This paper provides a rigorous theoretical formulation to obtain an inductive resonant wireless power transfer (WPT) link with load-independent output voltage or current. This is a crucial working condition for wireless battery recharging, where there is no deterministic knowledge of load variation with respect to the battery charging level. The ideal lossless and the realistic lossy configurations are considered for both voltage- and current-excited WPT links. The link transfer matrix (ABCD matrix) is used to determine the operating frequencies where a load-independent output voltage or current can be obtained. It is shown that in the lossy cases that an almost load-independent behavior can be achieved, provided that the load resistance lies in a suitable range and analytical conditions on the load resistance value have been derived. The analytical relationships obtained by this theory are validated by means of both circuit simulation and experimental data at 13.56 MHz.