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EFFECT OF POTASSIUM OIL CONTENT OF SESAME *(Sesamum Indicum* L*)* VARIETIES IN KANO SUDAN SAVANNA ECOLOGY OF NIGERIA

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ABSTRACT

A field experiment was conducted during the 2018 rainy season at Dawakin Kudu and Teaching and Research Farm of Kano University of Science and Technology, Wudil, Gaya Farm. The study assessed the effect of potassium on oil content of sesame (Sesamum indicum L.) varieties in Kano (Sudan Savanna ecology) Nigeria. The treatments comprised of four levels of potassium (0, 50,100 and 150 kg K ha^{-1}) and two (2) varieties of sesame (Ex-Sudan and E8). These were laid in a Randomized Complete Block Design (RCBD) and replicated four times. Results showed that there were no significant differences in oil content of sesame with an increasing levels of potassium at both sites. The variety E8 had the highest oil content. Also there was no interaction effect between potassium and sesame varieties in this study. This suggests that farmers in the sudan savanna ecology should adopt variety E8 as best variety for desired productivity in oil content in sesame.

INTRODUCTION

Sesame (*Sesamum indicum* L.) is an important oil seed crop which is cultivated in tropical and sub-tropical countries of Asia and Africa (Akintunde, 2007). The major sesame growing countries are China, India, Tanzania and India (FAO, 2017). Nigeria is the second largest producer of sesame in Africa after Sudan (FAO, 2017). Young sesame leaves are used for soup ingredients in sub-saharan Africa. In India and China, the leaves play a role in treatment of cancer while the seed cake left after oil extraction is an excellent livestock feed, which can also be used as manure, carrier for medicine and perfume (Vossen and Mkamilo, 2007). Its seeds oil content is approximately 50% (Burden, 2005) which is comparable to that of olive tree (*Olea europea*). Magda *et al.,* (2005) stated that increasing soil potassium level significantly increased number of branches/pods/plants, weight of pods and seeds/plants, 100 – seed weight, oil and protein yield of peanut. Report of nutrition studies carried out in the tropics have shown significant yield increase due to fertilizer application. Relatively higher growth rate, yield and oil content of sesame were significantly influenced with the application of potassium in india. The significantly maximum oil content and seed yield were observed with the application of potassium at 50 kg K ha^{1} (Ramswaroop *et al.*,2017). Dasmahapatra *et al.*,(1990) and Mondel *et al.,* (1993) reported similar increases in growth yield and oil content with 50 kg K ha^{-1}.

Alegbejo *et al*. (2012) reported that Sudan and Sahel Savannah ecological regions of the country are important areas of sesame production with distinct wet and dry season. The major producing states in Nigeria are Jigawa, Katsina, Taraba, Adamawa, Kogi, Nasarawa and Benue (Busari *et al.,* 1993, FAO, 2017). The presence of antitoxidants (*Sesamum, Sesamolin and sesamol*) make the oil to be one of the most stable vegetable oils in world (Anon; 2008) Potassium is one of the most abundant cations in plants and is associated with many physiological processes such as photosynthesis, Nitrogen fixation, regulation of the stomata and enzymes activation (Imas, 2013, Ramswaroop

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et al., 2017). Plants depend upon K to regulate the opening and closing of stomates, which is essential for photosynthesis (Imas, 2013). Sesame seeds (approximately 50 percent oil and 25 percent protein) are used in baking, candy making in cooking and salad oil and margarine. The oil can also be used in manufacture of soaps, paints, perfumes, insecticides and pharmaceuticals. Sesame meal, left after the oil is pressed from the seed, is an excellent high protein (34 - 50 percent) feed for poultry and livestock (Oplinger *et al.*, 2007; Nwalem, 2015). From the foregoing this crop is of significant economic relevance. Hence, farmers produce them as important cash crops. During cultivation they apply various types of fertilizer to enhance yield. This study meant to assess the impact of potassium rich fertilizer on the oil yield of sesame seeds.

MATERIALS AND METHODS

The experiment was conducted during 2018 rainy season at the Gaya Teaching and Research Farm of the Faculty of Agriculture and Agricultural Technology, Kano University of Science and Technology, Wudil situated at $11^0$86North latitude, and $9^0$10 East and 400 meters elevation above sea level. The mean range annual temperature is between 27^0C to 30.6^0C and soil type is sandy – loam. The second location was at Dawakin Kudu ($11^0$50N, 8^0 35 E) above sea level. The two sites are located in the Nigeria Sudan Savanna agro ecological zone.

The experiment consisted of four levels of potassium (Muriate of potash sourced from Kano Agricultural Supply Company KASCO at 0, 50, 100 and 150 kg K ha^{-1}) and two varieties of sesame (Ex-Sudan and E8).These were factorially combine and laid out in a Randomized Complete Block Design (RCBD) and replicated four times. The land was ploughed and harrowed to obtain a fine tilth. Ridges 40cm high and 75 cm inter row were erected. The field was marked out into replications and plots according to the experimental design. The total area for experiment was 22.5m x 15.5m = 348.5m^2. Gross plot size was 4.5m x 1.5m = 6$m^2$and net plot size was 1.5m x 3m = 4.5m^2.

Seeds were sown on 2nd July and 6th July, 2018 at Dawakin Kudu and Gaya sites, respectively. Seeds were mixed with sand in the ratio 10g: 1kg and sown on ridges at intra-row spacing of 15cm. A pinch containing sand and seeds was sown per hole. Seedlings were thinned to one plant per stand at three weeks after sowing (WAS). Potassium at 0, 50, 100 and 150kg ha^{-1} was applied using side placement method at 3 and 6 WAS. Harvesting was done after the pods were matured. Growth and yield characters were determined. Five gram (5g) of seed sample from each plot were taken and oil content determined using soxhlet fat extraction method with the help of soxhlet apparatus (Malik *et al.*, 2003). The extraction procedure was as follows: A clean dry receiver flask from the soxhlet assembles were taken, 250ml of petroleum ether was poured into it. The weighed thimble containing the weighed sample (5g) which was in the extraction compartment were introduced. The height of the thimble was in such a size that the highest point of it remained below the bend of siphon. The apparatus and filled soxhlet with petroleum ether poured in through the condenser at the top by means of a glass funnel were assembled. The apparatus were then placed on a heating mantle set a control knob of 4. Water was then allowed to circulate in the condenser. Extraction was for 6 hours. After the extraction is over, the thimbles with sample was then removed and transfer into the oven to dry out the solvent and then weighted. The difference between initial weight and the final weight of the samples after extractions was the fat present in the sample. Thus

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$$\% \text{ fat} = \frac{\textbf{Wt of thim + sam b4 extr – wt of thim + sam after extr}}{\textbf{initial wt of sam}} \times \frac{\textbf{100}}{\textbf{1}}$$

5g ( )

Key: Wt=weight, thim=thimble, sam=sample, b4=before, extr-extraction

Data collected were subjected to analysis of variance (ANOVA) as described by Snedecor and Cochran (1967) using GenStat (Version). Significantly different treatment means were separated at 5% level of probability using Duncans Multiple Range Test (DMRT).

RESULTS

The effects of potassium on oil content of sesame as influenced by potassium and variety at DKD and GYA during 2018 rainy season was shown in Table 1. There ware no significant differences in oil content of sesame with an increasing levels of potassium at both sites. The varieties also did not differ significantly in oil content (Table 1). Further more the interaction of Potassium and variety did not significantly (P>0.05) influenced oil content at both locations.

Table: Oil Content (%) of Sesame as Influenced by Potassium and Variety at DKD and GYA During 2018 Rainy Season.

Treatment	DKD	GYA
Potassium (kg/ha)		
0	1.437	0.812
50	1.300	1.075
100	1.412	1.113
150	1.250	1.037
SE±	0.0896	0.1333
Variety (v)		
Ex – Sudan	1.369	0.919
E8	1.331	1.100
SE ±	0.0633	0.0942
Interaction		
P x V	NS	NS

DISCUSSION

Oil content in sesame is of great importance as it is grown mainly for it. It determines market price for farmers. The oil content of the crop were not significantly influenced with the application of potassium at both locations (Table 1). This is in contrast to findings of Magda and Mirvat (2005) that stated increasing soil potassium level significantly increased seed, oil and protein yields of groundnut. Varieties also did not differ significantly in oil content in both locations.

CONCLUSION

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Based on the experimental results, it was concluded that better oil content of sesame crop can be obtained by the application of potassium at 100 kg Kha^{1}using variety E8 at both locations.

RECOMMANDATIONS

Based on the result obtained from this study Ex-sudan variety can be recommended for farmers in sudan savanna ecology for desired productivity in oil content in sesame.

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