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SODIUM AZIDE: A CHEMICAL MUTAGEN FOR THE ENHANCEMENT OF YIELD TRAIT OF SESAME.

INTRODUCTION

Sesame belongs to the family Pedaliaceae and genus *Sesamum*. The genus consist of about 36 species out of which the commonly recognized is *Sesamum indicum* L. (Falusi, 2006). *Sesamum indicum* is very drought tolerant. It has been called a survivor crop because of its ability to grow where most plants fail. The crop is believed to have originated from Africa where the greatest diversity of the genus sesame and its family Pedaliaceae is present (Falusi and Salako, 2003). Currently it is cultivated in the tropical and sub tropical region of Africa, South America, North America and Asia principally for its seeds which contains about 50-52 % oil, 17-19 % Protein and 16-18 % carbohydrate (Falusi and Salako, 2003).

MATERIALS AND METHODS

Collection and Sodium azide treatment of sesame seeds

Seeds of two varieties of sesame (Ex-Sudan and Kenana-4) were obtained from the National Cereal Research Institute (NCRI) Baddegi, Niger State, Nigeria. The seeds were treated with sodium Azide at five different concentrations, 0.00%, 0.02%, 0.04%, 0.06%, 0.08%. Sodium azide was diluted to the required concentration by using distilled water, 0.02g, 0.04g, 0.06g and 0.08g were dissolved in 100ml of water respectively to make 0.02,0.04,0.06,0.08%. Seeds were soaked in the water for six hours to initiate Biochemical reaction. The presoaked seeds were put in flask and Sodium azide was added and left for eight hours. Intermittent shaken was given to ensure uniform exposure of the chemicals. The chemical was drained after the treatment time is over. The seeds were washed immediately not less than 30mins.

Experimental design

Field experiments were conducted during the 2012 rainy season between May and August in the Experimental Garden, Federal University of Technology, Minna, Niger State, Nigeria. The experimental design used was a randomized block design with 30 pots per block. The experiment was replicated three times, with a total of 90 pots. Ten seeds were planted per pot (that is, 5 per hole in each pot). Three weeks after planting, each pot was thinned to two plants per pot. A total of 6 pots for each treatment combination were used.

Soil Analysis

The physical and chemical properties of the soil used were determined using the procedures adopted by International Institute for Tropical Agriculture (IITA) Ibadan, Nigeria and the result is shown in Table 1.

Data Analysis

The results of this research were subjected to analysis of variance (ANOVA) to show whether there were significant differences among the yield parameters. Duncan Multiple Range Test (DMRT) was used to separate the means. The Pearson's correlation was used to show relationships between the chemical treatments and the parameters.

RESULTS

The results obtained for all the yield parameters showed an interesting variation between and within the varieties.

Number of flower/plant

The number of flowers per plant were not statistically uniform in Kenana 4 and Ex-Sudan at different concentrations of SA at $p<0.05$ level of significance (Table 2), the correlations in flower number was negative (-0.067 and -0.932)

Number of capsule/plant

For number of capsule per plant all the two varieties showed statistical differences at $p<0.05$ level of significance (Table 2). The correlations in capsule number were both negative in Kenana and Ex-sudan (-0.685 and -0.87 respectively)

Length of capsule (cm)

The capsule length in Ex-Sudan was not significantly different at different doses of SA but Kenana-4 showed significant differences at certain doses of SA at $p<0.05$ (Table 2. However, there were negative correlations Ex-Sudan (-0.431) but positively modest (0.537) in Kenana (Table 3).

Weight of capsule (g) and Number of seed /plant

The two varieties treated with sodium azide showed significant differences ($p<0.05$) with respect to capsule Weight, (Table 2). Similarly Kenana and Ex-Sudan showed significant differences ($p>0.05$) with respect to number of seed per capsule (Table 2). The correlations in number of seed per capsule in Kenena was negative and significant (-0.915*)(Table 3). Similarly in Ex-Sudan the correlation was negative (-0.278) but not significant. The correlations in the weight per capsule were all negative and not significant (Table 3).

Table 1. Some physical and chemical properties of the soil used.

P^H	OC	OM	TN	Exchangeable Cations				EA	CEC (Cmol/kg)	Sand (%)	Silt (%)	Clay (%)
				Na	K	Ca	Mg					
6.84	1.65	2.87	0.06	0.13	0.41	6.20	7.01	0.10	13.85	86.52	7.28	6.20

Table 3: Correlations of the Various Yield Parameters with the Chemical Treatment

Variety	NOF/P	NOC/P	LOC (cm)	WCP (g)	NOS/C	OIL %	FLW %
Kenana-4	-0.067	-0.685	0.537	-0.84	-0.915*	0.375	0.012
Ex-Sudan	-0.932	-0.87	-0.431	-0.75	-0.278	0.823	0.555

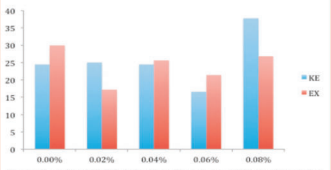
*NOF/P=Number of flower/plant, NOC/P=Number of capsule/plant, LOC=Length of capsule, WCP=Weight/capsule, NOS/C=Number of seed/capsule, FLW%= Flowering percentage

*Significant

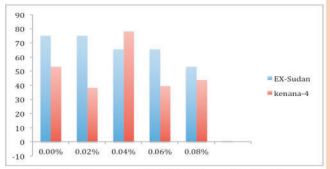
Table2 : The yield parameters of the two varieties at different concentration of sodium azide.

TREATMENT COMBINATION	N0. OF FLOWER PER PLANT	N0. OF FRUIT PER PLANT	LENGTH OF CAPSULE	N0. OF SEED PER CAPSULE	WEIGHT OF CAPSULE
KENENA					
0.00%	14.60±2.05a	31.10±6.69^b	2.10±0.12ab	49.50±3.40b	0.21±0.02b
0.20%	29.80±5.14d	12.90±6.20^a	2.49±0.07c	54.70±3.64c	0.50±0.06c
0.40%	21.80±4.69c	19.90±14.21^a	2.35±0.14bc	50.70±1.43c	0.23±0.01b
0.60%	14.70±2.62a	12.70±6.81^a	2.22±0.10b	48.00±3.04a	0.23±0.03b
0.80%	15.70±2.28b	14.30±7.42^a	1.91±0.10a	46.00±1.61a	0.11±0.01a
EX-SUDAN					
0.00%	20.70±2.98a	32.90±16.46^b	2.08±0.09a	43.10±3.55a	0.21±0.01b
0.20%	29.90±3.99c	22.10±9.09^a	2.37±0.06a	52.20±2.18b	0.28±0.02c
0.40%	23.40±3.24b	19.40±8.04^a	2.21±0.11a	51.70±2.84b	0.24±0.01b
0.60%	21.00±3.32a	19.90±10.11^a	2.06±0.18a	49.40±1.55b	0.16±0.01a
0.80%	18.10±2.92a	16.70±9.40^a	2.12±0.06a	45.90±1.66a	0.20±0.01b

**Values are mean ± SD. Values followed by the same letter (s) within the same column do not statistically differ at the 5% level according to DMRT, analysed for the Treatment combination*



Percentage oil (%±SE) of the Two Varieties at Different Doses SA



Flowering Percentage (%±SE) 45 Days after Planting

DISCUSSION

The insignificant differences in capsule number per plant in Ex-Sudan treated with Sodium azide could be associated to high Chemical tolerance of sesame as reported by (IAEA, 1994). However, the variations observed in the Kenana-4 and Ex-Sudan in the other yield parameters might be due to varietal response to Chemical as reported by Pathirana and Subasingbe, (1993).

The negative correlations observed with respect to some of the parameters imply that as the Chemical level increases, these parameters decrease. This is close to the findings of Muhammad, Akbar, Muhammad, and Zia (2003), who reported that Seedling emergence, panicle fertility and grain yield declined with increasing dose level in all the varieties of Basmati rice studied. The negative correlation is in line with the report of Nura, *etal*. (2011), they observed highly significant variation ($P=0.01$) in number of pods/plant which decreased with increase in colchicines concentrations.

The positive correlations observed with respect to some of the parameters imply that as the Chemical level increases, these parameters also increase. This is in line with Falusi *et al* (2012); Daudu *et al*., 2012.They all reported positive correlations between the irradiation exposure period with certain morphological and yield traits. The positive correlations are in agreement with the report of Daudu *et al*. (2012), they observed that yield parameters such as number of fruits/plant, number of seeds per fruit, length of fruit (cm), width of fruit (cm) and weight of fruit (g) increased as the Irradiation Exposure Period increased. The variations in oil contents obtained might be due to environmental factors. This is in close agreement with Carlsson *et al.*, 2008; Rai and Jacob, (1957). Carlsson *et al.*, 2008 reported that Genetic and environmental factors influence the oil content and fatty acid compositions in sesame. Rai and Jacob (1957), studied induced mutations in a black seeded variety T.16 by treating with X-rays and reported mutant in M3 and M4 generations respectively and both were found to have higher oil percentage (52.10%).

The results also showed that flowering percentages were affected by chemical doses which are in close agreement with Shad, Tariq, Said and Shamsur (1986), who reported that Days to flowering were significantly affected both by gamma ray and fast neutron but differences in days to flowering were not significant statistically for varieties.

CONCLUSION

Genetic diversity is of great significance for breeding programmes as well as for taxonomic studies. Ex-Sudan appeared to be the most sensitive to Sodium azide and Kenana-4 is the least. The dose 0.02% show more significant effects in the two varieties. Thus Sodium azide can serve as useful tool for creating variability in sesame. Artificial induction of mutation through the use of sodium azide proves vital in the improvement of genetic variability in sesame. Certain concentrations of Sodium azide (0.02% through 0.04% sodium azide concentration) have the potentiality of inducing variability that could be used in the improvement of the yield of sesame.

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