Chemical exchange saturation transfer (CEST) is a novel MRI contrast mechanism that is dependent on intracellular pH. Amine and amide concentration-independent detection (AACID) is a recently developed CEST contrast method that can be used to measure intracellular pH. Intracellular pH ($pH_i$) has an important role in the maintenance of normal cell function, and is normally maintained within a narrow range by the activity of transporters located at the plasma membrane. In cancer, changes in $pH_i$ have been correlated with both cell proliferation and cell death (apoptosis). In addition, high $pH_i$ appears to be a common feature of proliferation, chemotherapy resistance, and thermosensitivity. Quercetin is a bioflavonoid and monocarboxylate transporters (MCTs) inhibitor. The goal of this study was to determine whether AACID CEST MRI measurement of tumour $pH_i$ was sensitive to acidification after quercetin injection. Using a 9.4T MRI scanner, CEST spectra were acquired in six mice approximately 14 days after implanting $10^5$ U87 human glioblastoma multiform cells in the brain, before and after administration of quercetin (dose: 200 mg/kg) by intraperitoneal injection. Three additional mice were studied as controls. These mice received only the vehicle injection. Repeated measures t-test was used to examine changes in tumour and contralateral tissue $pH_i$. Two hours after quercetin injection there was a $0.21 \pm 0.03$ reduction in tumour $pH_i$, and a $0.05 \pm 0.03$ increase in contralateral tissue $pH_i$. Inspection of pH maps following vehicle injection also showed a small decrease in $pH_i$. In this experiment we used quercetin to induce a metabolic change detectable by endogenous MRI contrast. This paradigm represents a unique approach to cancer detection that differs from other current molecular imaging techniques, which require the injection of an imaging contrast agent. These results demonstrate that CEST contrast changes after administration of quercetin could help localize brain cancer and monitor tumor response to chemotherapy within two hours of treatment.