The short story of rice grain quality

STORYTELLER

« All living organisms, rice included, are supported by a genome, e.g. the totality of their genes. Thanks to their ability to talk with the environment, the genes produce a phenotype, e.g. the totality of the traits that we usually observe in a living organism and that give us the daily opportunity to say... "that's lovely monkey!"... and, why not... "that's interesting rice plant!"... Oh yes!... someone could be interested to the phenotype of a rice plant, or even to the phenotype of a single rice grain.

But... please, let me came back to the origin of this story.

The genome "builds" a rice plant using a well-defined hieratical scheme, along which other important actors, transcriptome and proteome, play pivotal roles in translating the genome information in a phenotype. We can imagine the transcriptome as the inventory of all the active genes at a given moment in time, whereas the proteome could be defined as the whole of the proteins that has been synthetized using the information inside the transcriptome. Therefore, thanks to transcriptome, the information inside the genome is translated in a proteome. »

reader

« Ok!... is the phenotype a simple proteome ? »

« Not exactly. If this is the case all the living organisms should be consider simply aggregates of proteins, which are not exactly what we experience every days. A rice grain contain not only proteins but also a broad variety of constituents, such as starch, sugars, lipids, vitamins, antioxidant compounds, flavorings, and minerals that largely contribute to determine its phenotype and nutritional value. All this constituents are present in a grain thanks to the wonderful ability of the proteins to organize complex metabolic activities that contribute to define the final product that usually we experience and enjoy in our dishes. »

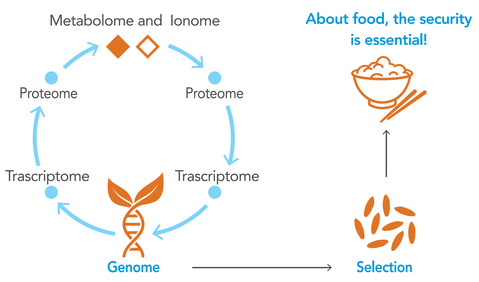
« Ok! This makes my mouth water and I am beginning also to be interested in the phenotype of a rice grain. Moreover, I would like to suggest you to consider other two "OMEs": the metabolome and the ionome ! »

« Brilliant! In the first "ome" we could include all the molecules produced by the metabolic activities of the proteins, whilst in the second one we could include all the mineral elements found in a rice grain. This is a good suggestion »

« Ok!... I know!... Men's fantasy has no limits... but in this way we are producing a litany! What is the mean of all of these "OMEs" ? »

« I know! Let me give a concrete example!

Please, see this picture



« The interactions between these OMEs produce a living organism, but also its **look** and **composition**. To understand the behaviors of the OMEs mean to understand how a rice plant produces and control the quality of its grains. When we want to taste a good "risotto" we expect to heat an appetizing, nutrient and healthy dish. This means that we have to cook a product with a high nutritional value, extremely rich beneficial compounds, and without any toxic elements (cadmium, lead, chrome, arsenic, etc.) that can be occasionally taken up by the plants and accumulated into the grains. Taken all these aspects into account it appears clear that the knowledge of both metabolome and ionome contributes to our understanding of how an interesting rice grain is produced. If you go back along this story, you will see how it would be possible to gain information about the genome by simply observing some phenotypic aspects: the metabolome and the ionome. The study of these important aspects of the rice grain quality allow us to individuate the key genes which control them, with the final aim of selecting new varieties producing healthy and nutrient grains. Our daily efforts in going back along this story like the "shrimps" testifies our attention to the Italian rice quality. »

Progetto UNIPER EXPO TUTTI

finanziato da mipaaf Ministero delle politiche agricole alimentari e forestali

LE UNIVERSITÀ PER EXPO 2015 COMITATO SCIENTIFICO DEL COMUNE DI MILANO

UNIVERSITÀ DEGLI STUDI DI MILANO

DiSAA DIPARTIMENTO DI SCIENZE AGRARIE E AMBIENTALI