This study investigated the long-term effects of electric fields (EF) which might cause physiopathological or morphological changes in the testis tissues of rats. We assumed that using resveratrol (RES) might reduce harmful effects of the EF. Thirty-two male Wistar Albino rats were randomly divided into four groups with eight animals in each; control, EF, EF + RES and RES. Malondialdehyde (MDA), superoxide dismutase, catalase, glutathione peroxidase and histopathological parameters were evaluated in testis tissue. Epididymal sperm count, motility and DNA damage were studied. Total testosterone, follicle-stimulating hormone, luteinising hormone, estradiol and growth hormone levels were evaluated in the plasma samples. EF caused statistically significant increase in MDA levels, body weight and DNA damage. A significant decrease was detected in sperm count and motility. The histopathological examination of the testes showed the germ cell decrease in the seminiferous epithelium with oedema and vascular congestion in the interstitial tissue. In immunohistochemical examination, the increase in the apoptotic cells number was detected. RES partially ameliorated biochemical, histopathological and immunohistochemical findings in the EF + RES group. These findings clearly demonstrated that EF can cause damage in rat testis. RES can ameliorate the damage caused by EF.