

RELATIONSHIP BETWEEN SEED YIELD AND LA, LAI, AND SOME HARVEST PARAMETERS OF SESAME (*Sesamum indicum* L.) IN OWERRI, NIGERIA

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Abstract: In a bid to understand the relationship between seed yield and some yield parameters of sesame, 100 sesame stands were sampled from the sesame field of the Federal University of Technology, Owerri, Nigeria. Data on Leaf Area (LA), Leaf Area Index (LAI), Total Dry Matter (TDM) at 4, 5 and 8 weeks after planting, and Number of Capsules (N_{Cap}), Number of seeds per capsule (N_{Seed}), Thousand Seed Weight (TSW), Seed Yield per plant and TDM were taken at harvest. The values obtained for seed yield were regressed on all other parameters and coefficient of regression (r^2) and the regression model were determined. Significant linear relationship exist between the seed yield and the some of the parameters with models that involved TSW, N_{Cap}, N_{Seed} and TDM at harvest having r^2 values ranging from 71.4% to 85.9%. This corresponds to the models; $0.00121 + 0.00234 \text{ N}_{\text{Cap}}$ ($r^2 = 85.9\%$), $0.0028 + 0.0009217 \text{ N}_{\text{Seed}}$ ($r^2 = 76.8\%$), $0.00309 + 0.00008583 \text{ TDM harv}$ ($r^2 = 71.6\%$). and $0.00045 + 0.01732 \text{ TSW}$ ($r^2 = 71.4\%$). These models will serve as effective tools in the development of yield predictor machines for sesame in precision agriculture.

Keywords: Sesame, Relationship, regression model, Co-efficient of determination.

Introduction

Sesame (*Sesamum indicum* L.) is an annual crop belonging to the family Pedaliaceae. It is generally called benniseed in West Africa (Seegler, 1989). At present, due to its economic potentials in terms of its high quality oil, its demand has increased in the world market (FAO, 2015). Total Dry Matter (TDM) accumulation and growth analysis including leaf area, leaf area index (LAI) and duration (LAD), crop growth rate (CGR), are important determinants of crop yield. Seed yield of sesame is dependent on several other growth and yield parameters. According to Haruna *et al.* (2011), sesame seed yield per plant and number of capsules per plant has the strongest contribution to seed yield per unit area. Chowdhury *et al.* (2010) had stressed the importance of the knowledge of the specific contribution of growth parameters to seed yield of sesame. Escante and Kohashi (2008) had also established a relationship between

seed yield and leaf area, absolute growth rate and specific leaf area. This research is therefore aimed at understanding the relationship that exists between seed yield and some yield parameters of sesame.

Materials and Methods

The experiment was conducted at the Teaching and Research farm of the Federal University of Technology, Owerri, Nigeria with annual rainfall of about 2500 mm. Sesame seeds were planted out and data were taken from 100 plants. The data collected included LA, LAI, TDM at 4, 5 and 8 weeks after planting; while number of capsules (N_{Cap}), Number of seeds (N_{Seed}), 1000 seed weight (TSW), seed yield per plant and TDM were taken at harvest. The values obtained for seed yield per plant was regressed on all other parameters. The coefficient of regression and regression models was subsequently developed.

Results and Discussion

The results of the regression revealed that there was a significant linear relationship between the seed yield per plant and each of LA, LAI, TDM, N_{Cap}, N_{Seed} and TSW at the various sampling times. This corroborates with the work of Escante and Kohashi (2008) who had also established a relationship between seed yield and leaf area and Vina and Taryono (2016) who reported that sesame seed yield/plant had positive and significant correlation with plant height, number of capsules/plant, biomass yield/plant and 1000 seed weight.

In this study, models that involved number of capsules per plant, number of seeds per capsule, 1000 seed weight and total dry matter at harvest, all had coefficient of determination (r^2) ranging from 0.714 to 0.859. Parameters whose data were taken at 4 and 8 weeks after planting had r^2 values from 0.130 to 0.190 while those taken at 8 weeks had r^2 values ranging 0.574 to 0.575. This suggest a better contribution of growth and yield parameters to sesame seed yield increases as the crop advances in age with the highest contribution made from the harvest parameters. 85.9% of the variabilities in the seed yield per plant was accounted for by the model involving Number of capsules per plant; 76.8% by model involving number of seed/capsule; 71.6% for model involving total dry matter at harvest and 71.4% for models involving 1000 seed weight. This is in agreement with Aristya *et al.* (2017) and Shakeri *et al.* (2016) who under various environmental and genetic conditions, had established that 1000 seed weight and the number of capsules per plant stand out, among other growth parameters in their relationship/contribution to seed yield of sesame

This corresponds to the models; $0.00121 + 0.00234$ N_{Cap}, $0.0028 + 0.0009217$ N_{Seed}, $0.00309 + 0.00008583$ TDM harv. and $0.00045 + 0.01732$ TSW. Pérez-Bolaños & Salcedo-

Mendoza (2018) had also established a linear association between sesame seed yield per plant and 1000 seed weight.

These models are effective tools in the development of yield predictor machines in the precision agriculture.

Table 1. Yield relationship model for sesame

Parameters	r ²	Standard Error	Yield model
LA @4 WAP	0.158	0.0271	-0.00052 + 0.0001202 LA4
LA @5 WAP	0.175	0.0268	-0.00189 + 0.0000765 LA5
LA @8 WAP	0.575	0.0193	-0.000795 + 0.01475 LA8
LAI @4 WAP	0.158	0.271	-0.00048 + 0.036 LAI4
LAI @5 WAP	0.175	0.0268	-0.00189 + 0.02295 LAI5
LAI @8 WAP	0.575	0.0193	-0.00189 + 0.01475 LAI8
TDM @4 WAP	0.130	0.0276	0.00232 + 0.01516 TDM4
TDM @5 WAP	0.190	0.0266	-0.00004 + 0.00798 TDM5
TDM @8 WAP	0.574	0.0193	-0.00504 + 0.002813 TDM8
TDM @ harvest	0.716	0.0158	0.00309 + 0.00008583 TDM Harv.
NCap	0.859	0.0111	0.00121 + 0.00234 NCap
NSeed	0.768	0.0142	0.00028 + 0.0009217 NSeed
TSW	0.714	0.0158	0.00045 + 0.01732 TSW

Key:

LA = Leaf Area; LAI = Leaf Area Index;
 TDM = Total dry matter; NCap = Number of capsules per plant
 NSeed = Number of seeds per capsule; TSW = 1000 seed weight

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