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The criteria for establishing an acceptable range of chemical, physical and biological indicators for the purpose of ecological standards developing

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The basis for development of standards for soil quality is based on the assessment of their resistance to external influences. The main criterion for assessing the environmental sustainability of soils and lands is the ability to perform their ecological functions (Nkonya et al, 2011, 2013; Costanza et al, 2014, Dobrovolsky and Nikitin, 1990; Yakovlev, Evdokimova, 2011). The limiting value of indicators of the state of the environment (physical, chemical, biological and other) corresponds to the value at which stability of environmental components is preserved (the ability to heal itself). Tht threshold for effect of stressor should be identified by the methods of bioindication and biotesting. The analysis obtained by these methods aimed to identify the highest indicator values of physical or chemical (concentration or dose of the stressor) effects, which have not yet fairly established negative changes in the organism, population of organisms or community. Using a theoretical model (Yakovlev et al, 2009, Gendugov., 2013) the problem of finding the threshold concentration is reduced to the finding of the singular points characterizing macroscopic "kinetics" of response in the phase space of dependence of the response rate upon the impact indicator. Singular points are determined by the analysis of derivatives. The theoretical model allows to calculate the singular points of the model (six of them), one of which, the maximum point corresponds to the highest concentration of the stressor at which it had no adverse effects on the test organisms. This point corresponds to the lowest concentration of the stressor at which it has no longer a stimulatory (hormesis) effect. Six singular points divide the whole range of stressors values (concentration) on seven bands with a unique range for each set of values of "macrokinetic" indicators of the living cells response to the impact of the stressor (concentration). Thus, the use of theoretical equations allowed us 1) to establish categories (borders) of soil quality on an the empirical scale of environmental quality and 2) to detail the category of quality in the range of hormesis, that is, in the range of weak positive effects of the stressor. The solution of the equation in the phase space of dependence of response upon exposure is: $q=C/z^b * exp(-K/z)$,

where q - is a measurable response of living organisms on exposure to the stressor, the concentration of which is equal to z; C -the constant of integration that makes sense of coefficient, which is scaling the value of q; b - the coefficient of the growth rate responding on the increase of z; K - the coefficient of the decline rate of q responding with increasing z.

The equation coefficients C, b, K are found by fitting the model to the experimental data got by the method of nonlinear regression using an available software package. The abscissa of the maximum point is of a particular interest, because it corresponds to: 1. the lowest concentration of the stressor, which does not manifest its stimulatory (hormesis) effect, and at the same time – 2. the largest concentration of the stressor, which has not shown its negative effect. That is, it meets the requirements for threshold concentrations of the stressor and can be used in the development of the environmental quality standards.

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