorded maximum number of branches $plant^{-1}$ during all growth stages and it was significantly superior over rest of the treatments during all growth stages, however on par with treatment 20 kg S ha^{-1}.

Similar results were also reported by Khanpara *et al.,* (1993) [4] at Udaipur (Rajasthan) and Singh *et al.,* (1993) [14].

Effect of Interaction

Effect of interaction of potassium and sulphur levels were non-significant in respect of mean number of branches plant^{-1} of groundnut during all the crop growth stages.

Effect on dry matter plant^{-1}

The data on mean dry matter accumulation plant^{-1} during various growth stages are presented in Table 4.5. The mean dry matter accumulation plant^{-1} recorded at 30, 45, 60, 75 DAS and at harvest was 2.06, 7.77, 12.66, 20.75 and 33.97 g, respectively.

Effect of Potassium Levels

Application of potassium levels produced significant effect during all the growth stages of crop on dry matter production plant^{-1}. The application of 45 kg K_2O ha^{-1} recorded highest dry matter accumulation plant^{-1} which was comparable with the application of 30 kg K_2O ha^{-1}. Lowest dry matter accumulation plant^{-1} was observed at 0 kg K ha^{-1}, due to lower availability of plant nutrients. Dry matter accumulation plant^{-1} was increased due to the increase in plant height, number of branches plant^{-1}. Similar results were also reported by Patil *et al.,* (2017) [8], Ponnuswami *et al.,* (1993) [10] and Aruna *et al.,* (2001) [1].

Effect of Sulphur Levels

Mean dry matter accumulation plant^{-1} was influenced significantly due to sulphur levels during various crop growth stages. In general, maximum dry matter accumulation plant^{-1} was recorded due to application of 40 kg S ha^{-1}, which was significantly superior over rest of treatments during all growth stages, however on par with treatment 20 kg S ha^{-1}. Similar result was also reported by Singh *et al.,* (1990) and Thirumalaisamy *et al.,* (1986) [15].

Effect of Interaction

Effect of interaction of potassium and sulphur levels were non-significant in respect of mean dry matter accumulation plant^{-1} of groundnut during all the crop growth stages.

Table 1: Mean plant height of groundnut as influenced periodically by different treatments

Treatments	Plant height (cm)				
	30 DAS	45 DAS	60 DAS	75 DAS	At harvest
Potassium levels					
K_0- 00 (kg K_2O ha^{-1})	6.94	11.66	17.05	22.27	29.47
K_1- 15 (kg K_2O ha^{-1})	7.37	12.51	18.38	24.06	30.51
K_2- 30 (kg K_2O ha^{-1})	11.39	15.12	20.48	26.13	31.97
K_3- 45 (kg K_2O ha^{-1})	12.24	16.37	21.27	27.36	33.16
S. Em±	0.37	0.57	0.52	0.65	0.86
C. D. at 5%	1.09	1.68	1.54	1.91	2.54
Sulphur levels					
S_1 - 10 (kg S ha^{-1})	8.67	12.84	18.33	23.96	29.07
S_2 - 20 (kg S ha^{-1})	9.62	14.35	19.32	24.71	31.48
S_3 - 40 (kg S ha^{-1})	10.16	14.56	20.24	26.20	33.34
S. Em±	0.32	0.49	0.45	0.56	0.75
C. D. at 5%	0.95	1.46	1.33	1.65	2.20
Interactions (K × S)					
S. Em±	0.64	0.99	0.91	1.13	1.50
C. D. at 5%	NS	NS	NS	NS	NS
General mean	9.49	13.92	19.29	24.96	31.28

Table 2: Mean plant spread of groundnut as influenced periodically by different treatments

Treatments	Plant spread (cm)				
	30 DAS	45 DAS	60 DAS	75 DAS	At harvest
Potassium levels					
K_0- 00 (kg K_2O ha^{-1})	5.23	9.77	14.72	18.50	22.12
K_1- 15 (kg K_2O ha^{-1})	6.53	11.39	15.96	19.69	23.28
K_2- 30 (kg K_2O ha^{-1})	6.90	11.79	16.78	20.57	24.31
K_3- 45 (kg K_2O ha^{-1})	7.52	12.64	17.74	21.90	25.46
S. Em±	0.22	0.41	0.51	0.55	0.64
C. D. at 5%	0.66	1.21	1.5	1.63	1.89
Sulphur levels					
S_1 - 10 (kg S ha^{-1})	6.12	10.74	15.34	19.28	22.88
S_2 - 20 (kg S ha^{-1})	6.63	11.26	16.41	20.01	23.48
S_3 - 40 (kg S ha^{-1})	6.89	12.19	17.15	21.20	25.02
S. Em±	0.19	0.35	0.44	0.48	0.55
C. D. at 5%	0.57	1.05	1.3	1.41	1.63
Interactions (K × S)					
S. Em±	0.39	0.71	0.88	0.96	1.11
C. D. at 5%	NS	NS	NS	NS	NS
General mean	6.55	11.40	16.30	20.16	23.79

Table 3: Mean number of branches plant^{-1} of groundnut as influenced periodically by different treatments

Treatments	Dry matter plant^{-1} (g)				
	30 DAS	45 DAS	60 DAS	75 DAS	At harvest
Potassium levels					
K_0- 00 (kg K_2O ha^{-1})	1.37	6.36	11.00	17.76	30.94
K_1- 15 (kg K_2O ha^{-1})	1.67	7.78	12.27	18.86	32.47
K_2- 30 (kg K_2O ha^{-1})	2.54	8.28	13.40	22.72	35.16
K_3- 45 (kg K_2O ha^{-1})	2.66	8.67	13.98	23.65	37.30
S. Em±	0.07	0.22	0.33	0.60	0.81
C. D. at 5%	0.21	0.64	0.98	1.77	2.40
Sulphur levels					
S_1 - 10 (kg S ha^{-1})	1.79	7.42	12.07	19.49	32.19
S_2 - 20 (kg S ha^{-1})	2.13	7.70	12.55	20.79	34.04
S_3 - 40 (kg S ha^{-1})	2.26	8.21	13.36	21.97	35.68
S. Em±	0.06	0.19	0.29	0.52	0.70
C. D. at 5%	0.18	0.56	0.85	1.53	2.08
Interactions (K × S)					
S. E m±	0.12	0.38	0.58	1.04	1.41
C. D. at 5%	NS	NS	NS	NS	NS
General mean	2.06	7.77	12.66	20.75	33.97

Table 4: Mean dry matter plant^{-1} of groundnut as influenced periodically by different treatments

Treatments	Number of branches plant^{-1}				
	30 DAS	45 DAS	60 DAS	75 DAS	At harvest
Potassium levels					
K_0- 00 (kg K_2O ha^{-1})	4.61	6.50	7.61	10.72	11.57
K_1- 15 (kg K_2O ha^{-1})	5.38	7.38	8.19	11.50	12.51
K_2- 30 (kg K_2O ha^{-1})	6.68	8.58	9.60	12.71	13.74
K_3- 45 (kg K_2O ha^{-1})	6.94	8.86	10.10	13.19	14.11
S. Em±	0.13	0.18	0.18	0.26	0.27
C. D. at 5%	0.40	0.52	0.54	0.77	0.81
Sulphur levels					
S_1 - 10 (kg S ha^{-1})	5.38	7.48	8.33	11.48	12.32
S_2 - 20 (kg S ha^{-1})	6.12	7.88	8.95	12.14	13.13
S_3 - 40 (kg S ha^{-1})	6.21	8.13	9.35	12.48	13.51
S. Em±	0.11	0.15	0.16	0.22	0.24
C. D. at 5%	0.35	0.45	0.47	0.66	0.70
Interactions (K × S)					
S. Em±	0.23	0.31	0.32	0.45	0.47
C. D. at 5%	NS	NS	NS	NS	NS
General mean	5.90	7.83	8.28	12.03	12.98

Conclusions

Application of 30 kg K_2O ha^{-1} found beneficial in increasing growth, yield and quality of summer groundnut. Among the sulphur levels application of 20 kg S ha^{-1} recorded the higher growth attributes during different growth stages of summer groundnut.

Acknowledgments

The authors are thankful to Agronomy Section, RCSM College of Agriculture, Kolhapur– 416004, Maharashtra, India for providing necessary facilities to undertake the field experiment.

References

1. Aruna E, Rao PG, Krishnamurthy VR. Effect of post-flowering nutrition management on yield and economics of bold kernel type groundnut (*Arachis hypogaea* L.). Res. Crops 2001;2(2):137-140.
2. Das PC. Oilseeds Crops of India. Kalyani Publishers, Ludhiana, India 1997,80-83.
3. Hadwani GJ, Gundalia JD. Effect of N, P_2O_5 and K_2O levels on yield nutrient content, uptake and quality of *summer* groundnut grown on Typic Haplustepts. J of Indian Soc. Soil Sci 2005;53(1):125-128.
4. Khanpara VD, Porwal BL, Sahu MP, Patel JC. Effect of levels and methods of sulphur application on biochemical changes in mustard leaves. Indian J. Agron 1993;38(3):410-413.
5. Mathur RS, Khan MA. Groundnut is poor men's nut. Indian Farmer's Digest 1997;30(5):29-30.
6. Nadia MH. Effect of different sources and levels of potassium fertilization on productivity of peanut grown under sandy soil conditions. *J. Soil Sci. and Agric. Eng*., Mansoura Univ 2015;6(12):1441-1454.
7. Panse VG, Sukhamate PV. Statistical methods for agricultural workers ICAR, New Delhi 1967,361.
8. Patil DB, Pawar PP, Wadile SC, Patil HM. Effect of integrated nutrient management on growth and yield of *kharif* groundnut (*Arachis hypogaea* L.). Int. J. of Hort., Agric. and Food Sci 2017,1(1).
9. Patra AK, Tripathy SK, Samui RC. Yield and nutrient uptake by groundnut (*Arachis hypogaea* L.) as influenced by potash fertilization and methods of planting. J. Potassium Res 1995;11(3/4):332-33
10. Ponnuswami K, Balakrishnan VK, Santhi P. Exploiting the production potentiality in groundnut (*Aarachis hypogaea* L.) by nutrient management to benefit the farmers in LBP (Lower Bhavani Project) area of Tamil

Nadu. New Botanist 1993;20(1/4):19-22.
11. Reddy SK, Srirammurthy VNM, Shantaram, MVN. P and S nutrition of groundnut grown in Alfisols. J. Oilseeds Res 1992;9(2):189-195.
12. Shahid, Umar, Bansal SK, Imas P, Magen H. Effect of foliar fertilization of potassium on yield, quality and nutrient uptake of groundnut. J. Plant Nutrition 1999;22(11):1785-1795.
13. Siddaramappa SN, Shivraj B, Andani, Gowda. Effect of source levels of potassium and sulphur with molybdenum seed dressing on yield and quality of groundnut. Mysore J. Agric. Sci 1993;27(2):124-129.
14. Singh B, Singh B, Khandelwal RB. Effect of phosphatic fertilizers, gypsum and their mode of application on yield, oil and protein content of groundnut. Indian J. Agron 1993;38(2):56-59.
15. Thirumalaisamy K, Sathasivam R, Natararatnam. Effect of sulphur fertilization on nutrient content, dry matter production and yield of groundnut. Madras Agric. J 1986;73(3):151-154.