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Screening of local cassava varieties against cassava mosaic disease and cassava green mite

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Abstract. One of the sustainable solutions in controlling cassava mosaic disease (CMD) is the deployment of resistant genotypes. In this study, fifty cassava varieties mostly local landraces collected from the Lake Zone were screened for resistance to CMD and GCM. The varieties were evaluated in high disease pressure areas of Geita district in a randomized complete block design in two replications in two seasons. Cassava genotypes were obtained from the cassava germplasm bank at ARI Ukiriguru and were planted at a spacing of 1.0m x 1.0m in plots measuring 10.0m x 2.0m. Disease incidence and severity were taken at three months intervals. In the first year, 40% of the genotypes were severely infected by the disease. Many of these were therefore eliminated. The varieties that were retained exhibited significant differences in disease levels ($P<0.05$). The most resistant varieties were Kachaga and Lwamilembe. Their CMD severity scores were 1.5 and 1.0, respectively. Root yield for the two varieties were 10.1kg/plot and 6.2kg/plot, respectively. These yields were higher than those of the rest of the varieties. Varieties that had high CMD severities also gave low root yields. The varieties Kachaga and Lwamilembe were therefore recommended for areas with heavy CMD infection.

Introduction

Cassava (*Manihot esculenta*) is an important subsistence food crop in Tanzania especially in the semi-arid areas. The crop is important because it tolerates drought and marginal soil conditions. It is therefore a household security crop and a famine reserve. Cassava is cultivated and produced in all regions of Tanzania but is mainly produced in Mwanza, Mara, Kigoma, Mtwara, Lindi, Tanga, Ruvuma and the coastal region. Cassava mosaic disease (CMD) and the cassava green mite (CGM) are very big constraints to the production of cassava in Tanzania.

Varieties identified earlier as being resistant to CMD have since become susceptible while those that are resistant to the green mite give low yields and their quality is not acceptable. From recent surveys, CMD and CGM are still pests of economic importance in the lake zone and need immediate attention.

The threat to cassava production posed by the CMD pandemic. In East Africa cassava mosaic disease has been known for a very long time although with limited impact on cassava production. Since the late 1980s, however, the situation changed dramatically with an epidemic of unusual severe CMD, initially reported from north-central Uganda. It is now established that this pandemic is associated with the ACMV variant known as the Ug-V. It has since expanded to cover an area over 750,000 square kilometers of East and Central Africa with devastating effects on cassava production in the affected zones. The disease spread into western Kenya, southern Sudan, eastern DRC and north-western Tanzania, making it arguably the greatest single threat to staple food production in the sub-region. Losses in Uganda between 1992 and 1997 were estimated at USD 60 million per year. Losses

of a comparable magnitude are currently being recorded in western Kenya and northwestern Tanzania. Virtually all of the locally available varieties are susceptible to CMD and many farmers have abandoned cassava cultivation. The effects of CMD have been exacerbated by concurrent infestations with other pests, most notably the cassava green spider mite (CGM). Biological control programs executed by IITA and NARS partners in the region, however, have continued to be successful in managing the effects of CGM but gains from this work are being wiped out by the severe CMD in the region.

Monitoring and diagnostic surveys in 1990 indicated the presence of UgV in four districts of Kagera, where the incidences of the disease were very high. In a 2000 survey the disease was noted to cover Kagera and part of Mwanza regions (Jeremiah and Ndunguru, 1999). Ukerewe Island was also found to be one of the risk areas in the Lake zone. From the experience from the affected areas it was evident that most, if not all local varieties, were susceptible to severe mosaic.

A survey of the districts of Mara and Mwanza regions by Jeremiah and Ndunguru (1999) indicated the presence of good (vigorously growing, high yielding and quick maturing and well adapted) local cassava cultivars. There was however need to establish their levels of CMD and CGM resistance in prepartion for the eminent arrival of the epidemic in this area.

Materials and Methods

The materials for evaluation were collected in the areas where severe CMD was not present. The materials had good performance in different aspects including low levels of CMD, high yields and popular with farmers. They were collected from Mara, Mwanza and Shinyanga regions. The materials were put into a trial in Butundwe, Geita district, an area with high CMD and CGM pressure in a traditional cassava growing area that had been affected by the CMD pandemic. The varieties were arranged in a randomised complete block design, with three replicates. Alleys three metres wide separated the blocks. Single row plots with ten plants spaced 1 m were used.

Fifty (50) commonly grown local cassava cultivars were evaluated. During the first season of evaluation, 17 of these were eliminated due to their severe damage by CMD. Butundwe site in Geita District had high CMD and CGM pressure.

Data Collection. Data collected included CMD and CGM severity starting one month after planting and recorded monthly on every plant thereafter. A scale of 1-5 was used for scoring severity of CMD and CGM where 1 indicated no disease and class 5 severe mosaic disease and leaves severely reduced. The mean severity score for each cultivar was then calculated.

Results and Discussions

Cassava Mosaic Disease and Green mite damage. The mean CMD reaction for the tested clones for three seasons and two locations is presented in Table 1. Varieties Kachaga (1.5), Kachongoma (1.9) Lumala (1.8) and Lwamilembe (1.0) had the least CMD damage at both location and for all three seasons. Varieties Mwendo wa nzige, 77009/5, Ex-Musoma and UKG 95/306 were the most susceptible.

Most of the varieties were affected by the cassava greenmite, although damage levels varied among them (Table 1). Variety Mwita Machela, Kachongoma and 79022 had the least CGM damage. A significant difference was noted among varieties and location. In general, CGM severity was low with a trial mean score of just 2.5.

Cassava yield. The yields of the tested varieties across season and locations are also presented in Table 1. Highest tuber yield was recorded in variety Kachaga (10.1 Kg/plot) followed by variety Lwamilembe (6.2 Kg/plot). The lowest yield was recorded from

Table 1: Cassava mosaic disease, green mite severity and yields for tested varieties.

Variety	CMD severity	Green mite severity	Yield
Monfera	3.1	2.2*	5.4
Kachanga	15	2.1*	10.1
Mbega	2.5	2.9	3.9
Rangimbili	2.5	2.8	3.2
UKG 95/272	2.6	2.3*	5.8
77009/5	3.7	2.5	4.6
Lugomantenga	2.6	2.7	2.9
Kachangisi	2.7	2.1*	5.5
Ex-Ukerewe	2.8	2.2*	3.3
Mlalu	3.3	2.6	6.0
Britis/5	2.4	2.9	3.3
1660/2	2.8	2.9	4.3
Kirigiri	2.5	2.6	4.7
Ali Mtumba	2.8	2.5	4.7
Kachongoma	1.9	1.9	6.0
Obaradak	2.3	2.1*	4.0
Kabumba	2.2	2.7	4.5
Mwendo wa nzige	4.2	2.8	3.5
Nyaikizu	2.6	2.6	6.0
Kihonyi	3.0	2.9	3.2
Sudhe	2.5	2.7	6.0
Mwita Machela	2.5	1.9	6.0
Mzimbitali	3.2	2.4	3.2
Rwabuhaya	3.0	2.4	3.6
UKG 95/277	3.1	2.5	2.3
Ex-Musoma	3.7	2.2*	6.0
Lumala	1.8	2.5	5.6
UKG 95/306	3.6	2.9	5.4
Nyalukapndo	2.9	2.6	3.2
Kamo	3.3	2.4	3.4
79022	2.7	1.7	5.7
Kongolo	2.8	2.7	4.9
Lwamilembe	1.5	2.6	6.2
Mean	2.7	2.4	5.5
CV	27.7	24.7	67.5

variety UKG 95/277 (2.3 t/ha). Seventeen varieties had yields above the trial mean.

A significant difference was recorded among varieties ($P \geq 0.05$). Location and season had a significant influence on yields of the tested varieties. There was also high and significant interaction between location and varieties. A negative relationship between both cassava mosaic disease damage levels ($r = -0.366$), cassava green mite damage levels ($r = -0.33$)and yield was recorded.

Recommendations

Varieties with good levels of CMD resistance have been identified. The most outstanding were Kachaga, Lumala and Kachongoma. The high disease pressure was related to yield reduction with most of the heavily infected varieties having low yields. Fortunately these varieties had low CGM damage scores.

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