The extensive use of herbicides in agriculture becomes an important factor in environmental pollution, especially in case of slowly degradable compounds. Some agents act on plants during a long period of time, even if a very low concentration of the herbicide remains in the soil. Here, we investigated the toxicological effect of a low concentration of dinitroaniline herbicide, trifluralin, on growing seedlings of *Hordeum vulgare* L. Trifluralin in concentration of 1 μg/ml inhibited root growth. The mitotic activity of meristematic cells was suppressed due to the retardation of metaphase progression – alteration that can be caused by cytoskeleton disorder. Using antibodies to α-tubulin, we investigated the distribution of microtubules in root meristem cells. During all stages of mitosis, the highly regular system of microtubular cytoskeleton observed in control cells was slightly disorganized. An examination of root structure using light and electron microscopy demonstrated that the cell walls did not form normally during cell division that led to the appearance of large multinucleated cells. Also, the premature (pathological) cell differentiation was induced by trifluralin. A part of differentiating cells showed intracellular structural changes that are consistent with programmed cell death. It seems that the development of alterations in trifluralin-treated roots was due to the microtubular cytoskeleton disorganization.

**Keywords:** Herbicides – trifluralin – roots – microtubules – differentiation – programmed cell death