

In present investigation, total twenty five mushrooms were collected for exploring the diversity of mushrooms from Maingi Baila Forest, Miandam, Swat Valley, KP, Pakistan. These mushrooms were characterized on the basis of morphological, anatomical features and characterized under the scanning electron microscopy, as well as on molecular basis. These mushrooms (*A. griseofolia*, *P. porphyrosporus*, *C. cibarius*, *C. sanguineus*, *H. crispa*, *L. fumosus*, *P. repanda*, *T. floccosus*) were already happened to be in the scientific knowledge in Pakistan. Other sixteen mushrooms (*A. maingibellaensis*, *M. reticulata*, *L. tinyspinosa*, *A. granulatam*, *B. longiformis*, *T. swatica*, *C. pakistanica*, *C. tocsins*, *C. squamousporus*, *C. caterensis*, *C. clusterosporus*, *E. pentagonii*, *I. swatica*, *I. pakistanica*, *R. pakistamica*, *R. neocystidia*, *M. dwarfii*) were new for mycologists from Pakistan. Eleven of them (*A. maingibellaensis*, *M. reticulata*, *A. granulatam*, *B. longiformis*, *T. swatica*, *C. pakistanica*, *C. tocsins*, *C. squamousporus*, *C. caterensis*, *C. clusterosporus*, *I. swatica*, *M. dwarfii*) were subjected to molecular characterization using rDNA-ITS. Molecular characterization will also be included when received from MacroGen Korea. Three selected mushrooms specimen were also studied under FTIR analysis, antioxidant activity, antibacterial activity. *Cantharellus cibarius* showed the best FTIR analysis, antioxidant and antibacterial activity. So, this selected mushroom was then used for anticancer test in male BALB MICE and it was the very first time in Pakistan when anticancer study was performed on mice.

The basic aim of this detailed study was to enhance and improve the existing literature about the diversity of Mushrooms in Pakistan and to provide a better source to the upcoming mycologists.