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Assesment of Variability in Yield and Proximate Composition of Nine Mungbean (*Vigna radiata* L. Wilczek) Genotypes in Awka, South-Eastern Nigeria

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ABSTRACT

Mungbean has tremendous genetic diversity worldwide. This genetic variation can be used for the genetic improvement of the crop towards developing high-yielding varieties. Therefore, the research aimed at assessing the growth, yield and proximate composition of nine mungbean genotypes (Umudike V1a, Umudike V2a, TVR 194, TVR 294, Iran mungbean, Umudike V1b, TVR 20, Umudike V2b, and TVR 111). The research was conducted at the Teaching and Research Farm of Crop Science and Horticulture, Nnamdi Azikiwe University, Awka. The experiment was laid out in Randomized Complete Block Design (RCBD) in three replications. The result of this study showed that an appreciable level of variation exists among the mungbean genotypes. Umudike V1a was a quick maturing genotype, At 4 WAS; it had the highest number of branches (8.67), height (18 cm), and number of leaves (24.67). It had the highest 100 and 1000 seeds weights of (6.67g) and (67.3g) with (Umudike V1b). Its seed is relatively low in protein (25.66%) and high in carbohydrate (53.96%). The pods are long (8.34cm) and large seeds (67.3g). Umudike V2a) shared related attributes with Umudike V1a, and so should be selected alongside for traits like quick maturity, erect stature, and long pods, large seeds that are rich in carbohydrates and relatively low in protein. Iran mung bean had the highest number of branches (23.11) at 8WAS which enabled it to bear the largest number of leaves (69.3) and pods (24.8). Its 100 and 1000 seed weights of 5.67g) and 54g is relatively high. The seed is relatively high in protein (29.73%) and low in carbohydrate (50.3%). Tvr 194 genotype shared similar attributes and should be selected alongside. Generally, in the tested genotypes of mungbean, seed yield is independent of plant height, number of branches and number of leaves.

Keywords: Genotypes, Mungbean, Umudike, Proximate composition, Genetic variation, Yield

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1. INTRODUCTION

Mungbean (*Vigna radiata* L. Wilczek) is an important annual leguminous crop mainly cultivated in the tropical, subtropical, and temperate zones of Asia including Bangladesh, India, Pakistan, Mayanmar, Indonesia, the Philippines, Sri Lanka, Nepal, China, Korea and Japan and parts of Sub-Saharan Africa (Rahim et al. 2010). It is a short-duration legume, hence grown solely as well as in inter and multiple cropping systems under rain fed and irrigated conditions. It is an excellent source of easily digestible high-quality protein for the predominantly vegetarian population of the world (Tomooka et al. 2003). It contains 3.5-4.5% fiber, 22-28% total protein, 21-25% of total amino acid and 1.53-2.63% lipids, 1.0-1.5% fat, ash content ranges from 4-5% and 59-65% carbohydrate on dry weight basis and provides 334-344 kcal energy (Agugo et al. 2010). India is the largest producer of mungbean, contributing 65% by area and 54% by production towards global mungbean production in India, it is cultivated in about 2.7 million hectares with a production of 1.19 million ton. However, the national productivity remains low 46g kg ha-1(Tomooka et al. 2003). Studies have shown that the rainforest agro ecological zone of Nigeria is well suited for the cultivation of mungbean (Agugo, 2017; Agugo and Muoneke, 2009). The short growth duration of mungbean makes it easily adapt to different cropping systems and rotation, hence creating diversity in the cropping systems (Agugo et al. 2010). Mungbean is known to be a high source of manganese, potassium, magnesium, copper, zinc, and phosphorus. It is also rich in various B vitamins and also serves as a food filter high in protein, resistant starch, and dietary fiber (DOA. 2017). Mungbean is widely used as human food, green manure, and forage for livestock. It also serves medicinal purposes (Hossain et al. 2003). Due to good taste easy digestibility, better palatability and acceptable market price may be the first choice of farmers (Agugu, 2017). It increases farmers' income and improves soil fertility through symbiotic nitrogen fixation (Malik et al. 2000). Other than food it is important for assistance in normal use of land water resources and enriching the soil. Mung beans have tremendous genetic diversity worldwide. This genetic variation can be used for the genetic improvement of the crop toward the development of high-yielding varieties. Therefore, the research aimed at assessing the growth, yield and proximate composition of nine mungbean genotypes (Umudike V1a, Umudike V2a, TVR 194, TVR 294, Iran mungbean, Umudike V1b, TVR 20, Umudike V2b, TVR 111).

MATERIAL AND METHODS

The field experiment was conducted at the Research Farm of Crop Science and Horticulture, Nnamdi Azikiwe University Awka, Anambra State. Nigeria during the Rainy Season (June-September, 2019). Awka is at an altitude of 91m from sea level with latitude and longitude 6°15' N and 7°07' E. respectively with an average annual rainfall of 1650-2000 mm per annum, a mean minimum and maximum temperature of 27°C and 30°C respectively and a relative humidity of 75-80%. Proximate composition analysis was carried out at the Food Profiling and Biotechnology Laboratory in Michael Okpara University of Agriculture Umudike (5.4807° N, 7.5457° E). Mungbean seeds were sourced from Michael Okpara University of Agriculture Umudike, Agricultural Development Program, Awka both in Nigeria and the International Institute of tropical Agriculture Nigeria (IITA) Ibadan (Table 1).

Table 1: shows the genotypes used for the study

S/No	Genotype	Description
1	Umudike V1a,	Large seed
2	Umudike V2a	Small seed
3	Tvr 194	Tropical *Vigna radiate*
4	Tvr 249	Tropical *Vigna radiate*
5	IRAN	Large seed
6	Umudike V1b	Large seed
7	Tvr 20	Tropical *Vigna radiate*
8	Umudike V2b	Small seed
9	Tvr 111	Tropical *Vigna radiate*

RESULTS AND DISCUSSIONS

The result of this study showed that an appreciable level of variation exists among the mungbean genotypes. Paven et al. (2019) reported a variation in growth and yield parameters of mungbean plant.V1 is a quick maturing genotype, this is in accordance with Sofie et al. (2011). At 4 WAS, it had the highest number of branches (8.67), height (18cm) and number of leaves (24.67) Table-3 .It had the highest 100 and 1000 seeds weights of (6.67g) and (67.3g) with V6 (Table 4).This high yield is in line with the

findings of Rasul et al. (2012). Its seed is relatively low in protein (25.66 %) and high in carbohydrate (53.96 %). The pods are long (8.34 cm) and the seeds large.V2 genotype shared related yield attributes with V1, it had the longest pods(8.48cm) and seeds high in carbohydrate (56.58%) and relatively low in protein(24.32%).It also had the highest seeds per pod (14.33) (Table.4). From Table 6, genotypes V1 and V2 should be selected for agronomic qualities like; quick maturity, short and erect stature and yield qualities like long pods, large seeds that are rich in carbohydrate relatively low in protein. V5 had the highest number of branches (23.11) at 8WAS which enabled it to bear the largest number of leaves (69.3) and pods (24.8) although not significant. Its 100 and 1000 seed weights of (5.67g) and (54g) is relatively high (3rd highest). The seed is relatively high in protein (29.73%) and low in carbohydrate (50.3%).V3 genotype shared similar agronomic and yield attributes and should be selected alongside. Generally, in the tested genotypes of mungbean seed yield is independent of plant height, number of branches and number of leaves. Traits that are linked positively include number of branches and leaves, number of flowers and seeds, large pod size and seed weight. This is in line the findings of Mehmet et al. 2014). Proximate analysis showed that high carbohydrate seeds are relatively low in protein and vice versa. The overall performance of the 9 Vigna radiata genotypes was determined using their rank summation index as shown in Table 5. For overall performance in Table 5, V1 (Umudike V1a) and V4 (TVR 249) ranked first, with a rank summation index (48).

Table 2. Variation in Number of Flowers and Days to 50% Germination of Nine (9) mungbean Genotypes

Genotypes	Days to 50% germination	No. of flowers
UMU V1a	6.00	25.8
UMU V2a	5.33	17.3
TVR 194	4.33	14.8
TVR 249	5.00	18.0
IRAN	5.33	16.7
UMU V1b	3.67	12.7
TVR 20	4.67	18.3
UMU V2b	4.67	18.8
TVR 111	5.33	21.7
$LSD_{0.05}$	1.72	13.74

Table 3: Variation in Plant Height, Number of Branches, Number of Leaves, Measured Leave Area at 4, 6 and 8 Weeks after sowing (WAS) of Nine (9) mungbean Genotypes

Genotypes	Plant Height (cm)			No of Branches			No of Leaves			Measured Leave Area (cm^2)		
	4WAS	6WAS	8WAS	4WAS	6WAS	8WAS	4WAS	6WAS	8WAS	4WAS	6WAS	8WAS
UMU V1a	18.00	25.6	29.5	8.67	10.44	13.00	24.67	32.33	40.1	65.1	131.1	100.8
UMU V2a	14.67	19.83	29.6	5.78	10.11	16.22	19.33	32.33	49.3	50.8	89.8	98.5
TVR 194	13.56	19.17	26.6	4.89	11.00	15.11	16.67	35.00	47.2	52.0	90.0	96.0
TVR 249	16.00	25.00	31.4	5.66	11.33	18.22	17.90	37.57	54.9	56.1	115.2	131.2
IRAN	15.89	17.78	18.2	6.44	10.67	23.11	21.33	34.20	69.3	57.9	108.9	118.2
UMU V1b	10.22	16.33	19.2	5.89	9.89	19.89	19.67	31.67	60.3	45.9	78.5	103.8
TVR 20	12.39	18.45	20.6	5.45	11.22	14.39	19.33	27.00	38.2	42.3	73.5	85.6
UMU V2b	12.67	18.45	27.1	5.11	9.22	15.89	17.33	29.77	51.2	62.0	91.4	126.3
TVR 111	13.78	21.11	60.0	5.44	10.89	15.55	21.00	34.10	45.0	55.3	99.0	112.5
$LSD_{0.05}$	5.40	6.63	15.82	1.52	3.09	8.36	4.69	7.24	11.21	NS	NS	NS

Table 4: Variation in Number of Pod per Plant and Number of Seeds per Pod, 1000 Seed Weight, Pod Length of Nine Mungbean Genotypes

Genotypes	No. of pod per plant	No. of seeds per pod	Pod length(cm)	1000 seed weight(g)
UMU V1a	15.0	11.22	8.34	67.3
UMU V2a	13.9	14.33	8.48	32.0
TVR 194	8.1	12.55	6.59	30.7
TVR 249	12.7	11.67	7.03	38.7
IRAN	24.8	11.89	8.33	54.0
UMU V1b	24.4	11.22	8.34	67.3
TVR 20	17.9	11.89	6.64	40.0
UMU V2b	16.1	12.45	6.53	42.0
TVR 111	22.2	11.45	6.37	32.0
$LSD_{0.05}$	19.06	2.59	1.73	16.12

Table 5: Variation in proximate composition of Nine (9) Mungbean Genotypes

Genotypes	% Ash	% CHO	% CP	% CF	% FAT	% MC	KcalEv
UMU V1a	2.800	53.965	25.660	3.305	1.620	12.650	333.080
UMU V2a	2.510	56.585	24.320	3.120	1.415	12.050	336.355
TVR 194	3.225	50.770	31.485	2.985	1.815	9.720	345.355
TVR 249	2.985	52.870	29.415	3.545	1.350	9.835	341.290
IRAN	3.055	50.300	29.730	3.665	1.780	11.740	335.060
UMU V1b	2.775	53.935	25.605	3.325	1.605	12.665	333.100
TVR 20	2.920	53.680	28.854	3.680	1.540	9.640	342.135
UMU V2b	2.485	56.565	24.330	3.165	1.400	12.100	336.320
TVR 111	3.005	52.220	29.635	3.635	1.480	10.025	340.740
$LSD_{0.05}$	0.04587	0.02211	0.03408	0.03082	0.01748	0.03291	0.7984

%CHO= % Carbohydrate, % CP= % Crude Protein, % MC=% Moisture Content, %CF= % Crude Fibre.

Table 6: Rank summation index of quantitative trait in *Vigna radiata* of Nine (9) mungbean Genotypes

Genotypes	Days to 50% Germ	No of Flowers	Pod Lt (cm)	No of pods / plant	No of seeds /Pod	1000 Seed Wt (g)	Leaf Area (cm^2)	No of Leaves	No of Branches	PH at 4Wks (cm)	PH at 6Wks (cm)	RSI
UMU V1a	6.00(9)	25.8(2)	8.34(2)	15.0(6)	11.22(8)	67.3(1)	100.8(6)	32.33(5)	10.44(6)	18.0(1)	25.6(1)	48
UMU V2a	5.33(6)	17.3(6)	8.48(1)	13.9(7)	14.33(1)	32.0(7)	98.5(7)	32.33(5)	10.11(7)	14.67(4)	19.8(4)	62
TVR 194	4.33(2)	14.8(8)	6.59(5)	8.1(9)	12.55(2)	30.7(9)	96.0(8)	35.00(2)	11.00(3)	13.56(6)	19.17(5)	69
TVR 249	5.00(5)	18.0(5)	7.03(5)	12.7(8)	11.67(6)	38.7(6)	131.2(1)	37.57(1)	11.33(1)	16.00(2)	25.00(2)	48
IRAN	5.33(6)	16.7(7)	8.33(4)	24.8(1)	11.89(4)	54.0(3)	118.2(3)	34.20(3)	10.67(5)	15.89(3)	17.78(8)	50
UMU V1b	3.67(1)	12.7(9)	8.34(2)	24.4(2)	11.22(8)	67.3(1)	103.8(5)	31.67(7)	9.89(8)	10.22(9)	16.33(9)	62
TVR 20	4.67(3)	18.3(4)	6.64(7)	17.9(4)	11.89(4)	40.0(5)	85.6(9)	27.00(9)	11.22(2)	12.39(8)	18.45(6)	65
UMU V2b	4.67(3)	18.8(3)	6.53(8)	16.1(5)	12.45(3)	42.0(4)	126.3(2)	29.77(8)	9.22(9)	12.67(7)	18.45(6)	63
TVR 111	5.33(6)	21.7(1)	6.37(9)	22.2(3)	11.45(7)	32.0(7)	112.5(4)	34.10(4)	10.89(4)	13.78(5)	21.11(3)	60

PH = Plant height, RSI = Rank summation index, the values in bracket are the ranking for individual variables

CONCLUSION

This research work revealed that V1 (umudike V1a) is the best and should be considered for breeding purposes for seed yield, for forage or vegetative growth while variety V3 (Tvr 194) should be considered for high protein content, fat, energy and Ash content.

In selecting the best variety for growth Tvr 249 which has the lowest rank summation (17) and for maximum yield umudike V1b should be selected which has the lowest rank summation (14).The best for overall performance based on the rank summation index with the lowest rank is umudike V1a and should be selected for best performance.

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