

Agronomic characterisation of farmer preferred pigeon pea landraces in Uganda

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Abstract

The study to evaluate and compare the agronomic performance of a collection of pigeon pea landraces from Malawi and Uganda was conducted at two sites in Uganda. Three experiments were laid out in a partial lattice design with two replications per location. High significant differences ($P \leq 0.001$) were detected on yield and its components such as 100 seed weight (g), pods per plant and so were flowering and maturity periods for both within and across sites and seasons. Cross site yield analysis was done on 54 pigeon pea land races. Landraces 2256, 2306 and AP 02 outyielded the local check 20 L by 20% (1233 kg/ha versus 1145 kg/ha) and doubled yield under farmers' management (450 kg/ha). Therefore, further screening and selection of these landraces provide a potential source of parental breeding lines.

Key words: Agronomic performance, cross site yield analysis, Malawi, pigeon pea landraces

Résumé

L'étude pour évaluer et comparer la performance agronomique d'une collection de variétés de *pigeon pea* en provenance du Malawi et de l'Ouganda a été menée sur deux sites en Ouganda. Trois expériences ont été énoncées dans un modèle en treillis partiel avec deux répétitions par site. Hautes différences significatives ($P < 0,001$) ont été détectées sur le rendement et ses composantes telles que poids de 100 graines (g), des gousses par plante et étaient donc en périodes de floraison et de maturité à la fois au sein et à travers les sites et les saisons. L'analyse du rendement du site en travers a été effectuée sur 54 races locales de *pigeon pea*. Les variétés locales 2256, 2306 et AP 02 ont donné un rendement supérieur dans la vérification locale de 20 L en 20% (1233 kg / ha contre 1145 kg / ha) et ont doublé le rendement en vertu de la gestion des agriculteurs (450 kg / ha). Par conséquent, le dépistage supplémentaire et la sélection

de ces variétés locales fournissent une source potentielle de lignées parentales de reproduction.

Mots clés: Performance agronomique, analyse du rendement du site en travers, Malawi, variétés de pigeon pea

Background

Pigeon pea is among the important pulses grown for food, feed and soil fertility improvement in tropical and sub tropical regions. It is a cheap source of protein (c" 20%), other soluble vitamins and essential amino acids to the resource poor farmers who are the main growers of this crop (Singh *et al.*, 1990).

Unfortunately, in southern and eastern Africa, pigeon pea has not been given much research attention (Damaris, 2007). Consequently, farmers in the region still use unimproved late maturing cultivars due to poor access to improved seed (Franklin Simtowe *et al.*, 2011, ICRISAT, 2009). Therefore, there is still need to improve pigeon pea landraces available in gene banks and farmer stores. The first effort in this regard is to evaluate the agronomic performance of the landraces and subsequently use the superior landraces in breeding programmes.

Literature Summary

High yields, resistance to pest attack and maturity periods and other traits such as cooking quality, good taste and storability influence farmers' choice of any crop variety, including pigeon peas (Manyansa *et al.*, 2009, Night and Latigo, 1994). Night and Latigo (1994) reported that flower and pod feeders and borers are the main insect pests that cause a significant reduction in pigeon pea yield. (Wasike *et al.* (2005) reported that characterisation of germplasm is one of the reliable ways of uncovering genetic variations in traits that influence yield and resistance to insect pests and diseases. Descriptors for characterisation of pigeon pea have been established (Upadhyaya *et al.*, 2008). Silim *et al.* (2006) however reported that to reliably characterise heritable traits in crops, evaluation must be carried out in multiple environments.

Study Description

Fifty four landraces were evaluated in three field experiments conducted at Makerere University Agricultural Research Institute Kabanyolo (MUARIK) and Ngetta Zonal Agricultural Research Development Institute (ZARDI) for two seasons. The landraces were planted in an alpha lattice design and replicated twice. Each replication had six incomplete blocks. Each genotype (landrace) was planted in a plot of size 0.75m x 0.60m x 5m in two rows. At the height of 15 cm, plants were thinned to two seedlings per hole. All standard agronomic practices for

the crop were followed. Data were collected for number of branches per plant, number of pods per plant, plant height, number of seeds per pod; days to flowering and maturity for each landrace. Data on response of landraces to attack by pests at different growth stages like seedling, vegetative, flowering, podding and physiological maturity stages were also scored to take into account of the impact of pest damage on yield. All collected data were subjected to the ANOVA using GenStat statistical package.

Research Application

There were significant genotype effect ($P < 0.05$) on yield (kg/ha), days to 50% flowering, days to 75% maturity and plant height (Table 1). About 44% of the landraces yielded 15% above landraces under farmers' cultivation in Uganda. Among these, 5% tripled farmers' current yields and outperformed the local check 20L by 20% providing an opportunity for selection and continued pigeon pea improvement. Weak positive and negative relationships were observed between yield, flowering and maturity periods (Table 2) indicating that yield, flowering period and plant height did not influence each other ($< 50\%$) in their performance among landraces hence selection for these traits can be done on an individual trait basis.

Pigeon pea landraces with yield above those under cultivation be selected for further screening in different locations and be incorporated in future pigeon pea breeding.

Table 1. Mean agronomic performance of pigeon pea landraces evaluated at MUARIK in the second season (September 2010- March 2011).

Land race	Flowering dates	Maturation period	Yield (kg/ha)	100 seed weight (g)	Plant height (cm)	Number of pods/plant
KB03	103	138	901	18	100.9	35
KB05-1	91	125	907	18	117.3	83
2256	107	182	1258	13	185.2	176
2306	84	175	1233.33	12	149.9	135
AP02	97	172	1144.67	16	172.8	96
*20L	104	162	1145	9	166.4	233
2281	133	206	171	16	190.4	77
786	124	214	400	14	162.8	63
SED	0.6	0.67	8.16	0.45	0.54	4.8
LSD	1.2	1.34	16.4	0.9	1.08	9.7
CV%	0.5	0.4	1.4	3.1	0.3	4.2

SED = standard error of the difference, LSD = Fisher's Protected Least Significant Difference at 95% confidence level, CV % Coefficient of variation. * Local check.

Table 2. Correlation of yield, flowering dates, maturation period and plant height for pigeon pea landraces evaluated at MUARIK in the second season (September 2010-March, 2011).

	Flowering dates	Maturation period	Yield (kg/ha)	Plant height (cm)
Maturation period	0.38***	-		
Yield (kg/ha)	-0.39***	-0.36***	-	
Plant height (cm)	0.24**	0.56***	-0.22*	-

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