

# Genotype by environment (G × E) interaction in cassava (*Manihot esculenta* Crantz) in Uganda

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## Abstract

Genotype (G) by environment (E) interaction (GEI) in cassava was studied using 10 genotypes in a multilocational trial in Uganda at different altitudes for 2 years. The study investigated the magnitude of GEI and diagnosed the underlying causal factors of the G × E pattern. The analysis of variance indicated that the effects of E, G, and GEI were significant for storage root number, storage root size, storage root girth, fresh storage root weight, and dry yield, but not for dry matter content. Additive Main Effects and Multiplicative Interactions (AMMI) was used to assist the selection and zonation of the environments into homogenous ecosystems. Genotype TMS I 92/0057 was found to have broad adaptation, high yield, and stability, with temperature being one of the underlying causal factors of the interaction. Namulonge (mid-altitude) was identified as a stable environment and could be considered as a site for broad selection.

**Key notes:** Cassava, genotype by environment interaction, AMMI, stability, adaptability

# Survey of *Scutellonema bradys* incidence on marketed yam (*Dioscorea* spp.) in Bénin

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## Abstract

A survey was conducted in the different areas in Bénin where yam (*Dioscorea* spp.) are grown. Yam tubers were assessed visually for dry rot disease associated with the yam nematode, *Scutellonema bradys*. Assessments were made during February and March in 2002 and 2003 on yam for sale on market stalls. Population density of *S. bradys* was also determined from 65 sampled yam tubers, selected for exhibiting symptoms of dry rot. Differences among yam cultivars, yam species, sites of tuber origin, and agroecological zones (AEZ) of tuber cultivation, were analyzed. A total of 3222 tubers from 110 market stalls were visually assessed for nematode damage. The percentage of tubers with dry rot caused by *S. bradys* was low (mean of 3.57%). Symptoms of nematode damage were observed most frequently on cultivar *Idjekoka* and cultivar *Krokotonnè* (both *D. rotundata*) and cultivar *Kokoro* (*D. cayenensis*). Population density of *S. bradys* varied considerably among yam cultivars, yam species, sites of origin of tubers, and the AEZ where tubers were grown. *Dioscorea rotundata* supported the highest ( $p \leq 0.05$ ) nematode population density (mean of 488 *S. bradys*/g tuber peel) and *D. alata* the lowest (mean of 4 *S. bradys*/g tuber peel). No *S. bradys* were recovered from some cultivars, even though tubers appeared to have dry rot symptoms. Nematode population density as high as 1700/g tuber peel was recorded on cv *Yoruba dundu* (*D. rotundata*). The highest number of *S. bradys* were recovered from the sites Bio Amadou Kpara (mean of 3789 *S. bradys*/g tuber peel), Monne (2609 *S. bradys*/g tuber peel), and Nangatori (2316 *S. bradys*/g tuber peel).

**Keywords:** pest, plant parasitic nematode, storage, West Africa

# Yield response of white yam as affected by sources and rates of potassium

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## Abstract

The study was prompted by the hypothesis that root crops like yam (*Dioscorea* spp.) require or can respond to potassium (K) fertilizer application, especially on soils where the reserves are dwindling due to cropping, erosion, leaching, etc. Two sources of K, muriate of potash (KCl) and sulfate of potash ( $K_2SO_4$ ) at levels of 0, 30, 60 and 90 kg K/ha along with a common dose of 60 kg/ha nitrogen (N) plus 60 kg/ha phosphorus (P) were applied to a local white yam (*D. rotundata* cv. *Dente*). The experiment was laid out in a randomized complete block design with four replications at a site that had been fallowed for about 5 years in the forest-savanna transition zone of Ghana. Results indicated that although there were no significant differences ( $p>0.05$ ) in tuber yield characteristics-tuber numbers, length, girth and weight-due to fertilizer application and K source, the mean yields (weights) for the sulfate (17 t/ha) were a great improvement over those of the muriate (14 t/ha), a mean response of 21% corresponding to 3 t/ha tuber weight. Tuber length correlated marginally with tuber girth and weight, whilst girth also correlated marginally with tuber weight. It can be concluded from this study that K fertilizer is not necessary for that variety of white yam on such long fallowed sites-the response may change at a different site where the land has been continuously cropped-and that sulfate of potash may be a better source than muriate on such soils.

**Key words:** white yam, muriate of potash, sulfate of potash, forest-savanna transition, yield.

# Overcoming the non-uniform, late and low sprouting rates in yam minisetts by the use of milked setts

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## Abstract

Field trials were conducted at the University of Agriculture teaching and research farm, Makurdi, to evaluate the ability of milked yam minisetts to overcome the non-uniform, late, and low sprouting rates from yam miniset technology. Yam were planted on 20 May 2004 and milked on 15 October 2004. Setts were treated and re-buried. The setts were harvested after 2 months and stored for 5 months before being planted with freshly cut setts out in the field in 2005. Results showed that milked setts were properly cured at harvest time and also stored very well, recording minimal. The control setts recorded only about 16.5% drying after 5 months of storage. The milked setts began to germinate in storage in late April. The Captan-treated setts recorded over 51.9% germination in June before being planted out in the field. The peak of germination was 4–5 weeks after planting (WAP). When compared with the freshly cut setts, the control of the milked setts germinated better than the best treatment for the freshly cut setts (treatment with Captan) by about 40.13% at 6 WAP. Milking yam minisetts therefore made the setts sprout early after dormancy was broken and a uniform and high sprouting percentage was also achieved.

**Key words:** Yam, milked minisetts, storage, sprouting.

# Assessing the effectiveness of ionizing radiation as a quarantine treatment for stored sweetpotato roots in Ghana

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## Abstract

Sweetpotato (*Ipomoea batatas*) roots are a rich source of starch and other carbohydrates and provide energy to consumers. During postharvest storage, however, the roots sprout, depleting their stores of carbohydrates and water and this results in wrinkling and a reduction in nutritional value. Also, the roots are susceptible to insect pest infestation that causes postharvest losses. Low dose ionizing radiation has been reported as effective in inhibiting sprouting and as a quarantine treatment for most stored food crops, including sweetpotato. However, not much is known about the response of Ghanaian varieties of sweetpotato to irradiation. The study was, therefore, conducted to assess the effectiveness of low dose ionizing irradiation for quarantine treatment and sprout inhibition of selected Ghanaian varieties of sweetpotato. Four varieties, Sauti, Faara, Okumkom and Santum pona, were used in the study and irradiated at doses of 150 Gy and 200 Gy. They were stored at ambient temperature ( $28\pm 1$  °C) for 10 weeks and observed for rots, sprouting, and insect infestation. Irradiation had no significant effect ( $p>0.05$ ) on rots of stored roots. Rots significantly depended ( $p<0.05$ ) on storage time and variety. An increase in storage time resulted in a corresponding increase in rots. Okumkom was the most susceptible to rots. Sprouting increased over the storage period. Irradiation at 150 Gy reduced sprouting to less than 20% for all varieties; 200 Gy practically prevented sprouting in Faara, Okumkom, and Santum pona over the storage period. Irradiation at 150 Gy was sufficient in disinfesting all the four sweetpotato varieties of insect pests.

# Morphological characterization of the national cassava (*Manihot esculenta* Crantz) collection in Côte d'Ivoire

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## Abstract

The collection of cassava (*Manihot esculenta* Crantz) in Côte d'Ivoire is composed of local and introduced varieties from various origins. A study concerning its morphological characterization was carried out from 2001 to 2002 at the CNRA's (Centre national de recherche agronomique) research station at Bouaké. It is based on 14 aerial and belowground qualitative descriptors applied to 340 accessions. Descriptors were recorded between 5 and 12 months after planting. Statistical analyses of data (multiple correspondences analysis, Aggregative hierarchical clustering, etc.), grouped the accessions into 8 homogenous classes. Class 1, 99(41)1 type, is composed of many improved varieties (68 %) while class 6, "Bonoua rouge" type, and class 7, CB type, each contains at least 80 % of traditional cultivars. All the clones with yellow flesh were assigned to class 2, "Agba bana" group. Some features, such as yellow flesh and white root skin have rarely been observed. Duplicate accessions account for 25 % of the germplasm. Therefore, the number of accessions could be reduced to 285 morphotypes.

**Key words:** accession, cassava collection, characterization, *Manihot esculenta*.

# Comparative studies of four storage structures for yam in Niger State of Nigeria

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## Abstract

Yam is one of the main tuber crops grown in Niger State of Nigeria with a high cash and food value for the local farmers. The main problems in yam storage are respiration, transpiration, and sprouting which cause weight and quality losses. In this study, four different yam storage structures were evaluated, local barn, improved barn, improved pit I, and improved pit II. Two cultivars of white yam, *asuba* and *giwa*, were stored and monitored for 18 weeks. During this period, air and soil temperature and humidity of the storage environment, sprouting, weight loss, and dry matter content of the tubers were monitored. The results showed a significant difference in the maximum air temperature among the structures (an average of 35.14 °C for local barn, 34.52 °C for improved barn, 33.43 °C for improved pit I, and 31.41 °C for improved pit II). The average outside temperature ranged from 28 °C to 46.4 °C. There was also a significant difference in the minimum humidity in the structures. In the local barn, with low humidity and high temperature, weight loss was high (22–23.65%). The pits had the least weight loss (18–20.7%), but higher sprouting rates (7.59–10.5%) than the other structures. A significant difference was observed in the dry matter content of the two yam cultivars. The percentage dry matter content of the tubers increased during 18 weeks of storage by 7–13 % from a range of 34–43 % to 43–50 %. The improved pit structures had a lower temperature throughout the storage period, which resulted in a lower weight loss. Commencement of sprouting was delayed and sprouting rate was low in all the improved structures.

**Key words:** Yam, storage, sprouting, temperature, humidity.

# Effect of three-year fallow with herbaceous cover legumes on soil fertility and sweetpotato production in south-eastern Nigeria

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## Abstract

The study, between 1999 and 2003, investigated the effect of a 3-year fallow with leguminous cover crops on soil fertility and sweetpotato production in the lowland humid forest zone of south-eastern Nigeria. The experiment was a 2 × 13 factorial in a randomized complete block design with three replicates. Treatments consisted of two sweetpotato varieties (TIS 87/0087 and TIS 8164) and 13 sources (*Aeschynomene histrix*, *Centrosema brasilianum*, *Centrosema pascuorum*, *Chamaecrista rotundifolia*, *Crotalaria ochroleuca*, *Lablab purpureus*, *Mucuna deeringiana*, *Mucuna pruriens*, *Mucuna veracruz*, *Pueraria phaseoloides*, *Stylosanthes capitata*, natural fallow, and natural fallow with NPK fertilizer). Aboveground biomass at 3 months after planting was significantly higher in *Mucuna veracruz* than in other cover crops except *Mucuna deeringiana*, *Mucuna pruriens*, and natural fallow. At 4 years after planting, however, *Aeschynomene histrix* produced significantly higher biomass than the other cover crops that persisted. Mean soil nitrogen was significantly higher with *Centrosema pascuorum* than with other legume cover crops and natural fallows except for *Aeschynomene histrix*, *Mucuna veracruz*, *Chamaecrista rotundifolia*, and *Crotalaria ochroleuca*. In 2002, shoot dry matter in sweetpotato variety TIS 87/0087 was higher by 37% than in variety TIS 8164 and tuber yield was higher by 68%. On average, tuber yields obtained with NPK fertilizer application were statistically similar to those obtained with *Mucuna veracruz*, *Centrosema pascuorum*, *Centrosema brasilianum*, and natural cover infested with *Mimosa invisa* but significantly lower in other cover crop fallows. There were no significant interactions between sweetpotato variety and the cover crops or NPK on tuber yield. The potassium content of the soil showed a significant positive correlation ( $r = 0.508$ ,  $P = 0.214$ ) with tuber yield. The enhanced potassium content of the soil under *Mucuna veracruz* was therefore reflected in the tuber yield.

**Key words:** Cover crops, fallow, soil fertility, sweetpotato, south-eastern Nigeria