Preliminary Characterization of Selected Pepper (*Capsicum annum* L.) Genotypes in South West Nigeria

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Abstract
Pepper is the king of all spices and consumers' preference for pepper fruits ranges in sizes, shapes, and colour. The aim of this study was to characterize five pepper genotypes under field condition. The field evaluation was carried out at the Research Farm of National Horticultural Research Institute, Ibadan. The selected lines were planted out in a randomized complete block design with three replicates and data were collected for days to 50% flowering, plant height, fruit length, fruit weight, fruit yield per plant and matured fruit colour. NHPJ-2 had the longest fruit length (12.3cm) and was also the earliest to attain 50% flowering while NHPJ-4 had the highest plant height. The highest fruit yield per plant was recorded for NHPJ-1 with a distinctive yellow colour at maturity. Based on the evaluated traits, promising lines. NHPJ-2 and NHPJ-1 can be deployed as parents to develop early maturing and high yielding pepper varieties in the south western Nigeria.
***Key words**: Pepper, Genotypes, characterization, fruit length, fruit weight*

INTRODUCTION

Pepper (Capsicum annuum L.) is a member of the solanaceae family and varies in shape, size, colour as well as the degree of hotness/pungency Bozokalfa *et al* 2009. It is the third most important vegetable crop commonly grown in Nigeria after onion and tomato (Uzo, 1984). The fruit is the economic part of the pepper plant and is consumed either fresh or in dried form. The fruits has found great use in nutrition and health Worldwide. It is an excellent source of vitamin A, vitamin B and calcium. It constitutes a vital constituent of the diet of Nigerians as it accounts for 20% of the average daily vegetable in-take either as soups or as condiments (Erinle, 1989). The health benefits of pepper is traceable to the amount of capsaicin (an alkaloid compound found only in pepper) it contains. Capsaicin benefits include anti-carcinogenic (American Association for Cancer Research, 2006. anti-oxidant, anti-mutagenic, immunosuppressive, hypocholesterolaemic, and bacterial growth inhibition effects (Grubben and El Tahir, 2004). Nigeria is the highest producer of pepper in Africa and more than 200 improved and local pepper cultivars (Idowu-Agida *et al*., 2012) are available.

In spite of the overwhelming economic importance of this crop, literature has shown that previous workers concentrated on its agronomy and yield attributes (Aminifard *et al* 2010; Adesina *et al*., 2014; Adeyemi and Ogunsola, 2017; Ndaeyo *et al*., 2017) not much effort has been put into genetic variability in this crop that can lead to varieties. Therefore, this study was undertaken to characterize the existing germplasm for future pepper improvement.

MATERIALS AND METHODS

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The trial was conducted in 2017 wet growing season at the Research Farm of National Horticultural Research Institute, Ibadan (Latitude 7 º 24' 26"N, and longitude 3º50'43"E; 191 meters above sea level. Ibadan has bimodal rainfall distribution, which peaks in June/July followed by a two weeks break in August. This distribution creates two cropping season generally categorized as early and late. The early rains occur between late March/April and end by July while the late rains starts from August/September to November (Olaniyan *et al* 2006). Seeds of mature fruits of the five genotypes were collected from National Horticultural Research Institute (NIHORT) Ibadan, Premier Seed Company and others sourced locally from Eleyele, Ibadan as stated in table 1. The seeds of each Genotype (NHPJ-1, NHPJ -2, NHPJ-3, NHPJ-4 and NHPJ-5) were raised in a nursery trays containing sterilized top soil for 6 weeks in the screen house and watered at two days intervals. Six weeks old pepper seedlings were transplanted to the field when rains were steady.

The experiment was laid out in randomized complete block design with 3 replications in single row plots of 0.5m intra spacing sand 0.7m inter spacing. 250kg ha^{-1} NPK fertilizer was applied at two splits, half at three weeks after seedling establishment and the remaining half applied at the bud initiation stage. Wedding and other cultural practices were carried out as at when due.

Data Collection:

Data were collected on five agronomic traits as follows: Plant height (cm), Days to 50% flowering (DF), fruit color (FC), fruit length (FRL) in cm, and fruit weight (fresh mass in grams) based on the International Plant Genetic Resource Institute (IPGRI, 1998) descriptors for capsicum. The data were subjected to statistical analysis, means were separated using the Least Significant Difference (LSD) and Pearson's correlation matrix was employed to determine the relationship between the agronomic traits.

RESULTS

The means of the evaluated pepper traits is shown in figure 1. NHPJ-2 was the earliest to flower at 22 days after transplanting while NHPJ-4 had the highest number of days to flowering (33 days) after transplanting from the nursery. Genotypes NHPJ-4 AND NHPJ-1 had the highest plant height of 98.3cm and 84.2cm respectively whereas NHPJ-3 had the lowest average plant height of 47cm. (Fig 1). The highest mean fruit length was recorded for NHPJ-4 at 12 (Fig. 1). Highest fruit weight per fruit of 18g was recorded for NHPJ-5 while NHPJ-1 expressed the lowest fruit weight of 6g (Fig. 1). Pepper genotype NHPJ-1 recorded the highest yield per plot (2.8kg) while NHPJ-5 although had the highest fruit weight recorded yield per plot (Fig. 1). Two main Fruit colour were observed in this study for the five pepper genotypes at ripening stage. Except for NHPJ-1 that produced yellow fruits, the other four Genotypes had red fruits at ripening. The relationship between the evaluated traits is shown in Table 2. Yield showed significant negative phenotypic correlation with fruit weight (-0.8295). Plant height showed a significant and positive correlation with fruit length (0.8241**), while days to flowering showed a significant and negative correlation with plant height (-0.6135*).

DISCUSSION

The variation observed among the genotypes based on the considered traits are good indicators that selections can be imposed to

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harness desired traits of interest. The variations observed for days to flowering among the five genotypes evaluated in this study agree with work done by (Sana et al, 2003 and Nkansah *et al*, 2017) who reported that differences in days to 50% flowering might be due to genotype inherited characters and environmental factors. The earliest genotype NHPJ-2 identified in this study can serve as a good progenitor in development of early maturing pepper varieties for the region. The significant variation in plant height among the five genotypes maybe due to their different genetic potentials and ability to absorb and utilize nutrients. This study agrees with work done by (Egharevba and Law-Ogbomo, 2007) who reported significant differences in plant height among different pepper genotypes. Furthermore, it was observed that pepper Genotypes NHPJ-4 which had the highest fruit length per fruit and NHPJ-5 with the highest fruit weight can be deployed to develop new pepper varieties for markets that favour heavy and long pepper fruits. According to Nkansah *et al*, (2017) and Barrera *et al*. (2008), fruits size and weight are used for grading produce with heavier pepper fruits attracting premium price. The high yield recorded for NHPJ-2 may be due to its earliness that gave rise to early fruit maturity and harvesting that might have induced continues flowering and fruit set. This is in agreement with Grubben *et al* (2004) who reported that early harvesting stimulates fruit set. Understanding the relationship between two traits helps the breeder to deploy indirect selection for desired traits in the field. The high negative relationship between yield and fruit weight is an indication that selection in favour of bigger fruits might result in low yield. It was observed from this preliminary study that majority of the genotypes with higher fruit weight also had lower fruit yield per plot compared to the genotypes with low fruit weight. Selection in favour of tall plants in this study might also lead to higher yield due to the moderate but positive phenotypic correlation with yield per plot. Genetic variability is the tool needed to develop new varieties in any crop. In this study, variability existed among the genotypes for various traits. Many workers had used genetic variability among genotypes in various crops to develop early and high yielding varieties (Sana et al; 2011). The early flowering genotypes NHPJ-2 and NHPJ-1 that was high yielding could be employed or cross together to develop early, high yielding cultivar.

CONCLUSION

Appreciable variations were observed among the pepper genotypes for the observed traits. Pepper genotype NHPJ-1 was the earliest to flower, while NHPJ-1 had the highest number of fruits per plant. Selection in favour of heavy fruits might lead to reduced yield among these genotypes. In all, NHPJ-2 and NHPJ-1 might be good parents to cross to create early maturing, high fruiting yellow and red pepper varieties adaptable for South West Nigeria.

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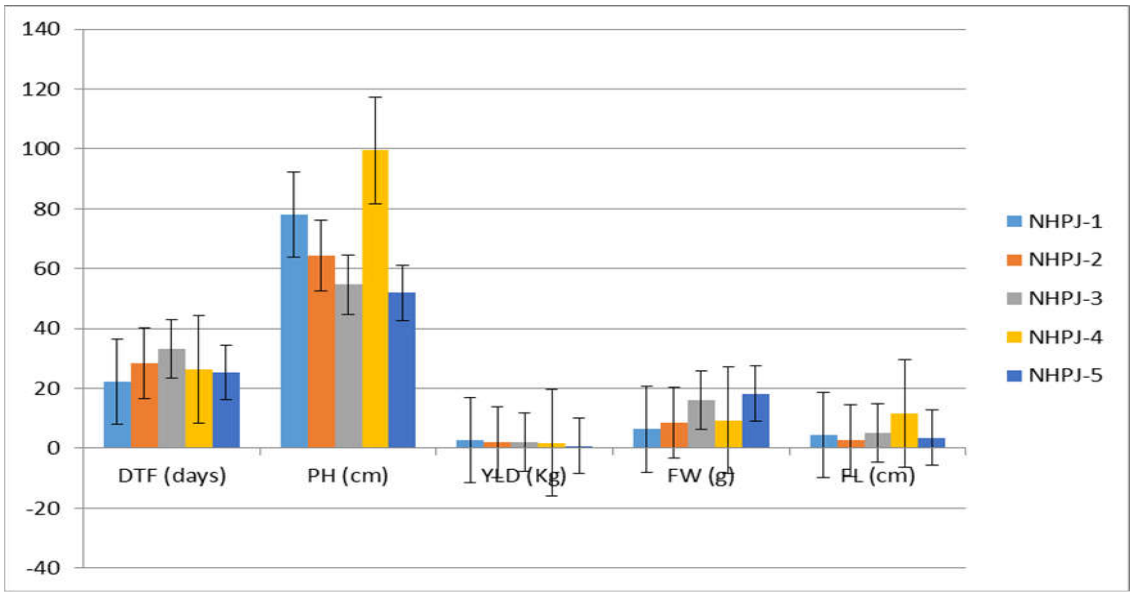
S/N	Source	Code name
1	NIHORT	NHPJ-1
2	Eleyele, Ibadan	NHPJ-2
3	NIHORT	NHPJ-3
4	Eleyele, Ibadan	NHPJ-4
5	Premier Seeds sweet pepper - California wonder	NHPJ-5

Table 1: Sources and code name of genotypes used.



DTF=days to flowering; PH= Plant height at maturity; YLD= Yield per plot; FL= fruit length
Figure 1: Means of evaluated traits among five pepper genotypes

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Table 2. Phenotypic coefficient of correlations between evaluated traits

	DTF	PH	FW	YPP	F L
DTF		-0.6135*	0.9443**	-0.233	0.6156*
PH	-0.6135*		-0.6931*	0.4138	0.8241**
FW	0.9443**	-0.6931*		-0.8295**	-0.1906
YPP	-0.233	0.4138	-0.8295**		0.0206
F L	0.6156*	0.8241**	-0.1906	0.0206	

DTF=days to flowering; PH= Plant height at maturity; YPP= yield per plot; FL= fruit length

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