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Aeroponic cultivation of some medicinal plants and their bioactivity

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A simple and efficient aeroponic system was developed for rapid and large-scale cultivation of roots from rooted stem cuttings of Tetradenia riparia and Cyanoptis speciosa, and somatic embryo-derived ex vitro growth of Mondia whitei, a traditional but Red Data Listed root based medicinal plants in South Africa. Antibacterial, antiplasmodial and cytotoxicity activity have been recorded with aeroponic cultivated plants compared with same age greenhouse plants. Aeroponic cultivation medicinal plants can provide high quality roots that are free from pesticides, soil born disease and can be produced in mild winter greenhouse. Methanolic extracts of various aeroponically grown plants showed bioactivity against both Gram- positive (E. faecalis, M. luteus and B. subtilis) and three Gram-negative (E. coli, K. pneumonia and P. aeruginosa). Tetradenia riparia root from aeroponically grown plant had a high activity 0.195 with SI (0.79) against B. subtilis value followed E. coli, K. pneumonia, P. aeruginosa and M. luteus. Leaf of Tetradenia riparia and Mondia whitei roots also recorded high activity. However, greenhouse grown plants recorded moderated activity. Cyanoptis speciosa recorded moderate activity in aeroponic as well as greenhouse plants. The highest antiplasmodial activity was recorded in samples sourced from the greenhouse; roots of Tetradenia riparia (IC50:4.33 µg/ml) and leaves of Cyanoptis speciosa (IC50:8.18 µg/ml). Roots of Tetradenia riparia sourced from aeroponically grown plants also showed good antiplasmodial activity (IC50:13.2 µg/ml) but not as active as the roots of the same species sourced from the greenhouse. The leaves of Cyanoptis speciosa from aeroponically grown plant showed a moderate activity (IC50:31.7 µg/ml) when compared to the same material from greenhouse (IC50:8.18 µg/ml). In the present study, the leaves extract of Tetradenia riparia also displayed a weak antiplasmodial (IC50>100 µg/ml). However, there was an improvement in the antiplasmodial activity (IC50:38.4 µg/ml) of the leaves extract of the same plant, grown aeroponically. The roots extract of Tetradenia riparia, from both sources (greenhouse and aeroponic), displayed stronger antiplasmodial activity with IC50 of 4.33 and 13.2 µg/ml respectively. The choice of treatment in aeroponic supplied nutrients significantly influenced the bioactivity of root quality in three months.

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