

## TRANSFORMATION DYNAMICS ESTIMATION OF NITROGEN-CONTAINING FERTILIZERS INTO NITRATES

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This article evaluates the dynamics of the decomposition of nitrogen-containing fertilizers in the soil, depending on the amount of fertilizers applied for different natural conditions. The obtained results are compared with the maximum permissible norms of nitrates in the soil. The relevance of this work is due to the widespread use of nitrogen-containing fertilizers, since nitrogen is one of the five trace elements necessary for plants for normal development and fruiting. However, cultivated plants consume only a part of the nitrogen-containing fertilizers introduced into the soil, and the rest of them turn into nitrates, and partly into nitrites. Both of these compounds are dangerous substances; easily dissolve in water, absorbed by plants and with them enter the human and animal body. Therefore, it is important to know how fertilization affects the balance of nitrates in the soil. This work compares the obtained results with the maximum permitted concentration of nitrates in soil. The assessment of nitrates concentration was carried out by both qualitative and quantitative methods. In all cases, it was revealed that soil samples after fertilization showed the appearance of nitrates, and their significant excessive concentration in comparison with permissible values when the norms of fertilization were violated. The obtained results can be useful for a wide range of consumers of nitrogen-containing fertilizers.

**Keywords:** soil, soil solution, nitrogen-containing fertilizers, nitrates, danger to humans, qualitative and quantitative determination of nitrates in the soil

### REFERENCES

1. Orlov, D. S., Sadovnikova, L. K., & Lozanovskaya, I. N. (2002). *Ekologiya i okhrana biosfery pri khimicheskom zagryaznenii [Ecology and protection of the biosphere in chemical pollution]*. Moscow: Vysshaya shkola Publ., 528 p.
2. Dorofeeva, T. I. (2002). These two-faced nitrates. *Khimiya v shkole [Chemistry at School]*, 5, 43–45 [in Russian].
3. Raevich, B. Y. (2004). *Osnovy otsenki vozdeystviya zagryaznennoy okruzhayushchey sredy na zdorov'e cheloveka [Fundamentals of assessing the impact of a polluted environment on human health: a guide to regional environmental policy]*. Moscow: Center for Environmental Policy of the Russian Federation Publ., 268 p. [in Russian].
4. Iminova, D. U., Dyusembaev, S. T., & Kuanyshev, D. N. (2016). Study of the content of nitrates in imported fruits. *Molodoy uchenyy [Young Scientist]*, 3, 351–355 [in Russian].
5. Deryagina, V. P. (1989). Ah, nitrates! And who invented you? *Zdorov'e [Health]*, 9, 21–22 [in Russian].
6. Bandman, A. L., Volkova, N. V., & et al. (1989). *Vrednye khimicheskie veshchestva. Neorganicheskie soedineniya elementov V–VIII grupp [Harmful chemicals. Inorganic compounds of elements of V–VIII groups]*. V. A. Filova and others (Eds.). Leningrad: Khimiya Publ., 592 p. [in Russian].
7. GOST 33045-2014. (2019). Water. Methods for the determination of nitrogen-containing substances. Moscow: Standartinform Publ., 25 p. [in Russian].
8. Polovets, Y. V. (2019). Causes of accumulation and methods of reducing the excess amount of nitrates in cultivated plants. *Molodoy uchenyy [Young Scientist]*, 23(261), 154–157 [in Russian].

9. Anjana, S., Umar, S., Iqbal, M., & Abrol, Y. P. (2007). Nitrate accumulation in plants, factors affecting the process, and human health implications. *Agronomy for Sustainable Development*, 27(1), 45–57. doi: 10.1051/agro:2006021.
10. Seis, P. La problematica del nitrati in orticoltura. *Journal Colture Protetto*, 15(10), 17–24.
11. Rybalsky, N. G., & et al. (1992). *Ekologiya i bezopasnost': T. 1, ch. 2, Bezopasnost' cheloveka [Ecology and safety: Vol. 1, Part 2, Human safety]*. N. G. Rybalsky (Ed.). Moscow: VNIPI Publ., 442 p. [in Russian].
12. Tamme, T., Reinik, M., & Roasto, M. (2010). Nitrates and nitrites in vegetables: Occurrence and Health Risks (pp. 307–321). *Bioactive Foods in Promoting Health*. doi: 10.1016/B978-0-12-374628-3.00021-9.
13. Vorob'eva, L. B., & Stepanova, S. A. (2008). *Fiziko-khimicheskie protsessy v tekhnosfere [Physical and chemical processes in the technosphere]*. Novosibirsk: SSGA Publ., 114 p. [in Russian].
14. Fertilizer diammofosk – application rates and instructions. (n. d.). Retrieved from <https://my-agro.com/udobrenie-diammofoska> [in Russian] (accessed October 29, 2021).
15. GOST 26212-91. (1992). Soils. Determination of hydrolytic acidity by the Kappen method modified by ZINAO. Moscow: Standards Publ., 7p. [in Russian].
16. Doktoning Your Soil: Testing pH With a Kit, or Red Cabbage. (n. d.). Retrieved from <http://gardening.afterschooltreats.com/wfdata/frame119-1006/pressrel10.asp> (accessed October 29, 2021).
17. Kreshkov, A. P. (1970). *Osnovy analiticheskoy khimii [Fundamentals of analytical chemistry]*. Moscow: Khimiya Publ., 460 p. [in Russian].
18. Trukhina, M. D. (n. d.). Methods for the determination of nitrates and nitrites. Retrieved from <https://him.1sept.ru/article.php?ID=200103501> (accessed October 29, 2021).
19. Resolution of the Chief State Sanitary Doctor of the Russian Federation of January 28, 2021 No. 2. On the approval of sanitary rules and norms SanPiN 1.2.3685-21 "Hygienic standards and requirements for ensuring the safety and (or) harmlessness of environmental factors for humans" (P. 301). Retrieved from ConsultantPlus online database [in Russian].

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