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A.A. Zhuchenko, a key science manager in our country, is a world-renown author of widely read scientific publications. His research is particularly focused on the environmental aspects of biodiversity immediately affecting the human habitat. The fundamental studies by Zhuchenko embrace various aspects of biology, genetics, ecology, breeding, and plant resources and address both theoretical and applied issues of world-wide importance.

This research has spread out, step by step, from solving the genetic problems of particular crops to formulating the basic concepts of ecological genetics and finally to advancing and substantiating the completely new idea of adaptive plant industry, which actually represents the innovative ecological paradigm for the XXI century. The concept of the adaptive plant industry is especially urgent today in regard to the novel concept of food safety for our country. The author sees the adaptive plant breeding as a sovereign scientific topic rooted into the basic plant adaptation responses and the ensuing strategy of ecological and genetic improvement of plant industry. This concept becomes particularly pressing as the international WHO and FAO experts forecast the global crisis in food and fresh water supply, a majoring as the international WHO and FAO experts forecast the global crisis in food and fresh water supply, a major ecological problem, which becomes especially acute because of global warming and aridization of large Earth territories. One must emphasize that all other publications in this field completely lack the discrete and systems analysis of ecological and genetic foundations of crop adaptive potential as the basis of adaptive breeding, adaptive plant industry, and their adaptive advancement—or sparsely represent such approach.

In his series of studies on crop adaptive potential and its practical applications, Zhuchenko summed up the data from many years of research into a key issue of current biology: plant adaptation. These generalizations add substantially to the general theory of adaptation of living organisms and are of utmost interest to many biologists, ecologists, geneticists, breeders and researchers in other fields of agriculture.

Writing on plant ecological genetics, Zhuchenko perceives the plant as an integrated system of nuclear and cytoplasmic genetic determinants and highlights the effects of combinatorial variation and its controls and the impact of abiotic and biotic environmental factors which act in plant organisms both as the selective agents and as the inducers of the mutation and recombination variations. By combining his own experimental data and the evidence from other researchers in his numerous innovative publications, Zhuchenko highlighted the primary role of genome integrity in higher eukaryotes as manifested in the associations of co-adapted genes maintained through the transfer of hereditary information to the next generation. Zhuchenko underlined the role of meiotic recombination in the development of potential genetic variation accessible to natural selection in flowering plants and maintained that the breeding technologies should shift from the control of inherited monogenic traits to the combinatorial control over polygenic traits frequently associated with the variable economic characteristics. These deep studies elucidated the ecological—genetic fundamentals of crop adaptation potential and outlined the priority fields of research in plant breeding, cultivar testing, seed production, and integrated plant protection.

In the book under review, Zhuchenko analyzed the mechanisms and manifestations of adaptive responses in ontogenesis and evolution of crop plants in order to expand on the ages-long scientific approach to adaptive plant industry. He set the limits of the adaptive plant industry regarding other areas of research and summarized his own data and the evidence from other scientists on intricate networks of interactions between the biotic and abiotic environmental factors and individual genomes integrated into the gene pool of plant species. The readers of the book under review encounter with a wide-scope and profound scientific analysis of multifacted biological and agricultural issues examined at several planes of plant organization, from the molecular level — through the cellular, organ and whole-plant levels— to plant population, phytocenosis, and biogeocenosis. The book lays emphasis on the spatial differentiation of agricultural technologies according to the conditions of climate zones and landscapes. However, plant adaptation is as important in regard to the varying outputs of agroindustry and the patterns of labor organization, which finally mold specific land exploitation and agricultural technologies. In this context, of utmost practical interest are the variations in the settings of agricul-
ture described as micro-, meso-, and macroecological niches within one or several geographic regions.

An advocate of broad and integral application of the current scientific achievements, Zhuchenko articulates the major goal: to transform the traditional agriculture based on progressively increasing input of non-renewable resources into “the life industry” that meets all the reasonable food needs of humankind — and does not threaten it with the environment degradation and contamination. The latter problem is of utmost importance — says Zhuchenko: “the transfer to adaptive strategies of intensified plant industry should be regarded as the major condition of protecting the natural environment from disintegration and pollution”.

The book covers the wide scope of the issues of adaptive systems of plant breeding and production, with the prominent depth of their analysis. Zhuchenko was first to describe in depth the relationships between plant potential productivity and their ecological stability at the levels of a particular cultivar, agrocenosis, and agro-system and recognized the mechanisms that limit genetic variation in breeding; he argued that the methods of induced recombinogenesis would overcome these limitations by expanding the range of genetic diversity. A special focus is on the issues related to the formative role of selection in the ecological and geographical breeding network and the interrelation of the major attributes of adaptive breeding, such as the steps of collecting and identification of germplasm, breeding per se, cultivar testing, and seed production.

The monograph consists of three large chapters, the conclusion, the index of plant Latin names, and the author index. Such construction, unique in its scope, has probably arisen from the initial yearning to define and develop a new science engaged in the transformation of “the knowledge of genes” into food calories. The author demonstrates the ways to manage the processes of plant production and environment amelioration at the level of cultivars (hybrids), agrocenoses and agrolandscapes and substantiates the priority goals for adaptive breeding, agricultural technologies, construction of agroecosystems, agroecological zoning of rural areas at macro-, meso-, and microlevels, and making plant industry as a whole resource conserving, ecologically secure and profitable.

By expanding the notion of the adaptive potential of crop plants, the author established new possibilities for regulation of plant adaptation in plant ontogenesis (the technologies for growing particular cultivars, the agroecological zoning of rural areas, the construction of adaptive agroecosystems and agrolandscapes, and the integrated plant protection) and phylogenesis (adaptive breeding systems that functionally link breeding new cultivars and hybrids to their state-controlled testing and seed production as well as completely new aspects of breeding, such as biocenotic, bioenergetic, symbiotic, edaphic, etc.). It is substantial that the concept of plant adaptive potential and the ways toward adaptive promotion of plant industry based on this concept have been claimed by the breeding centers and are widely employed in the zonal agrotechnological systems, regional programs for research and development, and found their place in various monographs, textbooks, manuals, practical recommendations, etc.

Today the concepts of global development of plant industry as the major sphere providing for insistence of civilization must be reshaped and formulated by taking into consideration the promotion of the capacity of agroecosystems and agrolandscapes for rapid adaptive response and self-regulation when they are affected by the environmental (climate, soil, weather) and anthropogenic factors. Adaptation is the best way to diminish the reliance of agroecosystems on diverse soil and climatic conditions and the weather whims. Following this idea, N.I. Vavilov insisted that the genotype overrides the environment in newly developed agroecosystems. The development of adaptive agroecosystems and agrolandscapes as well as the corresponding breeding systems should provide for the adequate replacement and renewal of the exhaustible resources by enhancing the role of cultivated autotrophic plants in supplying agricultural produce and restoring environment.

By working on systemic notions, which describe the levels and mechanisms for adaptive potential development in an individual plant, population, species, and agrocenosis, the author introduced several new concepts of the synthetic theory of breeding including the maintenance of adaptive potential in the gene pool of cultivated species as an incessantly evolving system, collecting well-defined determinants of meiotic recombination (rec-genes, mei-genes, etc.), building up the programs that integrate breeding with ecology and agrotechnology, taking into account the energy cost of plant survival depending on various ecological regimes, upgrading the representative spatial and temporal assessments of cultivar adaptive potentials, the implementation of ecological and geographical concepts into the organization of the breeding and cultivar-testing networks.

Below we will annotate in short the contents of the book under review.

In the chapter 1, Adaptation Problems in Agriculture of the XXI Century, Zhuchenko substantiated in detail the need to delineate ecological genetics as a separate discipline within general biology and ecology. The author described the history of this discipline and defined its objects, goals, and research methodology.

The manifest characteristics of the adaptive plant industry that tell it apart from other sciences are rooted in its generalizing and integrating capacity, which sums up the most basic features of living organisms within the biosphere and of their interactions with the network of diverse abiotic factors. The latter aspect is especially important because the very formulation of this concept