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Effects of Temperature and Water Availability on Plant Growth and Artemisinin Concentration of *Artemisia annua* L.

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Abstract

Artemisia annua L. is under debate as a herbal drug against malaria. This effect has been ascribed to the high leaf concentrations of artemisinin, a sesquiterpene lactone that controls even chloroquine-resistant *Plasmodium* species with little side effects. However, little is known about the optimal agronomic conditions for the growth of *A. annua*, in particular the effects of temperature and water availability on dry matter production and artemisinin concentration. Therefore, an experiment was conducted under controlled conditions to investigate the effects of three different average temperature regimes (20°C, 25°C and 30°C) and two different water levels (sufficient and reduced) on shoot growth of *A. annua* thereby increasing our knowledge about environmental factors on the cultivation of this herb as a drug.

The trial with *A. annua* cv. *anamed*, a cultivar with a particularly high artemisinin concentration in its shoot, showed large effects of temperature and water availability on plant growth, whereas treatment effects on the artemisinin concentration were much lower than expected.

Suboptimal water supply reduced dry matter production by 21–70 % whereas temperatures had little effect on shoot growth.

The artemisinin concentration in plants grown at 20°C and sufficient water level was 19 % higher than that of plants grown at 30°C. At the low water level the cooler temperature regime resulted in a 10 % higher artemisinin concentration.

The relatively high concentration of artemisinin in the leaves of the clone used (>1 %) confirms that this breed is of interest as a raw material for a possible plant-based anti-malarial drug in Africa.

Keywords: Africa, *Artemisia annua*, malaria, water scarcity