Rainbow colorings of graphs have been introduced in [1]. They are edge colorings of an undirected graph $G = (V, E)$ such that there is a path between any two vertices of $G$ for which all of its edges are differently colored. A rainbow coloring is called a rainbow $k$-coloring if it uses at most $k$ colors.

Counting rainbow $k$-colorings is computational intractable in general graphs. We present here some graph classes for which this counting problem can be solved in polynomial time. Especially we show how to count rainbow colorings in tuber shrubs, which are graphs that arise from attaching a rooted tree to one vertex of a cycle.

As main tools, we use a generating function for the number of rainbow colorings of a graph — the rainbow polynomial and for counting independent edge sets in rooted trees — the rooted tree polynomial.

**Keywords:** rainbow coloring, graph polynomial, unicyclic graph.

**AMS Subject Classification:** 05C31, 05C15.

**References**