A STUDY OF THE POTENTIAL GENOTOXIC EFFECTS OF SOME MEDICINAL PLANTS COMMONLY USED IN KENYA USING THE SALMONELLA/MAMMALIAN MICROSOME ASSAY AND THE VICIA FABA TEST SYSTEM

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ABSTRACT

Several plant products such as the pyrrolizidine alkaloids, flavonoids, cycasin, quinones and bracken fern toxins have been reported to possess genotoxic properties in various test systems. However, crude drugs from plants, i.e., the complex mixture from which these drugs are extracted have been only scantily examined for their genotoxic activity. Such crude drugs are widely used in traditional medicine in various parts of the world.

In the current study, a number of plant extracts, namely; the fresh sap of Aloe graminicola (A. graminicola), and the methanol extracts of Annona senegalensis (A. senegalensis), Centella asiatica (C. asiatica), Maesa lanceolata (M. lanceolata), Myrsine africana (M. africana) and Myrica salicifolia (M. salicifolia) which are commonly used as Kenyan traditional medicine were investigated for their potential genotoxic effects in the Ames/Salmonella/mammalian microsome assay and in the Vicia faba (V. faba) test system.

The results of this study revealed that the Salmonella test is an indispensable tool in the detection of mutagens in crude drugs. In general, metabolic activation with the liver microsomal fraction (S9) increased mutagenic activity of these extracts.
However, evidence of deactivation by S9 of the methanol extracts of *A. graminicola* in TA97a and *A. senegalensis* in TA100 was recorded. The methanol extract of *A. senegalensis* was found to be mutagenic in all the histidine mutants (TA97a, TA98, TA100, TA102, and TA104), but relatively small number of revertants were recorded in all tester strains (the highest being a mean of 549 revertants/plate/1000 ug in TA104 (+S9) compared to 1-2³ cells plated in the mutagenicity assay). This means that histidine which may be present in crude drugs could not have influenced positive results in the extract of *A. senegalensis*.

The plant extracts were found to induce reverse mutations in most of the tester strains. However, TA104, a strain that contains a nonsense mutation (AT) at the critical site of reversion, yielded the highest number of revertants with most of the plant extracts. The analogous strain TA102 detected some of these mutagens but not as effectively as TA104. The greater reversion of TA104 as compared to TA102 suggests that the deletion of the *uvrB* gene facilitates better detection of crude drugs as mutagens.

One of the limitations of the Ames test for the detection of mutagens in crude drugs was the reduction in number of revertants at higher doses. In two plants, *M. africana* and *M. salicifolia*, toxic
occurring in the roots allowed to recover could have been induced in G1 or S phase of the cell cycle.

The fresh extract of *A. graminicola* produced micronuclei in roots allowed to recover for 20 hours. This gives evidence on the possibility of loss of genetic material in cells exposed to this extract.

The methanol extract of *M. lanceolata* increased the size of nucleoli in roots allowed to recover for 20 hours. Nucleolar enlargement (nucleolar oedema) could be an artifact as a result of subjecting the cells to unphysiological conditions. Statistical analysis revealed that there was no relationship between size of nucleoli and dose of treatment.

From the results presented in this study, several plant extracts used in Kenyan traditional medicine are likely to contain mutagenic (genotoxic) ingredients. Some are activated by mammalian microsomal enzyme fractions while certain others are deactivated to some extent. Further studies with purified extracts and other test systems are needed before recommendations regarding their continued use in traditional medicine can be made.