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Application of near-infrared spectroscopy for basil chemical composition analysis

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Abstract

The near infrared spectroscopy method investigated the chemical composition of fragrance basil plants (Ocimum basilicum) with green leaf colour, the Stella variety, which is a green culture with a short period of vegetation. The lighting was carried out using 400 W arc sodium mirror lamps (DNaZ 400), with a light flux of 46 thousand. Lm, whose spectrum is predominantly orange-red light (650 nm), is most effective for photosynthesis. The level of illumination when growing basil was 10 thousand and 15 thousand lk. The longitude of the day, taking into account the lighting, was 16 hours. In the above-ground portion of the basil plants, the protein, fiber, lipid, ash and starch content was determined by near infrared spectroscopy on an infrared *SpectraStar XT* analyzer, model *1400XT-3*, full scanning range 1400-2600 nm. The increase in illumination stimulated photosynthetic activity and the synthesis of assimilates, achieving, at a certain level of illumination, an equilibrium state between the amount of CO_2 absorbed and released. Basil plants have been shown to react differently to different levels of illumination. Using BIC spectroscopy, it was found that with increased illumination, the protein content of basil plants decreased from 23.4% at 10,000 lx to 20.1% at 15,000 lx, and the starch content increased from 30.1% at 10,000 lx to 43.7% at 15,000 lx. The content of basil in plants at different levels of illumination of such indicators as fat, ash and fiber remained at the same level and amounted to 3.06, respectively; 8.51 and 26.4% at 10 thousand lx and 2.80; 8.08 and 26.5% at 15 thousand lux.

References

[1] *GOST R 50817-95.* Mixed fodders, feed mill raw materials. Method of wet protein, wet oils, wet cellulose content determination with the usage of NIR spectroscopy. *Publishing house of standards, Moscow.* **2010**. 8p. (russian)
[2] I.V. Kuryanova, S.I. Olonina. Assessment of the influence of various spectra of LED lamps on the growth and development of vegetable crops. *Bulletin of the NIIEI.* **2017**. No7 (74). P.35-44.
[3] O.V. Eliseeva, A.F. Eliseev. Assimilation apparatus formation as the base of yield of leaf radish (*Raphanus sativus L.*). *Vegetables of Russia.* **2015**. Vol.1. No.26. P.13-19. (russian)
[4] O.V. Eliseeva, A.F. Eliseev, S.L. Belopukhov. Application of NIR spectroscopy for leaf radish chemical composition analysis. *Kazan Technological University bulletin.* **2017**. Vol.20. No.12. P.143-146. (russian)
[5] S.I. Nikolaev, T.O. Kulago, S.N. Rodionov. Application of NIR spectroscopy for determination of inorganic and organic compositions amount in fodders. Nizhnevolzhskiy agricultural universities complex bulletin. *Zootechny and veterinary series.* **2013**. No.2(30). P.1-6. (russian)
[6] T.V. Tulyakova, E.I. Shibanova. Application of NIR spectroscopy for an input control of raw materials at meat processing plant. *Meat industry.* **2014**. No.2. P.46-48. (russian)
[7] V.L. Sheptun. Introduction into the near-infrared spectroscopy method: manual. *Kyiv: Near-infrared spectroscopy methods center Analit-Standard, Ltd.* **2005**. 85p.
[8] E.B. Dedova, S.L. Belopukhov, and A.V. Davaev. Productivity and quality of *Amaranthus Paniculatus* in mixed crops under irrigation in Kalmykia. *Butlerov Communications.* **2013**. Vol.34. No.4. P.144-148. ROI: jbc-02/13-34-4-144
[9] L.A. Sushkova, V.L. Dmitriev, L.B. Dmitriev, and S.L. Belopukhov. Influence of biologically active compounds on the composition, structure and content of the major biosynthesis products of plants. Part 1. The

influence of plants processing with herbicides on biosynthesis of essential oil *Mentha piperita* L. of the grade Yantarnaya. *Butlerov Communications.* **2013**. Vol.34. No.4. P.149-151. ROI: jbc-02/13-34-4-149

[10] D.V. Sergeeva, and P.P. Purygin. Comparative analysis of presowing treatment of sunflower seeds with various petroleum products. *Butlerov Communications.* **2018**. Vol.56. No.11. P.166-169. DOI: 10.37952/ROI-jbc-01/18-56-11-166

[11] V.A. Litvinskiy, E.A. Grishina, V.V. Nosikov, and S.L. Belopukhov. Application of ICP-AES technique for determination of zinc in plants and plant products. *Butlerov Communications*. **2018**. Vol.54. No.4. P.140-148. DOI: 10.37952/ROI-jbc-01/18-54-4-140

[12] A.A. Lapin, S.D. Borisova, M.L. Calayda, and V.N. Zelenkov. Biochemical examination of leaf lettuce, grown in aquaponics. *Butlerov Communications.* **2019**. Vol.59. No.8. P.132-139. DOI: 10.37952/ROI-jbc-01/19-59-8-132