

Pure bio-active compounds from the Egyptian fungus *Aspergillus* ASAI

Mostafa Alasmaey

Al-Azhar University, Egypt National Research Centre, Egypt

Aspergillus is a fungus whose spores are present in the air we breathe, but does not normally cause illness. In those people with a weakened immune system, damaged lungs or with allergies, *Aspergillus* can cause disease. Common *Aspergillus* infections include invasive aspergillosis, ABPA CPA and aspergilloma. Aspergillosis is a group of diseases which can result from aspergillus infection and includes invasive aspergillosis, ABPA CPA and aspergilloma. Asthma is also complicated and exacerbated by aspergillus infection (SAFS). *Aspergillus* affects humans and birds and animals can also develop aspergillosis, commercially many plant diseases and food spoilage may be due to aspergillus infection. *Aspergillus* species are common and widespread moulds in the nature. They are among the most successful groups of moulds with important roles in natural ecosystems and the human economy. They are widely used as cell factories for the production of food ingredients, enzymes and antibiotics. *A. niger* and *A. ochraceus* are used in cortisone production. *A. terreus* produces meviniolin which is able to reduce blood cholesterol. They can be used as an expression system for eukaryotic proteins. In food industry, *A. oryzae* is used to ferment soybeans to soy sauce. *A. niger* is used in the bread and beer making industries and also is able to decompose plastic. In addition of food industry, fungal biomass of *Aspergillus niger*, is a by-product of citric acid fermentation that has proven to be a valuable biomaterial that can be both beneficial and practical. From an environmental point of view, it can be a useful bio-adsorbent to detoxify and decolorize the wastewater samples. *Aspergillus niger* has a plethora of strains. The size of different strains of *Aspergillus niger*, as individual organisms, can range from anywhere between 900-1,600µm in length, with the rough, spherical conidia measuring 3-5µm. Some strains of *Aspergillus niger* are known to secrete ochratoxins –mycotoxins which can give rise to nephrotoxicity and renal tumours in a variety of animal species and are potentially hazardous to human health through their consumption. They are released by *Aspergillus* and *Penicillium* fungi species. Ochratoxin A, for example, is a problem organism during the bulk storage of grains if the conditions are in any way wet or damp. More recently, the strain ATCC 16404 strain of *Aspergillus niger* has had to be reclassified as *Aspergillus brasiliensis*. This strain was considered similar enough to be classified as the same species, however, with the addition of more research, it was deemed too different – so required a new classification in 2007. Because this strain of *Aspergillus* is used frequently in the pharmaceutical industry, the ATCC number and details therefore also required updating inside the U.S. Pharmacopoeia and Europe Pharmacopoeia. The last two decades have shown that the fungi can be ‘bio-factories’ of bioactive secondary metabolites with novel skeletons. Amongst the fungi *Aspergillus* species are a rich

source of structurally unique and biologically active secondary metabolites. During the course of our investigation on bioactive natural products from micro-organisms, we found the extract of fungus ASAI was obtained from the soil sample collected at Giza province, Egypt and identified as *Aspergillus* sp., it had a promising activity against many pathogenic test organisms. Chromatographic techniques isolation led to the isolation of nine pure compounds, which were identified by using 1D and 2D NMR. One-dimensional (1D) NMR spectroscopy includes regular (1H) Proton, 13Carbon and spectra of other nuclei. There are two main types of one-dimensional experiment, regular and decoupled. 2D-NMR techniques can save time especially when interested in connectivity between different types of nuclei (e.g., proton and carbon). The basic 2D NMR experiment consists of a pulse sequence that excites the nuclei with two pulses or groups of pulses then receiving the free induction decay (fid) and classified into three types: triterpene, quinone and diketopiperazine alkaloid. Triterpenes are a class of chemical compounds composed of three terpene units with the molecular formula C₃₀H₄₈; they may also be thought of as consisting of six isoprene units. Animals, plants and fungi all produce triterpenes, including squalene, the precursor to all steroids. The quinones are a class of organic compounds that are formally "derived from aromatic compounds [such as benzene or naphthalene] by conversion of an even number of –CH= groups into –C– groups with any necessary rearrangement of double bonds", resulting in "a fully conjugated cyclic dione structure". diketopiperazines are another group of biologically active compounds synthesized by Penicillin. They consist of residues of two amino acids and mevalonic acid. For example, roquefortine and related alkaloids(3,12-dihydroroquefortine), glandicolines A and B, melegrine, and oxalin are formed by tryptophan, histidine, and mevalonic acid. Tryptophan and mevalonic acid are also the precursors of the diketopiperazine alkaloids fellutanines and isofellutanines (Kozlovskii et al., 2000). Brevianamides A and B and piscarinines A and B are synthesized by tryptophan, proline, and from one or more mevalonic acid molecules.