

SEMIARID JOURNAL OF ACADEMIC RESEARCH AND DEVELOPMENT (SJARD)

Oil Content of Sunflower (*Helianthus Annuus* L.) Varieties as Influenced by Intra-Row Spacing in Sudan Savanna, Nigeria

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Received 7 October, 2017; Accepted December, 2017

ABSTRACT

*This research was conducted to examine the response of sunflower (*Helianthus annuus* L.) to varying intra-row spacing in the Sudan savannah zone of Nigeria. The trial was conducted in two different locations, Bagauda KUST research farm and BUPOLY Hadejia practical farm. Four varieties of sunflower (SSL803, SSL806, SSL807 and SSL809) were planted at varying intra-row spacing of 20cm, 30cm, 40cm, 50cm and 60cm. Split plot design was adopted for the research, with variety allocated to the main plot while intra-row spacing to sub plots, treatments was replicated three times. The result of the investigation shows no significance statistical difference in oil content between the varieties in both locations. The oil was extracted through ether extraction method and the percentage was calculated.*

Keywords: Sunflower, Intra-row Spacing, Sudan Savanna

Introduction

Sunflower (*Helianthus annuus* L.) originated in western North America; it is thought to have been domesticated around 1000 B.C. by Native Americans. Spanish explorers brought the sunflower to Europe in 1510. However, it was not until the late 1800, when the flower was introduced into the Russian Federation that the sunflower became a food crop. In 1860, Russian farmers made significant

improvements in the way that the sunflower was cultivated. At that time, they became the world's largest producer of sunflower seeds (Schneider and Miller, 2010). According to Robert (2007) Sunflower was probably first introduced to Europe through Spain, and spread through Europe until it reached Russia where it was readily adapted. Selection for high oil in Russia began in 1860 and was largely responsible for increasing oil content from 28% to almost 50%. The high-oil lines from Russia were

reintroduced into the United State which rekindled interest in the crop.

The economic importance of sunflower cannot be over emphasized as an important oilseed crop worldwide. The fresh green plants can be fed as silage or fodder to livestock. The seed which can be eaten raw or roasted contains 36 - 45% oil depending on the variety and can be used in salad, cooking oil, margarine, lubricant, paint vanishes and soap production. The decorticated seed cake is a good source of protein (35%) for livestock, especially when made from whole seed. The crop is also a good source of nutrition which is used in food preparation, feeding livestock and poultry (FAO, 2010).

Sunflower oil is one of the vegetable oil in the world though it was not seen as a vegetable oil source in the U.S until the last 50 years, and really began to be significantly grown for this purpose about 25 years ago (Robert, 2007). After the oil is extracted from the sunflower seed which is about 40 to 45% of the seed by weight, the remaining seed material (meal) is fed to livestock. The nutrient value of sunflower meal depends primarily on the type of processing it has gone through. If part or all of the hulls remained on the seed prior to oil extraction, then the meal will have higher fibre content but lower protein and fat. Solvent extracted sunflower meal will have a protein percentage around 41% if dehulled, and around 28% if hulls are left on the seed. Fat content of solvent extracted meal is roughly 1%, and roughly 9% in mechanically pressed seed meal (Burton, 2008).

Although whole seed or confectionery use of sunflower in the United State is only about 10- 20% of the crop each year, it is a premium market. Prices for confectionery sunflower run significantly higher than oilseed sunflower. Most of the confectionery sunflower is sold for snack food. Reportedly in Russia, sunflower seeds are such a popular snack food that people carry some packets of them around in their pockets, making them even more popular than peanuts are in the United State. Some confectionery sunflower finds its way into processed foods, such as granola bars, multigrain breads or other baking uses. Confectionery sunflower varieties have seeds that are larger, easier to dehull, lower in fat and are typically striped or white (Ford, 2011). This work is designed to investigate the oil content of sunflower (*Helianthus annuus* L.) obtained from Bagauda and Hadejia locations.

Materials and Methods

The research was conducted at Bagauda research farm at Bagauda village of Bebeji local Government Kano state which lies between latitude 11 40'N and longitude 8 16' E and C.O.A Hadejia practical farm, Hadejia town Jigawa state which lies between latitude 12 26' 59''E and longitude 10 02' 39'' E to evaluate the response of sunflower (*Helianthus annuus* L.) varieties to varying intra-row spacing in the Sudan savannah zone of Nigeria.

The treatments of the research consist of variety SSL803, SSL806, SSL807 and SSL809 which were allocated to the main plot and intra-row spacing of 20cm, 30cm, 40cm, 50cm and 60cm allocated to subplot. Split plot design was selected involving three replications, where each replication consists of four main plots each of 4.5m x 3m represented by 6 ridges.

The method of data collection adopted was observation procedure, where 5 selected plant samples were tagged and observations were recorded as needed in the experiment. The data on growth and yield characters were collected at 4, 6, 7 and 8 weeks after sowing and also at harvest.

A sample of the threshed seeds from each subplot were cleaned and dried to reduce the moisture content. The sample seeds were crushed manually and the nuts were separated from the chaff. The nuts were then grounded into flour and wrapped with filter paper and then inserted into a soxhlet apparatus thereby adding ether solution to extract the oil through ether extraction method. This was done for each sample from all subplots in the experiment. Variety SSL809 produces higher oil at Bagauda while variety SSL807 at Hadejia and combined. The results of the treatments were subjected to analysis of variance using SAS software.

The oil percentage was calculated using the formula given:--

$$\%Fat = \frac{W1-W2}{W1} \times 100$$

W1 = weight of sample before extraction (g).

W2 = weight of sample after extraction (g).

Results and Discussions

The effects of variety and intra-row space on oil percentage of sunflower (*Helianthus annuus L.*) at Bagauda, Hadejia and combined during the 2015 wet season showed that, at Bagauda the variety SSL809 produced the highest percentage of oil which was higher than the other varieties. But at Hadejia, variety SSL807 was significantly higher than the other varieties. The intra-row spacing at both Bagauda and Hadejia was 60cm which was significantly ($P \leq 0.05$) higher than the other spacing.

Skoric (2007) reported that, the performance of varieties tested over several environments is the best basis for selecting sunflower hybrids. The choice should consider yield, oil percentage, maturity, seed size, lodging and disease resistance. Accordingly, oil from sunflower was regarded to be cholesterol free and the ability to withstand high cooking temperatures. Oil obtained from sunflower is valued as one of the healthy vegetable oil in the world and the sunflower seeds are used for the production of confectionaries (Berglund, 2007). According to Smith (2008) Sunflower grown in rows 22, 30, or 38 cm apart did not differ in seed yield, oil percentage, large seed percentage, seed weight, seed test weight, height, or flowering date.

Table 1: Effect of Variety and Intra-row spacing on Oil Percentage (%) of Sunflower at Bagauda, Hadejia and combined during the 2015 rainy season.

TREATMENT	BAGAUDA	HADEJIA	COMBINED
Variety			
SSL 803	46.86	42.25	44.56
SSL 806	43.95	42.22	43.09
SSL 807	46.67	42.59	44.63
SSL 809	46.87	42.39	44.63
S.E $\pm$	1.65	0.62	1.25
LOS	NS	NS	NS
Inter-row spacing (cm)			
20			
30	46.35	41.21	43.78
40	46.60	41.53	44.07
50	47.09	42.89	44.99
60	43.18	42.97	43.08
S.E $\pm$	47.22	43.22	45.22
LOS	1.47	0.55	1.11
Interaction (VxSP)	NS	NS	NS
	NS	NS	NS

Means followed by the same letter(s) within the same column and treatments are not significantly different using Duncan's Multiple Range Test (DMRT). Where NS = Not significant, LOS= level of significance.

Conclusion

Sunflower produce high quality vegetable oil and livestock feeds. After the oil is extracted from the sunflower seed which is about 40 to 45% of the seed by weight, the remaining seed material (meal) is fed to livestock (Burton, 2008). This study examined the level of oil percentage at Bagauda and Hadejia locations. Based on the findings of the study, the results showed that the effects of variety and spacing

on oil contents of sunflower was not statistically significant in both location of the experiments, the differences in between is just by chance. Hence any of the variety tested can perform very well in the experimental sites with good management.

References

Berglund, D. R. (2007). Sunflower production manual. Northern Dakota University Journal, Fargo. Pp. 17& 18.

- Burton, J. W., Miller, J. F., Vick, B.A., Scarth, R. and Holbrook, C.C. (2008). Altering fatty acid Composition in oil seed crops. *Adv. Agron.* 84, 273–306.
- FAO, (2010). Sunflower crude and refined oils handbook. FAO invest. Centre Division. Pp. 5-11.
- Ford, J. H. (2011). Sunflower plant population and its arrangement. University of Minnesota. pp. 6 - 7.
- Robert, L. M. (2007). Sunflower production alternative crop guide. Gefferson institute. Pp. 2- 6.
- Schneider, A.A. and Miller, J. F. (2010). Sunflower production guideline. Department of Agriculture, forestry and fisheries. pP. 9-10.
- Skoric, D., Jovic, S., Lecic, N. and Sakac, Z. (2007). Development of sunflower hybrids with different oil quality. *Helia* pp 109-114
- Smith, L. J. (2008). Response of sunflower to plant population. *Agron publishers*. Pp 9.