Monogenetic basaltic volcanic fields are distributed worldwide in tectonic environments ranging from extensional to compressive. Such fields are composed of numerous volcanic centers, with each center representing the end point of a separate pathway of magma from its source to the surface. Understanding similarities and differences between these fields may provide us clues for the generation of monogenetic basaltic volcanic fields. We analyzed the spatial distribution and lineaments of volcanic centers within 20 different monogenetic volcanic fields, applying methods used successfully elsewhere to characterize random spatial distribution of natural phenomenon (e.g., fractures, earthquakes, volcanoes). For each volcanic field, spatial distribution was analyzed using nearest-neighbor analysis and power-law distribution, while alignments between volcanic centers, which we suppose to be representative of preferential pathways used by the magma to reach the surface, were first generated using linear regression, and then analyzed using power law distribution. The fractal dimensions of spatial center distribution range from 1.02 to 1.86, with no clear relation with tectonic setting. These first results suggest that the distribution of centers within a volcanic field is not dependent on its tectonic environment.