to form a glycoside [20]. The selection of microbes as candidates for fermentation depends on process characteristics (such as viscosity or recoverability), legal approval of use, and the state of knowledge about the selected organism. Sugars comprise the principal feedstock (i.e., production process strictly biological) for microbial processes (carbon and energy sources) [20]. Feedstocks include molasses, unrefined sugar, and sulfite liquor from cellulose production plants, hydrolysates of wood and starch, or fruit juices, such as the grape juice used in wine making processes. Thus, these raw sources contain other compounds beside sugars. This can be beneficial, because vegetative materials invariably contain nitrogen, phosphorus, and potassium, important nutrients to maintain microbial growth and metabolism [20]. For the purer feed stocks, the nutrients are added to the reactor as inorganic compounds such as ammonium compounds, phosphate, and potassium chloride. Organic supplements include meal, fish meal, cotton seed, low-quality protein materials such as casein or its hydrolysates, millet, stillage, and corn steep liquor. In addition, these chemically complicated mixtures must contain micronutrients, that is trace elements and growth promoters, which are limiting factors. In general, the raw materials are dissolved or suspended in water, and then the medium is heated, filtered, and sterilized. For downstream processing (harvest, concentration, and purification) or for analytical assays during the process, additional pretreatment of the raw material can reduce unwanted side reactions [20] (Figure 6).

By imitating natural selection and evolution, the performance of naturally occurring enzymes can be improved. Enzymes can rapidly be "evolved" (this technique is called "molecular evolution") through mutation or genetic engineering and selected using high-throughput screening to catalyse specific chemical reactions and to optimize their performance under certain conditions such as elevated temperature [77].

11. Nigeria Situation

In research institutions and universities, biocatalysis have been applied in laboratory-scale experiments and primary investigation of product synthesis. Most of the detergents in the country are incorporated with various enzymes. The most significant areas of application of biocatalysis as a biotechnological tool in Nigeria are in the areas of yoghurt production by many local industries, confectionaries and bread production industries, local fermented special seasonings (Ogiri and Okpei) for soup making in the eastern part of Nigeria, produced by boiling melon seed, castor oil seeds and exposing them to microorganisms in the environment for fermentation followed by milling and packaging for consumption. Others involve fermentation of cassava for food and brewing of alcoholic drinks by pilot commercial industrial production in organizations such as Nigerian Breweries, Nigerian Distilleries, Guinness Nigeria Plc, and many other brewing industries which spread across various states in the country (Table 6).

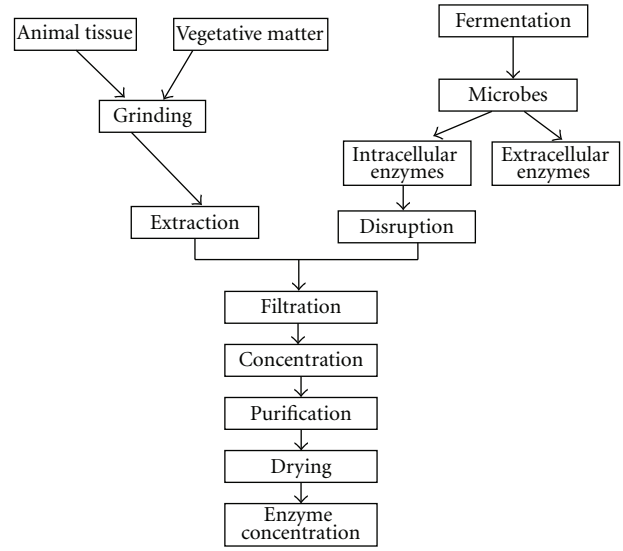

Figure 6: Steps in industrial fermentation (enzyme production). Source: [25].

Enzyme biotechnologies can be visualized as sets of biological reactions occurring at various scales in the environment. The activities of enzyme in reactions can lead to desirable results, such as the chemical transformation and ultimate degradation of toxic substances into harmless compounds. Biological reactions may also lead to undesirable results, such as the introduction of genetically modified organisms to an ecosystem or the generation of toxic chemicals. Here enzymes are modified to do the clearing process of these toxins.

12. Conclusion

At the backdrop of the need to meet certain challenges that affect development, thus the much needed change to bring about these developments informed the decision by the United Nation to elaborate on key agenda which most nations are expected to adhere to in order to achieve certain goals known as Millennium Development Goals (MDGs). The attainment of these goals, aiming at ensuring that participating countries, provide basic good things of life for their citizens.

The United Nations (UN) Secretary General's Special Adviser on the MDGs, Jeffrey D. Sachs, visited Nigeria recently for assessment of progress in indicators of whether Nigeria is on the part of attaining these (MDGs) and he gave his verdict. In his word as reported by Anuforo [94] "One would say Nigeria is on the path, but not well on the path. The direction is positive. The institutional innovation is exciting. But the quantitative achievement is not sufficient. So, there really need to be acceleration between 2010 and 2015."

On her part, the Senior Special Assistant to President Goodluck Jonathan on the MDGs, Mrs. Amina Az-Zubair, also gave perspective to what the Nigerian Government is doing to attain the 2007 to 2016 objectives. According