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Soil Microbiology in Agricultural Research in Relation to Ancient Knowledge

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Abstract

Actually the advances in massive communication media and social networks have allowed us to know the preferences in agricultural research worldwide, which are specially focused in areas of genetics, plant pathology, tillage techniques and agro-ecology. The main effort is for food products with global distribution leaving beside native or forgotten species and varieties. Soil microbiology is more generalist in microorganisms and plant species that previously mentioned areas, giving attention to beneficial interactions. Application of soil microbiology along with the ancient knowledge in forgotten crops can help to promote their production, diffusion and conserve the genetic pool.

Keywords: Ancient knowledge; Soil microbiology; Forgotten crops

Introduction

Research gaps have been covered thanks to the advances in technology and scientific knowledge. Nowadays, many assays have been conducted in the quest to create applied technologies in agriculture, trying to a) improve life quality, b) supply the world next year's food requirements, c) recovering degraded soils and, d) obtain products and competitive advantages under the global climatic change [1,2].

There searches are diverse and comprehensive ranging from simple crop selection to the genetic management [3]. They also include genes selection to create resistance against pests, the productivity improvement to produce high quality crops and, inclusion of foreign genes in plants, all of them forecasting of supplement the human being nutrition [4,5]. These researches include the selection of a high variety of microorganisms with beneficial effects on plants, such as their nutrition and surviving in adverse conditions [6,7].

Unfortunately, many of these agricultural investigations are performed mainly over widely distributed plant species and varieties that are the source of food for the majority of word population [7-9]. These crops have a huge area on earth surface for their production [1,2,10], leaving beside and forgetting a high amount of native varieties or plant species with nutritional or medicinal potential [11-13].

Crops characterized by their low productivity, low demand, reduced size, long harvesting time, or restricted distribution because of specific local growing conditions, but with high nutritional value or with desired medicinal properties are scarcely investigated. Species such as quinua (*Chenopodium quinoa*), ibia (*Oxalis tuberosa*), cubio (*Tropaeolum tuberosum*), mangostine (*Garciniamangostana*), yacon (*Smallanthus sonchifolius*), nispero (*Eriobotrya japonica*), pomarrosa (*Syzygium jambos*), pupunha (*Bactris gasipaes*), taperebá (*Malpighia emarginata*), buriti (*Mauritia flexuosa*), Nispola (*Mespilus germanica*), salac (*Salacca zalacca*), durian (*Durio zibethinus*), rambutan (*Nephelium lappaceum*), and other plant species are poorly studied [11,12]. Along with previous species, forgotten varieties of crops such as beans (*Phaseolus vulgaris*), and corn (*Zea mays*), are limited to local or native are as for their use and management [13].

Among agricultural biotechnology, the soil microbiology has a contrasting perspective because it has not a strict specificity with plant species. In the latter area, the biotechnological advances usually are widely used. For example, fungi and bacteria with phosphate solubilizing capacities are investigated in terms of solubilizing capacity of different phosphate sources, the effects of environment in their performance, their association with different plant species, their nutritional benefits in association with different crops in different soil pHs or with different carbon

sources [14-16]. Furthermore, the symbiotic nitrogen-fixing bacteria have been studied in terms of their plant association and geographical distribution. Al together with nitrogen free fixing bacteria, they have been evaluated in their nitrogen fixing capacity, their behaviour in different conditions and habitats, their association with different crops, and in search and selection of the most effective methods and culture medium for propagation, even in the search of genes that determines their functioning [17-19].

Finally the Arbuscular Mycorrhizal Fungi (AMF) is characterized because of the low specificity in their association with plants [20]. In these fungi, different species of 270 recognized are associated with the 90% of plant species. Different fungal species can be associated with the same plant species. In the root association, fungal species can change with phenological plant development and environmental conditions [21]. The fungal genera Glomus and Acaulospora have cosmopolitan distribution and can be found in different elevations in the five continents [22-24]. The studies in these microorganisms are focused in their association with different plant species, their changes in association, their characterization in different natural and cultivated systems, their capacities to decontaminate the soils and promote the plant growth and productivity [25-28].

Several studies of associative effects of microorganisms that promote plant growth are realized in microcosms conditions. Under these conditions, the results anticipate or replicate the association behaviour in field conditions [29,30]. This kind of assays are usually performed with pure strains as with mixes of microorganisms, sometimes the plants are exposed to microorganism similar or not to found in soils where extracted. In other cases, the environmental conditions are variable, from natural condition to stressing environments [31,32]; the results can be contradictory and in many occasions contrast with laboratory assays.

Conclusion

For the agricultural development, the perspectives of use of beneficial soil microorganisms constitute an imminent potential in the development and sustainability of conventional and traditional agriculture. The rescue of lost or hidden agriculture knowledge and traditions and crop management, that rest in memory of ancient people, behind the modern knowledge, deserve a high potential that needs to be exploited [12, 33]. The fusion of soil biotechnology, ancient knowledge and modern research in forgotten crops is needed to promote their diffusion and conservation of the genetic pool. We must begin right now, taking advantage of the low specificity of soil associations and perhaps we already started without knowing it.

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