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Full Length Research Paper

Evaluation of nursery sprouting media for the minisetts of some *Dioscorea rotundata* yam cultivars and the field establishment of sprouted minisetts in Garkawa, Plateau State, Nigeria

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Sandy soil, Rice straw and 1:1 sawdust/wood shaving were used as sprouting media to assess the nursery sprouting of the minisetts of four *Dioscorea rotundata* yam cultivars namely *Agumaga, Alushi, Dan Onitsha* and *Punch* in a minisett technology of seed yam production study at Garkawa (Lat. 10.11'N and 8.21'E). Ware yam tuber sizes of the yam cultivars were cut into about 25g size, treated in a fungicide solution, cured and subjected to sprouting in the sprouting media contained in constructed nursery boxes in a completely randomized design (CRD) experiment with three replications. The boxes were kept in a nursery shade for four weeks. The sprouted minisetts were assessed for field establishment in a randomized complete block design (RCBD) experiment with three replications. The result showed that percentage sprouting of the yam minisetts differed significantly (P<0.05) among the sprouting media with the highest sprouting in the rice straw medium followed by sand soil and least in the 1:1 sawdust/wood shavings. *Punch* yam cultivar had the highest and significantly higher percentage sprouting compared to the other yam cultivars. The sprouting media did not significantly affect percentage field establishment of the sprouted minisetts but *Punch* and *Alushi* yam cultivars had significantly higher field establishment compared with *Dan Onitsha* and *Agumaga.* Field establishment of the sprouted minisetts was relatively high (78%).

Keywords: Yam, minisetts and sprouting media.

INTRODUCTION

Yam (*Dioscorea spp*) is an important tuber crop in Nigeria as a food and cash crop. Nigeria is the largest world producer of yam with annual production, estimated at 26.587 million metric tones (FAO, 2006). Asumugha et al. (2009) reported that there is need for increased production of yam not only to satisfy domestic need but also export demand. The major constrain to increased production of yam in Nigeria is the scarcity of seed yam (NRCRI, 2006, Udoh et al., 2008, Udealor and Ezulike, 2009) and large quantities of about 30% (3.5 tones per hectare) of the previous years harvest are required (Okoli and Akoroda, 1995). To address this problem, the yam minisett technique has been developed as a quick and easy way of multiplying healthy seed yams (Otoo et al., 2001).

The minisett technique involves the use of about 25g setts to produce whole tubers which serve as "seed" yam (Okoli and Akoroda, 1995). The major problem militating against the adoption of the yam minisett technique by Nigerian farmers is the low sprouting of minisetts (Okoro, 2009).

Pre-sprouting of the minisetts in the nursery before transplanting to the field has been reported to be useful for the success of yam minisett technique where the rainfall duration is short (Otoo et al., 2001). They further reported that moist sawdust has been used effectively as a medium for sprouting minisetts but it is not easily

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available especially in areas where sawmills are not located. It has therefore been necessary to find substitutes for the sawdust. Yam cultivars differ in their duration to sprout and would respond differently under different sprouting media. This study was carried out to assess three pre-sprouting media for the minisetts of four popular *D. rotundata* yam cultivars in the study area and their post-sprouting field establishment.

MATERIALS AND METHOD

Six tubers each of four *Dioscorea rotundata* Poir local yam cultivars namely *Agumaga, Dan onitsha, Alushi* and *Punch* weighing between 1.5 - 2.0kg were selected for use. The tubers had initiated sprouts and were cut into minisetts each weighing about 25g. The minisetts were treated in water suspension with Actforce (fungicide) and left over night to cure.

Thirty-six (36) wooden boxes measuring 40cm in width 150cm in length and 40cm high were constructed with ventilations for excess water to drain and for air circulation for use as nursery boxes. The sprouting media were sandy soil taken from a virgin land, rice straw and 1:1 volume ratio mixture of wood shavings and sawdust. The three sprouting media and the four yam cultivars were combined in a factorial combination to give twelve treatments. Each treatment was assigned to a nursery box in a completely randomized design experiment with three replications. The sprouting media were moistened and 30 yam minisetts were placed in two layers in between the sprouting medium in each of the boxes according to the treatment schedule. The boxes were kept in the nursery shade and were sprinkled with water every other day to ensure dampness of the sprouting media and maintained for four weeks from the second week of April, 2010 to the first week of May, 2010. At the end of the four weeks the yam minisetts were carefully removed and assessed for sprouting.

Ridges were constructed at the experimental field of College of Agriculture Garkawa (Lat. 10.11'N and Long. 8.21'E) for field planting of sprouted minisetts. The sprouted minisetts were planted at a spacing of 1m x 25m in a post nursery trial in a randomized complete block design with three replications. A spacing of 1.0m was maintained between plots and between blocks. The planted plots were uniformly mulched with dry grass to conserve moisture. Vine emergence was monitored and in the sixth week, plant establishment count was taken for evaluation of post nursery field establishment. Five plants were sampled in each treatment plot and the vine length measured from ground level. The mean values were used for data analyses.

Data Analysis

Data collected were analysed using Genstat (3) Discovery edition package for statistical analysis. Detection of differences among treatment means for significant effect was by the use of least significant difference (LSD) at 5% level of probability.

RESULT

The percentage sprouting of the yam minisetts differed significantly ($P<0.05$) among the sprouting media used (Table 1). The highest sprouting of the yam minisetts was in rice straw followed by sandy soil and least in the 1:1 sawdust/wood shaving. The yam cultivars also differed significantly ($P<0.05$) in percentage sprouting of their minisetts. *Punch* cultivar had the highest and significantly higher percentage sprouting compared to the other cultivars which did not differ among themselves. The percentage sprouting was least in *Agumaga* cultivar. There was a significant interaction between the sprouting media and the yam cultivars. The percentage sprouting of the yam minisetts were greatly enhanced for all the cultivars in rice straw medium while sandy soil medium slightly lowered percentage germination in *Agumaga* and *Punch* cultivars. Percentage sprouting of the minisetts was significantly lowered in *Alushi* and *Dan onitsha* cultivars in 1:1 sawdust/wood shaving medium.

The sprouting medium did not significantly ($P<0.05$) affect percentage field establishment of the pre-sprouted yam minisetts six weeks after planting (Table 2). However, percentage field establishment was slightly higher in minisetts that were pre-sprouted in rice straw followed by those pre-sprouted in sandy soil and least in those pre-sprouted in 1:1 sawdust/wood shaving mixture. There was a significant ($P<0.05$) variation in percentage field establishment of the sprouted minisetts of the yam cultivars at six weeks after field planting. The percentage field establishment was significantly ($P<0.05$) higher in *Punch* (86.2%) and *Alushi* (85.1%) cultivars compared to *Dan onisha* (70.5%) and *Agumaga* (70.0%) cultivars. There was no interaction effect between the sprouting media and the yam cultivars on the percentage field establishment of the pre-sprouted minisetts six weeks after planting.

The sprouting media effect was not significant ($P<0.05$) on the vine length of the yam plants in the field at six weeks after planning of the sprouted yam minisetts. However, the vine length of the plants that were pre-sprouted in rice straw medium had the highest vine length followed by those that were pre-sprouted in sandy soil and least in those that were pre-sprouted in 1:1 sawdust/wood shaving media. The vine length did not differ significantly ($P<0.05$) among the yam cultivars at six weeks after planting of the pre-sprouted minisetts. However, vine length was slightly higher in *Punch* cultivar compared to others which were at close range. There was no interaction effect between sprouting media and yam cultivars on vine length of yam plants at six weeks after planting of the pre-sprouted minisetts.

Table 1. Effect of nursery sprouting media on percentage sprouting of yam minisetts of four *Dioscorea rotundata* yam cultivars

Yam cultivars	Sprouting Medium			
	Sandy soil	Rice straw	Sawdust/wood shavings	Mean
Agumaga(Ag)	38.3	83.3	50.0	57.2
Alushi (Al)	65.0	98.3	35.0	66.1
Dan Onitsha(Do)	60.0	80.0	40.0	60.0
Punch (Pch)	75.0	96.7	78.3	83.3
Mean	59.6	89.6	50.8	66.7
		Sprouting Medium	Yam cultivar	S/medium x Y/cultivar
	LSD 0.05	6.07	7.74	13.41

Table 2. Effect of nursery sprouting media on field percentage plant establishment of sprouted yam minisetts of four *Dioscorea rotundata* yam cultivars at six weeks after planting

Yam cultivars	Sprouting Medium			
	Sand soil	Rice straw	Sawdust/wood shavings	Mean
Agumaga(Ag)	64.4	79.3	66.5	70.0
Alushi (Al)	86.3	87.1	81.8	85.1
Dan Onitsha(Do)	72.7	72.4	66.4	70.5
Punch (Pch)	88.2	83.2	87.2	86.2
Mean	77.9	80.5	75.5	78.0
		Sprouting Medium	Yam cultivar	S/medium x Y/cultivar
	LSD 0.05	5.02	5.79	10.04

Table 3. Effect of nursery sprouting media on vine length (cm) of sprouted yam minisetts of four *Dioscorea rotundata* yam cultivars at six weeks after planting

Yam cultivars	Sprouting Medium			
	Sand soil	Rice straw	Sawdust/wood shavings	Mean
Agumaga(Ag)	15.3	15.9	9.5	13.6
Alushi (Al)	13.3	15.8	8.8	12.6
Dan Onitsha(Do)	9.9	14.8	15.2	13.34
Punch (Pch)	17.7	16.4	17.1	17.0
Mean	14.0	15.7	12.	14.0
		Sprouting Medium	Yam cultivar	S/medium x Y/cultivar
	LSD 0.05	4.61	5.33	9.23

DISCUSSION

The significant ($P<0.05$) variation in sprouting of the minisetts in the sprouting media was attributed to the characteristics differences among them in providing the required conducive environment for sprouting of the minisetts.

The rice straw had the highest sprouting of minisetts because it allowed for good aeration of the minisetts and easy drainage of any excess water thus providing a conducive environment for sprouting. The very high sprouting in this medium compared to others implied that it was ideal for sprouting of yam minisetts. The common availability of rice straw in rural areas eases its adoption by farmers which according to Okoro (2009) will aid the adoption of yam minisett technique to generate large

quantities of yams with minimal inputs and less complication in technique. The lowest sprouting of minisetts under sawdust/wood shavings mixture medium was attributed to high heat generation by decomposing sawdust which may affect the minisetts as reported by Wilson (1989). A higher sprouting in sandy soil compared to sawdust/wood shavings was attributed to lower heat generation in the medium as the boxes were kept under shade. The differences in sprouting by the yam minisetts in the sprouting media justify the suggestion by Otoo et al. (2001) that substitutes to sawdust as a sprouting medium should be found.

The significant variation in sprouting of the minisetts among yam cultivars was attributed to genotypic differences and it agrees with an earliar report by Ikeorgu and Ogbanna (2009). The high percentage sprouting in *Punch* cultivar (83.3%) implied its good attribute for adoption in yam minisett technology. The generally high percentage sprouting of minisetts of the yam cultivars ranging between 57.2% in *Agumaga* cultivar to 83.3% in *Punch* cultivar implies that they could perform well in the minisett production of their seed yams. This is a good prospect for the success of the minisett technology which is ideal for the production of seed yam to boost yam production. The significant interaction between the sprouting media and the yam cultivars implies the need for careful selection of sprouting media for a particular yam cultivars or varieties. However, the rice straw was particularly good for all the yam cultivars in this study.

The non significant effect of the sprouting media on percentage plant establishment was attributed to the uniform field condition under which the sprouted minisetts were planted in the field. However, the relatively higher percentage plant establishment for minisetts that were sprouted in rice straw medium compared to those that were sprouted in the other media was attributed to the influence of the earlier better sprouting condition under that medium. The establishment performance was reflective of their media sprouting percentage performance. The generally high percentage plant establishment of about 78% in this study was attributed to the pre-sprouting of the minisetts which according to Otoo et al. (2001) is useful in areas where rainfall duration is high.

The significant ($P<0.05$) difference among the yam cultivars was attributed to genotypic differences. The higher percentage establishment in *Punch* and *Alushi* cultivars compared to *Agumaga* and *Dan onitsha* cultivars implied better genotypic characteristics for adoption in yam minisett technique of seed yam production. The average 78% plant establishment in this study was higher than the 56.4% for 25g yam minisetts reported by Udealor and Ezulike (2009) and attributed to the pre-sprouting of the minisetts adopted in this study.

The non significant vine length of the yam plants was attributed to the uniform field condition under which the sprouted minisetts were growing. It is expected that the pre-sprouting media effect would diminish in the field as the roots of the plants were in a different (soil) medium which was the same for all the minisetts. The relatively longer vines (not significantly) in *Punch* cultivar compared with the other genotypes was attributed to genotypic characteristics.

Pre-sprouting the minisetts of the four yam cultivars was successful in the three sprouting media of sandy soil, rice straw and 1:1 sawdust/wood shavings with greater success in rice straw. The pre-sprouting minisetts gave a good post nursery field plant establishment. Rice straw which could be readily available in rural areas is recommended for adoption in the pre-sprouting of yam minisetts to boost the minisett technique of seed yam production by rural farmers. *Punch* and *Alushi* yam cultivars exhibited greater potential for success in the minisett technique of seed yam production and are recommended for adoption.

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