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EFFECT OF PHOSPHORUS AND SULPHUR ON OIL CONTENT OF SESAME VARIETIES (RESEARCH COMMUNICATION)

[1]H. A. Jahun, [2]M. A. Samndi and [3]S. G. Mohammed
[1]Department of Agricultural Technology Binyaminu Usman College of Agriculture Hadejia Jigawa State
[2]Department of Soil Science, Faculty of Agriculture Bayero University Kano
[3]Department of Agronomy, Faculty of Agriculture Bayero University Kano.
Corresponding author; hmsjhn5555@gmail.com.

ABSTRACT
Information on phosphorus sulphur fertilizer requirements of some new sesame varieties in Semi-Arid ecological regions is deficient therefore the need to evaluate the effects of P and S has become necessary.Two sets of experiments were carried out to evaluate the effect of phosphorus and sulphur on the oil content of sesame (*Sesame indicum* L.). The experiment was conducted during 2009 raining season at Teaching and Research Farm, Faculty of Agriculture Bayero University Kano (11^0 58 and 8^0 25 ^{1}E) and Jahun, Jahun Local Government of Jigawa State (12^0 3^1 N and 9^0 35^1 E). The soils of two locations were sandy loam, with 800 mm and 400 mm of rainfall at Kano and Jahun site respectively. The treatment included three sesame varieties (E8, Sudan and Yandev 55), four levels of P_20_5 (0,20, 40 and 60 kg ha^{-1})and four levels of sulphur (0, 15, 30, and 45 kg s ha^{-1}). A Randomized Complete Block Design was used and replicated three times. Result revealed that sesame variety and phosphorus fertilizer had significant effect on oil content (48.8 %) at Kano. Sulphur had significant effect on oil content at Jahun where 30 kg S ha^{-1} produced 49.66 % oil. Sudan variety had the highest oil content and E8 had the lowest oil content. There was interaction effect between variety, phosphorus and sulphur on oil content at Jahun. Therefore, sesame need fertilizer for good production of oil and more investigation should be carried out for confirmation.
Keywords: Sesame, Phosphorus, Sulphur, Oil content.

INTRODUCTION

Sesame occupies the 16th position in the world vegetable oil producing oil crops (FAO, 2008), the largest producers are China and India, followed by Burma, Sudan, Mexico and Nigeria. Nigeria ranks the 8th position in Sesame production in the world, producing about 408,000 metric tons as at 2005 cropping season (AGSA, 2008). The importance of the crop lies on the high protein, calcium, iron, methionine and good quality oil contents, which is about 50 % of the seed weight (Gupta *et al.,* 1998 and Babaji *et al.* 2006). The oil is good for cooking, salad and used as ingredients in soap lubricant and illuminant in Pharmaceuticals, (Purseglove, 1986).

Apart from Nigeria being one of the largest producers of sesame in Africa, the estimated yield on farm field is about 48 kg ha^{-1} which is

low compared with 1083 and 1960 kg ha^{-1} obtained in Saudi Arabia and Venezuela respectively (Muhammad and Gungula, 2006). The low yield obtained in Nigeria may be attributed to low fertility status of the soil and lack of proper fertilizer type and rates. The use of fertilizer and sesame has remained very controversial, as a rate differs with location within Nigeria (Haggai 2004; Babaji *et al*., 2006; Okpara *et al.,* 2007). The low yield obtained in Nigeria soils, particularly in the savanna zones is attributed to the low status of P and S which are major nutrients (Okpara *et al*., 2007). These nutrients (P and S) play an important role in the production of oil crops. Manker and Satao. (1995), reported increase in oil contents of sesame with application of 50 kg P_20_5 ha^{-1}, oil yield increased up to 71 %. Salwat *et al.* (2009) reported that oil percentage in sesame was significantly affected by up to 71% application of elemental sulphur and micronutrients. Maragatham and Twarry (2006) stated that application of sulphur up to 40 kg s ha^{-1} increased sesame seed oil content from 47.63% (0 kgs ha^{-1}) to 49.83 % with 40 kgs ha^{-1}

The study was carried out to determine effects of P and S on sesame oil content.

MATERIALS AND METHODS

The experiment was conducted during 2009 cropping season at two locations. The Teaching and Research Farm Faculty of Agriculture, Bayero University Kano (Latitude 11^0 58" and longitude 8^0 25^1 E) with annual rainfall of about 843 mm and mean annual temperature of 36.11^{0}C. The second location was Jahun, in Jahun Local Government Area of Jigawa State, it lies between latitude 12^0 03^1 N and longitude 09^0 33" E, with mean annual rainfall of about 400 mm and mean maximum temperature of 36 ^{0}C. The study areas are both located in semi-arid regions of Nigeria.

The treatment constituted four levels of phosphorus in form of triple super phosphate (0, 20, 40, and 60 kg ha^{-1}) and four levels of sulphur elemental (0, 15, 30 and 45 kg ha^{-1}) with three sesame varieties (E8, Sudan and Yandev 55 variety). The treatments were laid out in a randomized completed block design and replicated three times. A gross plot size of 13.5 cm^2 and net plot size of 3.74 cm^2 were used. The seeds were sown on ridges at spacing of 15cm intra row in a 75cm ridge. Two weeks after sowing the seedlings were thinned to two plants per stand, phosphorus and sulphur were applied at sowing at the rates of, 0, 20, 40, 60 and 0, 15, 30 and 45 kg ha^{-1} respectively. At three weeks after sowing, basal application of nitrogen in forms of urea was applied at 40 kg ha^{-1}

Five plants were randomly selected from each plot for evaluation. Two grammes seed sample was collected from each plant and analyzed for oil Contents using ether extract (oil content) The data collected were subjected to analysis of variance (ANOVA) by using SAS V8 2000 and means were separated using Duncan multiple range test (DMRT) Simple correlations among some of the variables were determined to assess the relationship among variables.

RESULTS AND DISCUSSION

Sudan variety had the highest oil yield of 48.71% (Table 1) Which can be deduced to genetic yield ability of the variety. Anon (1996) indicated that the improved varieties of sesame produced the highest percentage oil content and oil yield.Thus variation obtained in oil yield, may be due to the varietal responses (Egbokun and Elieza, 1997), Phosphorus application resulted in significant increase in oil yield (38 %) in Kano (Table 1), similar result was obtained

by Katherison and Darmaligon (1999). Sulphur at 30 kg ha^{-1} significantly affected oil content in Jahun, producing the highest yield (49.66 %) This may be due to involvement of sulphur in oil synthesis, as it is a constituent of oil glands and plays role in lipid metabolism This agreed with the works of Raja *et al.* (2007), and Salwat *et al.* (2009) that the percent oil contents of sesame was significantly affected by application of sulphur.

There was an interaction between variety and sulphur at Jahun (Table 2) Sudan variety produced up to 64.5 % oil yield Jahun, Sudan, variety performed better with application of 30kg ha^{-1} which gave 53 % oil. Salwat *et al.* (2009) reported that % oil in sesame was significantly affected by application of element sulphur, while Raja *et al.* (2007) reported that 60 kg S ha^{-1} produced 50.7% oil yield and 45 kg S ha^{-1} produced 48.7 % oil content in sesame.

Table 1 Effect of phosphorus and sulphur on oil content of sesame at Jahun and Kano

	JHN	KANO
Variety (v)		
E8	44.21a	42.31
Yandev 55	43.50b	45.90
Sudan	48.71a	43.78
SE+_	1.3	1.8
Phosphorus (P_2O_5 $kgha^{-1}$		
0	48.08	42.25b
20	46.00	45.45ab
40	44.25	40.33c
60	43.58	47.91a
SE	2.7	2.1
Sulphur (S)		
0	44.04	43.66
15	47.75	44.58
30	49.66a	43.91
45	44.48	43.83
SE±2.7 2.1		
Interaction		
p x s	NS	NS
v x s	*	NS
v x p x s	**	NS

means followed by the same letters in a column are not significantly different at 50 % level of probability.*=significant, N S = not significant ** highly significant

Table 2 interaction between variety with sulphur on oil content (%) of sesame in Jahun

	Sulphur ($kgha^{-1}$			
Variety	0	15	30	45
E8	46.00ab	47.50ab	38.88b	40.50b
Sudan	46.88ab	53.38a	53.25a	41.50b
Yandav55	39.25b	42.38ab	44.88ab	47.50ab
SE		2.7		

Mean followed by the same letter (s) in the column are not significantly different at 5% level of probability

Application of 30 kg S ha^{-1} with 60 kg P_20_5 ha^{-1} produced the highest oil content. Sudan variety produced 48.9 % oil content at Jahun and phosphorus significantly affected oil content at BUK, where 60 kg P_20_5 ha^{-1} produced 47.91% oil.This work indicated that sesame (*Sesamum indicum* L.) requires P and S fertilizers for good oil yield and Sudan variety produced the highest oil content.

CONCLUSIONANDRECOMMENDATION

From the above findings it can be concluded that oil content is affected by both sesame variety and phosphorus and sulphur application. Application of 30 kg S $ha^{-1}$with 60kg P_2O_5 ha^{-1} produced the highest oil content. Phosphorus had significant effect on oil content in Kano, where 60 kg P_2O_5 ha^{-1} gave 47.9 % oil. It is recommended that 30 kg S ha^{-1} and sudan variety should be used for good oil yield.

REFERENCES

AGSA, (2008). American Sesame Association, 2008 *world sesame situation www.worldstatemen*t.

ANON,(1996). An overview of the Nigerian sesame, industry, cropping scheme meeting reports legume and oil seeds research ABU Zaria, pp18-29.

Babaji, B.A., Yahaya, R. A., Mahdi, M. A. and Shafari, A. I, (2006). Nitrogen and phosphorus nutrition of sesame *(Sesamum indicum* L.), at Samaru Zaria, ABU Zaria. *Proceedings of the Annual Conference of Soil Science Society of Nigeria.* Pp329-336

Egbokum, M. K. and Elieza, M. V. (1997) Proximate comparison and functional properties of full fat and departed beniseed (*Sesamum indicum* L.) *Journal of Plant, Food and Human Nutrition* 51;35 -39.

FAO (2005). Food and Agriculture Organization. *Bulletin of Statistics. www, FAO. Org.*

Gupta, SKTP. Vadar, K., Parkash, N. K. Thakral and P. kumar, (1998). Influence on oil and fatty acid composition in sesame (*Sesamum indicum* L) *Ann. Bil*,14;67- 68

Haggai, P.T. (2004) Effect of nitrogen and phosphorus application on yield attributes and yield of sesame (*Sesamum indicum* L.) *Proceedings of the 38th Annual Conference of Agricultural Society of Nigeria(ASN)* pp150-157.

Katherison and Dharmalingan, A. (1999). Influence of nutrient levels on sesame (*Sesamum indicum* L) in different season. *Sesame and Sun flower Newsletter.* No. 14; 234 - 235.

Muhamman, M. A., Gungula, D. T. and Sajo, A. A. (2006). Phenological and yield Characteristics of sesame (*Sesamum indicum* L) as affected by nitrogen and Phosphorus rates in Mubi Northern Guinea Savannah ecological zone of Nigeria. *Enin Journal of food Agric* (21)(1) 1 – 9.

Okpara, D A., Mounuke, C. O. and T. O. Ojukphun (2005). Effect of nitrogen and Phosphorus fertilizer rates on the growth and yield of sesame *(Sesamum indicum* L) in South eastern Rainforest belt of Nigeria. *Agric Journal* 1-38; 1 -11.

Raja, A.K., Omar Hattab, L., Gunsamy, G. Vambu A. and Sugsnya (2007) Sulphur application on growth, yield, and quality of sesame varieties. *International Journal of Agriculture. Ress,* 2; 559-606.

Salwa, A. I., Elsa; Moilse, M., Abbas, M. and Bahany, S. S (2009) Amelioration of soil by using amino acid, sulphur and micronutrients for sesame production. *Egypt Journal of American Science.* 2 250-254 pp.