AEROPONICS: AN ALTERNATIVE PRODUCTION SYSTEM FOR HIGH-VALUE ROOT CROPS
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An aeroponic system was developed for the production of root crops used as raw materials for the herbal and phytopharmaceutical industries. The variability in the phytochemical quality of botanicals produces inconsistent products and precludes the ability to administer uniform dosing in clinical studies. Aeroponic systems allow the producer to precisely control root zone nutrient and water regimes and environmental conditions, as well as have complete access to the roots throughout the life of the crop. An A-frame aeroponic system was designed to maximize root yields and permit free access to the roots for monitoring.

Burdock (Arctium lappa, Asteraceae) plants were grown in aeroponics with controls grown in a greenhouse soilless mix for ten weeks in a research greenhouse in Tucson, Arizona. The plants were harvested and the dry weights of above ground parts and roots were determined, as well as the chlorogenic acid concentration in the dried roots. Chlorogenic acid is a caffeoylquinic acid derivative known to have antioxidant activity. The chlorogenic acid concentration of several commercial burdock root preparations were also determined and used as benchmark values. A second crop of burdock was grown for six months in the same aeroponic system and the root biomass and chlorogenic acid yields were determined. The second crop grew from seeds obtained from different seed sources to ascertain if phytochemical variation might be due to variation within the species.

The biomass yields of the above ground (aerial) parts were significantly higher in the aeroponically grown plants compared to the controls. The root biomass yields showed no significant difference between treatments. The chlorogenic acid concentrations were also not significantly different, however the plant-to-plant variability was significantly lower in the aeroponically grown plants, suggesting the potential for more consistent phytochemical yields using this production technique.