Preliminary Evaluation of Two Okra Hybrids (*Abelmoschus esculentus* (L.) Moench) under Rainfed Conditions in South-Western Nigeria.

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Abstract
Appreciable genetic gains have been made for various traits in many crops using hybrid seeds. However, efforts have remained low in exploiting heterosis to develop and release hybrid okra varieties in Nigeria. The objective of this study was to evaluate the performance of okra hybrids derived from the reciprocal crosses of two inbred breeding lines, IK7 (medium maturing) and Iwo Nla (early maturing) under rainfed conditions. Both hybrids (IK7 x IwoNla and the reciprocal,IwoNla x IK7) and their parents were evaluated in a randomized complete block design with three replicates for number of fruits, days to flowering, number of branches, number of fruits per branch, plant height and number of seeds per pod. The highest number of branches with fruits was recorded for Iwo Nlax IK7, while the inbred line Iwo Nla was the earliest to flower. We anticipate that the high level of heterosis for branching recorded for the hybrid IwoNla x IK7 can be exploited to improve okra yield through increased number of fruits per plant. The implications of potential parent-of-origin effects as observed are discussed.
Key words*: Heterosis, hybrid, inbred line, reciprocal cross*

INTRODUCTION

Okra (*Abelmoschusesculentus*) originates from Africa and belongs to the Malvaceae family. It is an important vegetable across West Africa (Alimi, 2004). The crop is well adapted to tropical environments and is widely cultivated in most regions across Nigeria because of its importance to the economic development of the rural dwellers and can be found in most markets in the country (Christo and Onuh 2005).

Okra plays a significant role in the nutritional needs of the ever increasing populace via for its fibrous content and other medicinal benefits. The fresh pods serve as soup thickeners due to its mucilage properties and are known to be good sources of vitamins and minerals (Schippers, 2000). Their edible fruit contains86% of water, 2.2% of protein, 10% of carbohydrate, 0.2% of fat and vitamins A, B, and C (Chaudhary, 2003). Despite its production been dominated by poor resourced farmers in Africa and South America the feasibility of fruit export and its prospects as a potential export earner is attracting large producers and seed companiesto invest in okra production (Sawadogo *et al.*, 2006). Several improved varieties, heirloom open pollinated cultivars and hybrids varieties are available for commercial cultivation. Interestingly, despite the higher cost of hybrid seeds compared to other okra varieties, they are gaining more popularity world over due to higher productivity, plant uniformity coupled with appreciable resistance to pests and diseases (Paterniani, 1974; Medagam*et al*., 2012).

Okra varieties vary by plant height, size of fruit, colour, early or late maturing (Udoh and Akpan, 2005). Despite the important role okraplays in the nutritional and economic life of Nigerian farmers and retailers, not much effort have been directed in the creation of improved varieties to meet the desired preferences of farmers and consumers in Nigeria. This has led to farmers still growing their own low yielding

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local cultivars or open pollinated varieties that are susceptible to various pest and diseases. Hence this work was carried out to evaluate the performance of reciprocal hybrids with their two parents for selected agronomic traits under field condition.

MATERIALS AND METHODS

The experiment was conducted at the experimental field of National Horticultural Research Institute, Ibadan. The genetic materials evaluated in this study comprised of two inbred parental lines (*IK7*and *Iwo Nla*) obtained from three cycles of selfing and selection from okra germplasm collected from farmers field in south western Nigeria (Anyaoha*et al*., 2018). The two reciprocal hybrids F1 (Iwo Nla x IK7) and F1 (IK7 x Iwo Nla) were developed by the traditional method of emasculation of the female parent followed by manual crosses.Emasculation was done a day prior to the opening of the flower and crossing the following morning according to Nascimento, (2014).Flowers of female parents were emasculated between 5 and6 pm in the evening, whiletransfer of mature pollen from flowers of the male parentto the female parent was carried out between 8 to 10 am in the morning.Fully developed fruits fromthe hybridization were harvested when they reached physiological maturity (evidenced by cracks on the pod ridges of pods) and seeds extracted separately. After extraction, the seeds were dried under shade in pre-labeled brown paper envelops and stored.

Seeds from the twoinbred parental lines and reciprocal hybrids were first treated with an anti-pest dressing (*DressForce*, JubailiAgrotech) prior to planting. Four seeds per hill were planted directly in 3cm holes under field conditions, and later thinned to two plants per hill after seedling establishment. The experiment was laid out in a Randomized Complete Block Design with three replications. Each replicate consisted of two rows of 15 plants for each genotype. Plants were spaced 70 cm x 50 cm between and within rows, respectively. Agronomic maintenance carried out included manual weeding at two and four weeks after planting. NPK 15:15:15 fertilizer was applied in split doses of 60 Kg/ha first at three weeks after planting and later at flowering. Data were recorded from five plants randomly selected from the middle section of each plot on the following agronomic attributes: pedicel length, days to 50% flowering, plant height at maturity, fruit width and length, number of seeds/ fruit, leaf length, pod width followed by number of ridges number of branches and yield.

RESULTS

The ANOVA revealed significant variation for five out of the eleven agronomic traits observed in this studyfor both parents and the reciprocal hybrids (Table 1). No significant variation was recorded for pedicel length, Days to 50% flowering, Plant height at maturity, fruit width and length (Fig. 1).Highest level of variation was recorded for number of seeds/ fruit, leaf length, pod widthfollowed by number of ridges number of branches and yield (Table 1). F1 hybrid (Iwo Nla x IK7) had the highest number of pods, number of branches per plant and number of fruits per fruits per seed with Ik7 recording the smallest leaf length (Table 1). Iwo Nla was the earliest to flower (47 days) while Ik7 had the least plant height of 72 cm(Fig. 1) while the highest leaf width, and fruit length were

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recorded for Iwo Nla and F1 (IK7 x Iwo Nla) respectively (Fig. 2).

DISCUSSION

The main aim of most breeders is to create heterotic hybrids that express superior performance over their parentsfor farmers and consumers preferred traits such as yield, resistance to pest and diseases (Mattedi*et al.*, 2015, Binalfew andAlemu, 2016). Understanding the variation existing for specific traits between parents and their reciprocal hybrids is important in okra hybrid production. True hybrids can be confirmed by using traits that shows significant deviation from those of the mother parents. The results from this study reveal the need to consider the direction of reciprocal in hybrid production. The performance of thereciprocal crosses showed that F1 hybrid created between Iwo Nla x IK7 and vice versa will produce superior when Iwo Nlawas used as the mother parent. This is evidenced by superior performance exhibited by F1 (Iwo Nla x IK7) for number of pods per plant, number of seeds per fruit and number of branches compared to both parents and F1 hybrids (IK7 x Iwo Nla).This is in agreement withMaciel*et al*.(2017) who reported superiority of hybrids for number of fruits per plant over the two parents studied. The reciprocal hybrids showed superiority for most of the traits considered in this study confirming the positive prospect of hybrid okra cultivars for Nigeria farmers. The high number of branching expressed by F1(Iwo Nla x IK7) might have contributed to increased number of fruits recorded for this genotype. The high branching allele might have been contributed by the female parent Iwo Nla since it also expressed higher number of branches compared to IK7. This further confirms the importance of adequate choice of parents for cross breeding since this will go a long way to determine the success and economic returns of okra genetic improvement programme.

CONCLUSION

The overall performance of the two parents and their reciprocal hybrids shows that F1 (Iwo Nla x IK7) had the highest number of pods per plant and number of branches per plant while Iwo Nla was the earliest to flower among the four genotypes evaluated in this study. Heterosis for higher branching might have contributed to increased number of fruits per plant as exhibited by F1 (Iwo Nla x IK7).

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Table 1. Mean of evaluated genotypes for six considered traits

Genotypes	YLD	NSF	NB	LL	FW	NR
Iwo Nla	11	72	1.83	19.5	3.24	5
F1 (Iwo Nla x IK7)	16	106	4.5	20.875	3.42	6
F1 (IK7 x Iwo Nla)	12	104	0	20.75	3.24	6
IK 7	9	80	0	15.875	3.55	7
Prob Level	0.029	<.001	0.002	<.001	<.001	0.001
LSD	3.898	0.8	1.061	0.7956	0.056	0.3

YLD=Yield per plot; NSF=number of seeds per fruit; NB= Number of branches; LL= Leaf length; FW=Fruit width, NR=Number of ridges; LSD= Least significant difference. Probability level= 0.05

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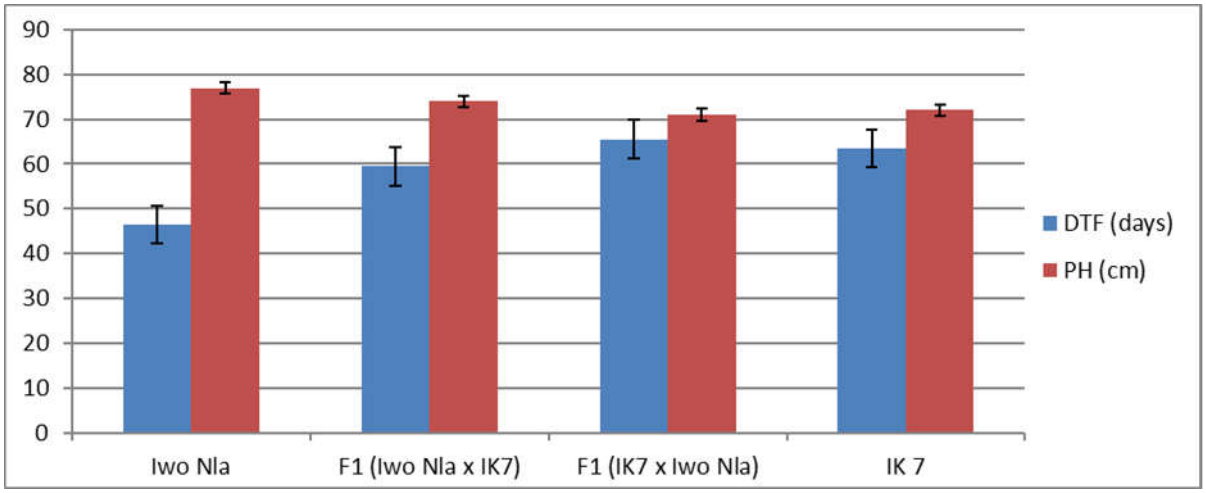

Fig 1. Days to 50% flowering (DTF) and plant height (PH) of the evaluated genotypes

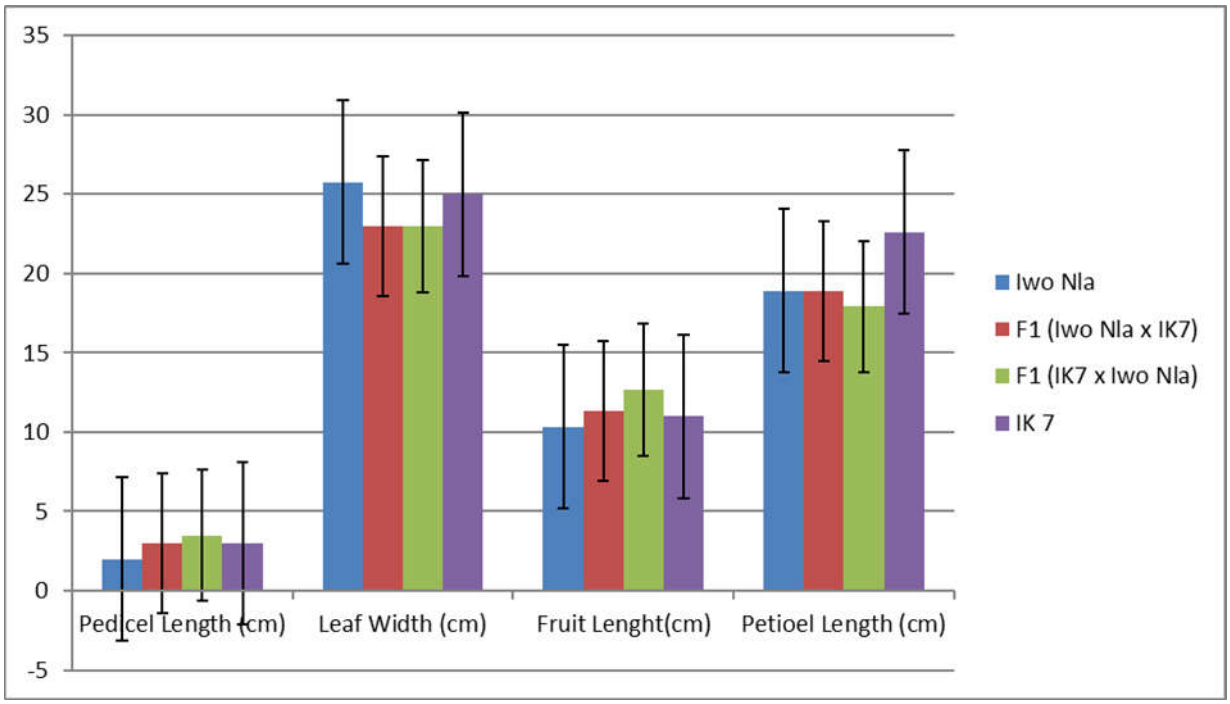

Fig 2. Pedicel Length, leaf width, fruit and petiole length of the evaluated genotypes

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