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Full Length Research Paper

The influence of root rot incidence on cassava genotype on consumers' acceptability of the gari produced from it

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In Nigeria cassava root rot causes serious yield losses in cassava tuber production every year. However, the influence of root rot incidence on cassava genotype at harvest on consumers' acceptability of the gari produced from it has not been studied. A sensory evaluation was conducted on gari processed from the tuberous root yield of rot susceptible TME-1 and improved TMS 30572, harvested at 12 months after planting at Sabongidda-Ora (humid forest eco-zone) of Nigeria during the 2003 and 2004 cropping seasons. A 5-point hedonic scale ranging from like extremely, through neither like nor dislike, to dislike extremely was designed to measure the degree of liking for the gari processed from both genotypes. 28 panelists were asked to indicate their degree of preference for the colour, odour and taste of each gari sample by choosing the appropriate category in the hedonic scale. The results were compared with the tuberous root rot incidence and severity of genotypes in the field. All experiments were repeated and the data collected were statistically analysed using the general linear model statistical procedures with the SAS system for windows. Comparisons among treatment means was done with the least significant square, with the Duncan multiple range test (P = 0.05). Variety TME-1 with the highest root rot incidence and severity of 53 and 21% respectively was less preferred for gari colour, texture and odour compared to TMS 30572 which had 15 and 6% rot incidence and severity respectively. In the second year trial where TME-1 still possessed the highest rot incidence and severity, panellists still showed more preference for the colour, taste and odour in TMS 30572 gari than TME-1 gari. All the differences observed and reported above between TMS 30572 and TME-1 were significantly different at probability 0.05%. The results of this experiment clearly show that high root rot incidence of a cassava genotype in the field can reduce consumer's acceptability of the gari produced from it.

Key words: *Manihot esculenta* Crantz., *Botryodiplodia theobromae*, sensory evaluation, *Fusarium* spp., Nigeria.

INTRODUCTION

Even though, cassava as a major food crop in the developing countries of Africa has the potentials of addressing the increasing food demand of the growing African population, yet, the average production of cassava in Africa is currently below the world average (Phillips et al., 2004; FAO, 2005). This is due to the activities of disease agents like *Botryodiplodia theobromae* and *Fusarium* species that cause root rot diseases to the crop. In Africa losses in tuber yield due to diseases can be as high as 90% (Wydra and Msikita, 1998).

Cassava tubers are consumed in Nigeria mainly as gari, a granular finished product. It is consumed either by being soaked in cold water with sugar, coconut, roasted groundnuts, dry fish, or boiled cowpea as complements or as a paste ('Eba') made with hot water and eaten with vegetable sauce. It has a shelf life of 6 months or more, when properly stored (IITA, 2005).

Freshly harvested cassava tubers are susceptible to fungal growth. Due to inefficient harvesting, packaging

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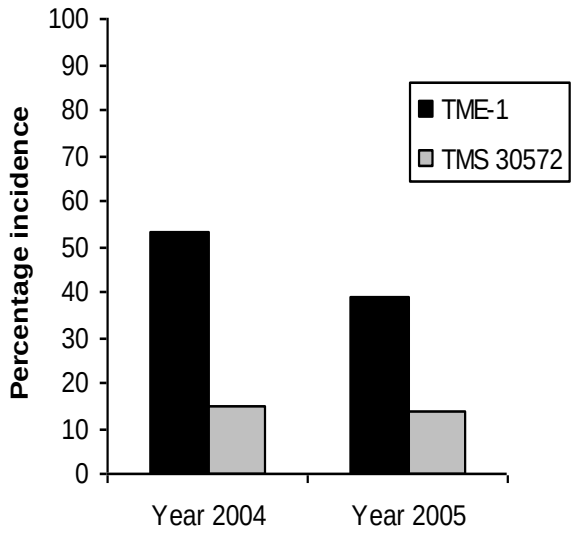

Figure 1. Cassava root rot incidence in two cassava varieties harvested in two different years.

and transportation of freshly harvested cassava tubers, most local farmers are unable to ensure that such cassava tubers are free from rot pathogens contamination, insect damage and without serious bruising or cuts. Farmers and gari processors normally select tubers free from rot for gari processing. Where there is partial rot on tuber, it is severed off, leaving the healthy portion for processing. This is to minimize waste in case of tubers harvested from field with root rot incidence.

Poor hygienic practices are often associated with the early stages of processing by local processors and waste materials from previous process are seldom properly removed from site allowing the risk of cross contamination (IITA, 2005). The possibility of latent infection on cassava tubers harvested from a field with root rot incidence cannot be ruled out; this may be carried over to the eventual gari product processed from such tubers.

In view of cross contamination risk of cassava tubers due to inefficient harvesting by farmers and poor handling by local processors, the objective of this study therefore is to find out if the cassava root rot incidence and severity recorded on genotype in the field has any influence with the eventual consumers' acceptability of the gari produced from it.

MATERIALS AND METHODS

Source of cassava tuberous roots for gari processing

Cassava samples of TME-1 and TMS 30572, collected at Sabongidda-Ora in a previous experiment preceding this one (Aigbe, S. O. and Remison, S. U. *unpublished data*), were used for this study. From the previous study, TME-1, at 12 months after planting (MAP) had the highest root rot incidence of 53% and a 21% severity, while TMS 30572 had the lowest root rot incidence of 15% and a 6% severity.

Preparation of gari samples for sensory evaluation

Mature TME-1 and TMS 30572 cassava tubers without visible rot symptom or with rotted portion excised, were processed into gari using standard procedure. The procedure involved peeling, washing in clean water, grating with a cassava grater and then pressing the liquid content out with a hydraulic press. Fermentation was allowed for 2 days after which it was sieved with a wooden sieve to eliminate fibrous particles to control particle size. These were then roasted in cast-iron pan over fire for 20 - 30 min and cooled at room temperature. Final sieving was done to obtain granules of uniform size after which they were packed in labeled polythene bags. The gari content in the polythene bags were thoroughly mixed and re-packaged into 28 small samples of 10 g each for sensory evaluation by 28 semi trained panelists.

Sensory evaluation using hedonic test

The sensory evaluation was conducted using a 5-point hedonic scale adapted from Watts et al., 1989 indicating degree of liking for colours, texture, odour and taste. 28 semi trained male and female panellists were used. The test consists of a 5-point scale ranging from like extremely, through neither like nor dislike, to dislike extremely, with varying numbers of categories. The panelists were given the gari samples of TMS 30572 and TME-1 from Sabongidda-Ora field. Samples were given to panelists alongside with the hedonic test form, they were asked to indicate their degree of liking for the colour, odour and taste of each gari sample by choosing the appropriate category. The 1 - 5 categories on the evaluation scale were: 1 = like extremely, 2 = like moderately, 3 = neither like nor dislike 4 = dislike moderately and 5 = dislike extremely.

Statistical analysis

Data were subjected to analysis of variance (SAS Institute, 1990). Where the anova test indicated significant differences, treatment means were separated using Duncan multiple range test at 5% probability level.

RESULTS AND DISCUSSION

The gari processed from TME-1 was less preferred for color, texture and odor compared to the gari from TMS 30572 (Figures 1 and 2). In the second season trial where TME-1 still possessed the highest rot incidence; Panelists still showed more preference for the color, texture and odor in TMS 30572 gari than TME-1. In addition, more preference was also shown for the gari taste of TMS 30572. All the differences observed and reported above between TMS 30572 and TME-1 were significantly different at probability 0.05% (Figures 3 - 6).

From result, the gari processed from TME-1 with high root rot incidence, was less preferred for color, texture and odor compared to gari from TMS 30572; with lesser root rot incidence. This clearly shows that high root rot incidence of a cassava genotype in the field can reduce consumer's acceptability of the gari produced from its roots, even though, such roots may appear healthy. This is so because of the possibility of latent infection. The aroma of gari is contributed by the natural aroma of the

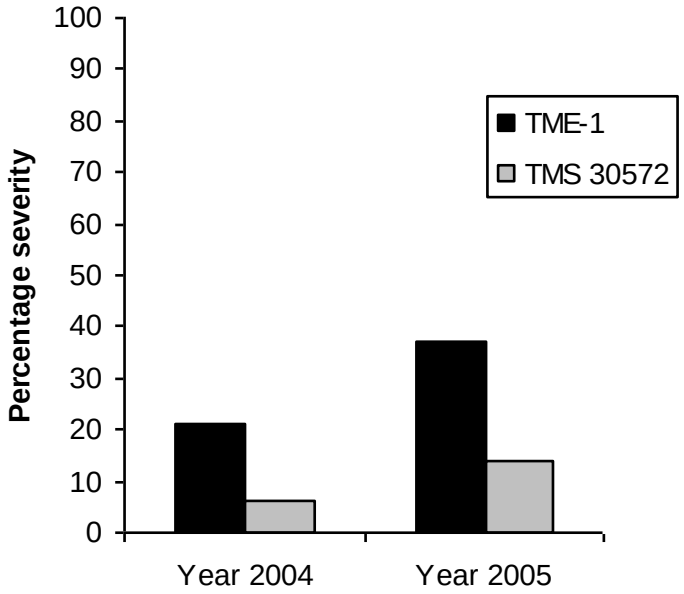

Figure 2. Cassava root rot severity on two cassava varieties harvested in two different years.

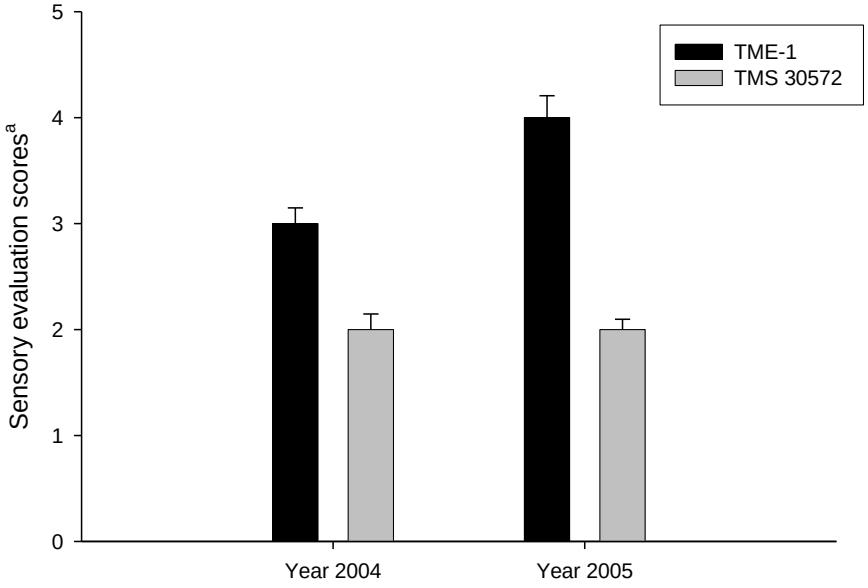

Figure 3. Changes in the colour of gari in two different years due to root rot and varietal differences. 1 = Like extremely, 2 = like moderately, 3 = neither like nor dislike, 4 = dislike moderately and 5 = dislike extremely.

root and the aroma developed by the activities of micro-organisms like *Aspergillus* sp. and *Fusarium* sp. (Okafor and Ejiofor, 1985) both of which were significantly isolated from TME-1 in Sabongidda-Ora (unpublished data).

In a previous report of the associated fungi isolated 12 MAP from the field studied, *Fusarium* spp. was reported to have the highest associated incidence of 55% (Bandyopadhyay et al., 2006). *Fusarium* spp. has been severally reported to release mycotoxin on cassava tubers (Bandyopadhyay et al., 2006), this may be responsible for the consumers' dislike for the gari processed from the TME-1 in this study.

The percentage incidence and severity of root rot in a cassava field at harvest influences consumers likeness for the gari processed from such field. High root rot

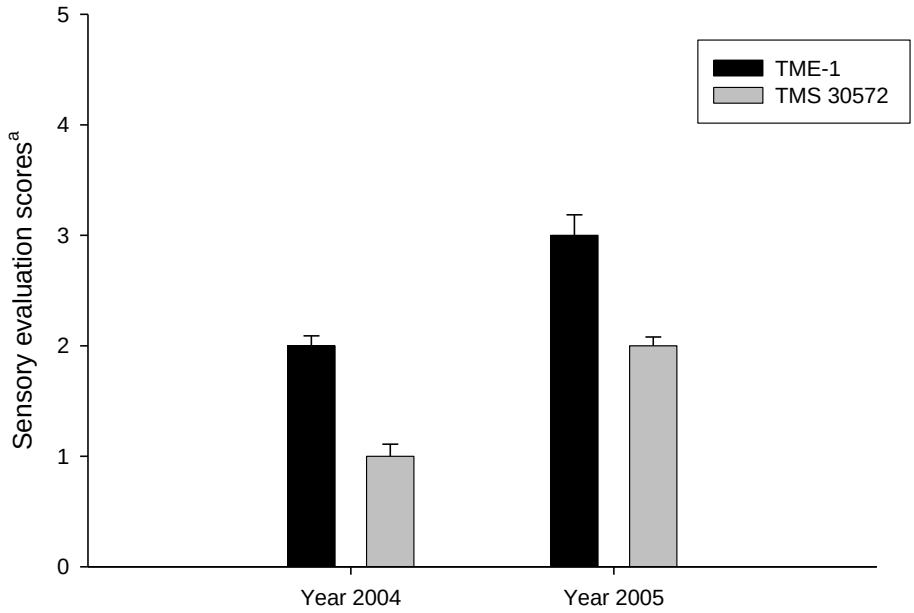

Figure 4. Changes in the texture of gari in two different years due to root rot and varietal differences. 1 = Like extremely, 2 = like moderately, 3 = neither like nor dislike, 4 = dislike moderately and 5 = dislike extremely.

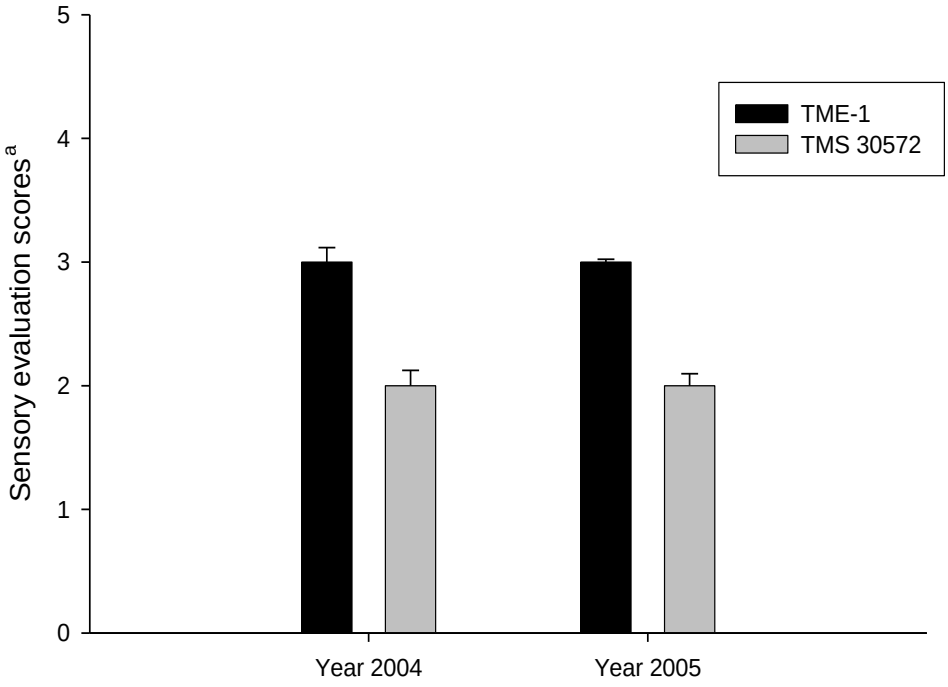

Figure 5. Changes in the odour of gari in 2 different years due to root rot and varietal differences. 1 = Like extremely, 2 = like moderately, 3 = neither like nor dislike, 4 = dislike moderately and 5 = dislike extremely.

incidence in a cassava field at harvest leads to dislike for the gari processed from such field. The effect of root rot on consumer acceptability for other cassava products should be studied, this and future research results should be reflected in the standards for cassava products and the guidelines for export.

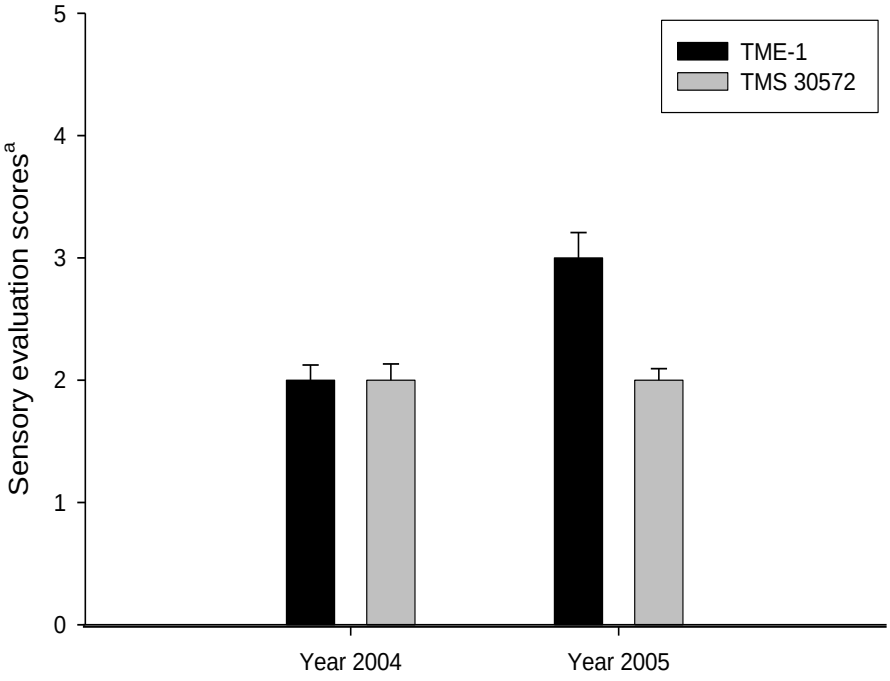

Figure 6. Changes in the taste of gari in 2 different years due to root rot and varietal differences. 1 = Like extremely, 2 = like moderately, 3 = neither like nor dislike, 4 = dislike moderately and 5 = dislike extremely.

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