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INVESTIGATION OF LUMINESCENCE SPECTRA OF PEA SEEDS

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Abstract. Graphs of the excitation spectral dependencies for pea seeds are given. Spectral measurements were performed on the basis of a hardware and software complex consisting of a multifunctional spectrofluorometer "Fluorat-02-Panorama", a computer with the installed software "PanoramaPro" and an external camera for the samples under study. The results of the work can be useful for engineers working in the field of spectroscopy, biophysicists, and specialists who use optical radiation in agriculture.

ИССЛЕДОВАНИЕ СПЕКТРОВ ЛЮМИНЕСЦЕНЦИИ СЕМЯН ГОРОХА

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Ключевые слова: спектр люминесценции, всхожесть, агрономия.

Аннотация. Приведен график спектральных зависимостей возбуждения для семян гороха. Спектральные измерения проводили на основе аппаратно-программного комплекса, состоящего из многофункционального спектрофлуориметра «Флюорат-02-Панорама», компьютера с установленным программным обеспечением «PanoramaPro» и внешней камеры для исследуемых образцов. Результаты работы могут быть полезны инженерам работающим в области спектроскопии, ученым-биофизикам, специалистам применяющим оптическое излучение в сельском хозяйстве.

Modern, rapidly developing agronomy largely depends on results of technological advances, intensive implementation of innovations, scientific and technical achievements, and continuous improvement of methods and technologies of production, its quality control and diagnostics. The existing methods of quality assessment of air-dry seeds by germination are time-consuming and require a lot of work to prepare tests and to let seeds germinate, thus excluding any possibility of quick control of seeds sowing qualities.

The paper subject is relevant due to its focus on development of an express-method for assessment of seeds sowing qualities by their spectral optical characteristics in visible and near-ultraviolet regions.

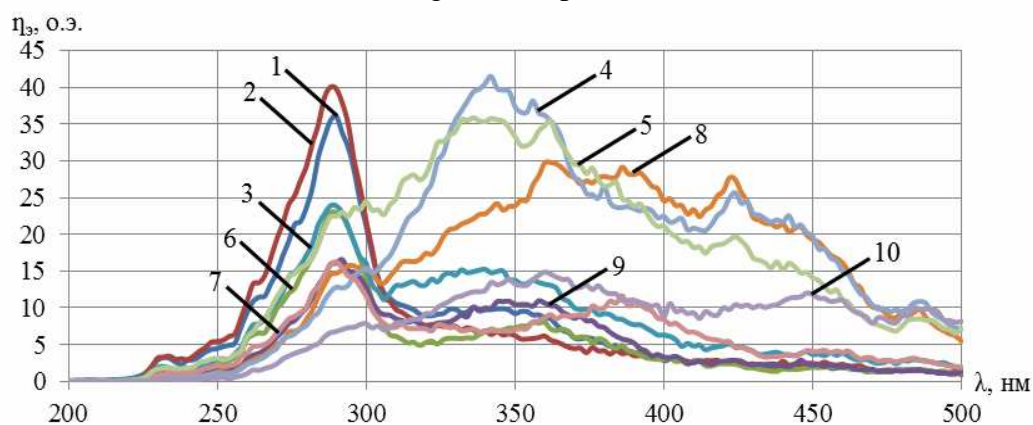
Development of an express-method for assessment of luminescence of seeds of various quality was performed on the basis of software and hardware resources, consisting of a multifunctional spectrofluorometer "Fluorat-02-Panorama", a computer with an installed computer program "PanoramaPro", and an external camera for the examined specimens [3]. The mentioned spectrofluorometer is designed for a wide range of scientific and methodological researches of the spectral-time characteristics of luminescence of most diverse objects.

After the measurements, seeds are put into a Petri dish and let germinate (5 seeds per a Petri dish) in accordance with GOST 12038-84 "Agricultural seeds. Methods for determination of germination" (Fig. 1).

The results of spectral measurements of 10 pea seeds are shown in Fig. 2.



Fig. 1. Pea sprouts



1 – first seed, 2 – second seed, 3 – third seed, 4 – fourth seed, 5 – fifth seed, 6 – sixth seed, 7 – seventh seed, 8 – eighth seed, 9 – ninth seed, 10 – tenth seed

Fig. 2. Spectral characteristics of excitation for pea seeds

After the spectral measurements, seeds were put into a Petri dish and let germinate (5 seeds per a Petri dish). The seeds germination was assessed 7 days later. Seeds No.1, No.2, No.3, No.6, No.7 had peaks at the wavelength of 290 nm and proved germinable, while seeds No.4, No.5, No.8, No.9, No.10 did not have such a peak and turned out non-germinable.

The obtained results might be used as a basis for development of a method for express-control of seeds quality, first of all, their germination ability and the primary parameters of germination.

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