

Molecular Methods as A Precondition for Development of Agriculture and Livestock Production

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Received: April 30, 2019; **Published:** May 27, 2019

The further development of agriculture and animal production cannot be accomplished without systematic application of contemporary molecular methods. That approach is currently non-replaceable for the improvement of food production and its control. The protein and nucleic acids (NA) analytical methods can be used for: marker assisted selection; determination of the food products origin and quality; detection of animal and plant diseases, GMO production and control, expression an evolutionary studies etc.

Marker Assisted Selection is commonly applied in animal and plant breeding using appropriate marker genes related to important traits in all branches of livestock and crop production using usually PCR based methods. In the last decade specific SNP's chips were developed for genome analysis of different organisms enabling characterization of thousands of single nucleotide polymorphisms (SNP's) which generates vast amount of data. However, the new developments need to take in account the conventional genetics which is still basis of selection in agriculture. The identification of the food products origin and their quality is another field of food production where the molecular tools are widely applied. The challenge to provide food safety and security in all phases of food production, processing and distribution, beside the common chemical methods, usually is done by protein profiling and different DNA assays. Not less important is an application of these tools in detection and characterization of causative agents for animal or plant diseases. These techniques provide fast and precise identification of viruses, bacteria, fungi and other organisms that can affect food production. And finally, the GMO production and control as reality is an outcome of application of molecular techniques in last three decades.

There are many other fields where the application of molecular tools in the first moment doesn't seem commercially important, but has serious long-term impact in the further developments of agriculture. In that sense, the expression studies are performed in order to analyze active genes and inhibitors in different metabolic pathways using mostly real time PCR. Also, the evolutionary studies are used to analyse and to protect the agro-biodiversity. According to FAO, in last few decades, there are more than 3000 animal breeds and strains worldwide that due to a dominant presence of new, more competitive breeds disappeared as genetic resources. These studies are performing on molecular level using DNA microsatellites in order to determine the genetic distance among the autochthonic breeds and strains of domestic animals and the plant varieties. The DNA microsatellites or the Short Tandem Repeats (STR) are determined by fragment analysis and if necessary by DNA sequencing.

There are few important factors as preconditions for implementation of these methods such as: trained human resources, new generations of technical devices and awareness of possible end users for such services in public and business sector. Beside the skills closely related to the handling and the analyzing of target molecules (proteins and nucleic acids), it is also necessary to develop capacities for usage and interpretation of gained data by experienced professionals in the field of bioinformatics. For such purposes, it is important to develop syllabi focused precisely on molecular biology and its tools acknowledged to the agriculture and the food sciences for undergraduate and

graduate studies. Also, in the frame of scientific and professional institutions dealing with this field it is important to organize different types of non-formal and informal courses for NA extraction, PCR base methods, new generation sequencing, microarray analysis etc. From the other side, the technical improvement in estimation of NA and protein molecules is incredible and it is still an on-going process which is very difficult to follow. But without such insight in modern trends, it is impossible to widen the application of these tools in practice. Finally, increasing of the awareness for wider usage of modern techniques in agriculture and livestock production is mostly dependent on presenting relevant information about this issue. From one side, it is important to avoid academization by complicating the issues and presenting scientific explanations, in too technical terms, about the possible benefits, and from the other side to offer services and prices, which will enable commercialization of them. Special effort needs to be put to motivate the decision makers in order to understand the importance of modern and emerging techniques and to create the legal and financial framework for their usage.

This is in general the environment, which can provide sustainable and systematic implementation of new knowledge and skills about the improvement of food production through the application of modern molecular tools which are worldwide, yet still not optimally implemented [1].

Conclusions

1. Molecular methods became irreplaceable tools for further development of agriculture and food production.
2. It is extremely important to build human and technical capacities for wider application of these tools in parallel with arising of awareness of their importance among the stakeholders in this sector.

Volume 5 Issue 6 June 2019

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