Plant Health and the Science of Pests and Diseases

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Abstract

The health/disease duality has developed alongside human history either as a struggle for survival or as a challenge of the human being to effectively get to know himself. To speak about pests and diseases of plants may not be as exciting as when speaking of human beings; however, entomology and phytopathology hold methodological similarities to conventional medicine, which, thus, allow for correlations among them. After all, plant protection and human medical science are based under common epistemological principles of modern scientific thought. Hence, the goal of this essay is to disclose certain disagreements of the disciplines of phytopathology and entomology with agroecological based science; yet, giving way to a discussion according to ecological principles. This is a theoretical essay, based on bibliographical research and on the direct experience of the authors with family farmers in the South of Brazil during the last 20 years.

Introduction

It seems unquestionable that human thought has evolved, and, with it, the organization of knowledge as the rest of the real/concrete world. Yet, such thinking is not hegemonic. The science of diseases and epidemic pests of human beings - medicine - has been construed by means of rational thought and observation, by thinking and reflecting on the phenomena, the processes, the causative powers of illnesses; therefore, on the ways in which we could possibly intervene in them. It was the Hellenic civilization that, before 300 B.C., gave way to the first reported account of the Western philosophical tradition, conceiving health as *soteria* [gr.] = harmony or saving; disease/illness as *pathon* = suffering, passion, lack of freedom; and therapy/cure as *therapeia* = body care, serve, to render praying. It is noteworthy that the etymological meanings of these terms are quite different to those underlying contemporary medical practice and, just the same, plant protection science. In spite of efforts to alleviate human suffering, the modern medical system paradoxically cannot avoid the resurgence of infectious diseases (Foladori, 2005). In comparison, agronomical science has established a conventional approach which subordinates the scientific disciplines of entomology and phytopathology to the development of technologies for a maximum yield. This orientation gave rise to the contradiction of offering food security by means of a system that increasingly demands use of pesticides (Tansey & Worsley (1997). The objective of this work is to unveil some contradictions between conceptions of plant protection and agricultural production

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systems, including intensive organic systems, when analyzed in the light of agroecological principles; therefore, opening the discussion for a new perspective towards the development of a science in actual support of sustainable agricultural.

Materials and methods

This work is based on theoretical analysis of current bibliography and on personal accounts of encounters with organic and non-organic farmers of the South of Brazil.

A) The history of the disease/health process

The illness/health process can be delineated by means of several historical phases, with some overlapping, giving explanation to this phenomenon (Machado, 2000). All the same, it was only by the second half of the XIXth century, with the contributions of Pasteur and Koch, that the modern scientific paradigm of medicine was first construed: biological agents were appointed as the cause of diseases and a method for verification was established. The methodological procedure has since then been successful and, yet, extended to animal and plant disease diagnoses as well. At times, this procedure may be further extended to epidemiological studies, when a population is affected by means of host and pest interaction. Incidentally, at the same time, Darwin stated that natural selection was the major force in the origin of new species, due to the competitive ability among lines within the same genetic basis, which further corroborates the idea that biological interactions, such as parasitism and plagues, are no more than constant faith and struggle for survival (Boff et al., 2003; Abdalla, 2006).

Pasteur determined that the causing agents of diseases among silkworms and of sour wine were microbial agents. By isolating the cause one could make the silkworm healthy and with quick heating, yet, save the wine. The underlying idea of both processes is that the microbiological agent and the host cannot come together.

B) Experience with family farmers

During the last 20 years, several family farms of the “Alto Vale do Itajai” and of the “Planalto Serrano Catarinense” regions were visited and on-farm research was done. This direct contact has allowed us to get a better idea of how farmers actually and effectually deal with pest and disease problems on crops and animals and what their references of knowledge are when deciding to intervene and treat the affected crops or apply drugs to the livestock or, yet, if care is granted to the family members as well.

Results and Discussion

A) Divergencies and contradictions

Pests and diseases on plants are generally perceived as undesirable events on farms. They clearly compete with human beings and, thus, must be eradicated or, at least, well controlled. The conceptual basis of this currently generalized farming way of thought probably came from the green revolution knowledge package, influenced by Pasteur’s microbiological paradigm and the Darwinian ideas of evolution by means of the survival of the fittest.

In the “Alto Vale do Itajai” and “Planalto Serrano Catarinense” regions of Santa Catarina State, Brazil, we observed that the logical basis for the intervention and management of pests and diseases on crops is the same for the conventional as well as for the majority of organic farmers, mainly if they are dealing with intense crop

farming. As a consequence, organic farmers increasingly search for external inputs to solve pest and disease problems, for example, biological control agents, resistance inducers, and a series of intervention measures using homemade preparations, plant extracts, etc. When doing so, farmers give expression to the idea that the nearby nature cannot help them under such agricultural conditions; hence, rescue must come from external sources. In spite of worldwide advocation of integrated pest and disease control - IPM - as an ecologically sound program, most experiences in Brazil failed to replace pesticides, and, in some cases, where an alarm system (forecast) was followed, an increase in the use of pesticides was further stimulated in order to fulfill the objectives of the prevention method itself. The use of external inputs for the solution of most internal problems in production systems diverges from the agroecological principle of promoting resilience by conceiving agriculture as an image of nature; consequently, such an approach fails to take into account that local and internal resources are the best solutions (Soule, 1992). Farmer Field Schools, supported by FAO programs, may be a good example to empower farm knowledge. Moreover, the mere implementation of technological interventions does not necessarily increase yield, as demonstrated by Gonçalves (2001), whose data clearly showed no effect of the intervention measures to control pests and diseases on onion crops in comparison to the non-intervention ones, as long as the system was running under healthy soil conditions. In fact, if one considers health as a matter of nutrition as postulated by Chaboussou (1969) through the Trophobiosis theory, perhaps recovering the ancient Hippocratic idea (300 BC) of “your meal is your medicine”, one must ask: why is it that such an idea is not recognized by the whole of the organic movement?

According to our point of view, and from what we could learn with the farmers, the discussion of plant health must start from conceptual principles other than those underlying the parasite/pathogen x host duality. Moreover, in the 60’s to the 70’s, environmental problems were thought to be threatening all life on earth. Society was concerned with the development of new technologies, regardless of their effective need or not. As a consequence, it was from this standpoint that a new approach of science, which took ecological principles into account, gave ground to supporting the public debate, and the world movement of organic agriculture was launched. However in Latin America, because of the socio-economic and political situation, the public debate on conventional agriculture embraces not only environmental questions but social and political issues as well, making the organic movement a further opportunity to change present socio-economic relations into ones based on principles of cooperation, fair market and farmer sovereignty. One may yet argue that Agroecology, as the science to provide appropriate technologies, takes a rather different role, whether it is required merely for environmental concerns, as in the Northern countries, or has, in addition, a socio-political orientation, as in the Latin-American countries.

B) Ecological emergence for new plant health rationality

Ecological based changes of agricultural systems should start from the assumption of mutual aid and cooperation among all living systems, as a permanent call for the improvement of the production systems (Abdalla, 2002; Kropotkin, 1902). Regulatory mechanisms of pest and disease epidemics should be realized by means of symbiosis, multitrophic interactions, antagonism/ synergism, cooperative attitudes and tolerance as to improve harmony in the living systems, which may yet include crops (Boff et al., 2003). The challenge in designing agroecosystems for sustainable agriculture is to optimize yields, considering the diversity of life, the complexity of the living systems and the social compromise with healthy food. Resilience of agricultural

systems should be the target for such designs, for it can grant a dynamic equilibrium, absolving the impacts from biologic disturbances, such as pests and diseases. As such, agroecology entails a plant medicine, which has the perspective of promoting cooperation, niche co-existence, and the transversality of knowledge (Abdalla, 2002). If such requires scientific knowledge not to be found within the boundaries of the disciplines of entomology and phytopathology, than it probably is the opportunity to build a new scientific body for the care of plants in agroecosystems. Would Phytiatry be a suitable plant care science?

Conclusions

Agroecology calls for a new rationality other than that which was built within the scientific disciplines of entomology and phytopathology. This new scientific body for plant health must consider cooperation as a common event among all living systems. Complexity, complementarity and multifuntionality are primordial dimensions to build a science to deal with plant health in harmony with agroecological principals.

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