PHOTOSYNTHETIC ACTIVITY OF SOYBEAN SOWINGS ON SOD-PODZOLIC SOILS OF WESTERN POLESIE

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The basis by which phytosynthetic activity results in soybean sowings is formation of the optimum leaf surface area. The leaf surface captures sun's energy and synthesizes organic compounds that go into formation of new plant organs and yield. According to the results of research, conducted in the Forest-Steppe of Ukraine, it is known that optimal leaf surface area for soybeans should be 40-50 thousand m^2/ha. If the leaf surface area is smaller, the opto-biological structure of sowings is not optimized and therefore the FAR is not used rationally. However, larger leaf surface area is undesirable, since a significant part of the leaves in the lower tier fall off as a result of inter-shading, and the rest is ineffective.

The purpose of research is to determine effect of inoculation and foliar feeding by chelate microfertilizers on dynamics of leaf surface area and formation of photosynthetic potential of soybean varieties on sod-podzolic soils of the Western Polesie.

Methodology of research. Field studies were conducted in the West Polesie during 2017–2019 in conditions of ALLC "Vasyuta", Kovel district, Volyn region. Soybean varieties Cassidy (Canada) and EC Mentor (France), inoculant Legum Fix, based on bacteria *Bradyrhizobium japonicum 532c,* chelate microfertilizers Vuxal Oil Seed and Quantum-Oliyni were studied. The area of accounting plot is 25 m^2, the total area is 50 m^2. Soybean was sown by typical row method with inter-row spacing 12,5 cm, sowing rate 650,000 similar seeds per 1 ha at soil temperature at a seed

wrapping depth 10–12 °C. Inoculation by preparation Legum Fix was performed at the day of sowing with rate 2,5 kg of drug per 1,0 ton of seeds. Soybean fertilizing system included introduction of 150 kg/ha of ammonium nitrate and 110 kg/ha of ammonium sulphate. Foliar feedings by chelate microfertilizers were carried out according to the recommendations of their manufacturers: Vuxal Oil Seed at the beginning and in full flowering (BBCH 60-66) with rate 2,0 l/ha, Quantum-Oliyni - in the budding phase (before flowering) (BBCH 50-59) and at the beginning of seed formation (BBCH 71-73) with rate 2,0 and 1.0 l/ha. The leaf area and photosynthetic potential of sowings were determined according to the methodology of A. A. Nychyporovich.

Results of research and their analysis. The larger area of leaf surface was formed by the early-ripening variety EC Mentor, which in all growth phases was by 0,4–2,5 thousand m^2/ha larger than area of leaf surface of variety Cassidy. Thus, the area of leaf surface in variety EC Mentor, depending on the variant of experiment and the period of plant growth varied in the range 21,5–45,7 thousand m^2/ha, whereas the area of leaf surface of variety Cassidy was in the range 19,8–44,7 thousand m^2/ha. The maximum size of leaf surface was reached during flowering period and at the beginning of beans formation, only later – in the phase of seed swelling, it decreased slightly, which is primarily due to the moisture content of plants. Lack of moisture leads to the suspension of plant growth processes and consequently to the weakening of their photosynthetic activity. Under these conditions, the main phases of development occur more rapidly and flow in plants, as does the overall duration of growing season. However, in all periods of determination, the area of soybeans leaf surface increased significantly with improved conditions of nutrition due to the nutrition of sowings by chelate microfertilizers. So, if in the budding phase of soybean plants variety EC Mentor on the variant of experiment without fertilizing and inoculation, on the average for three years of studies, it was 21,5 thousand m^2/ha, and variety Cassidy 19,9 thousand m^2/ha, at cultivated plots with fertilizing by Quantum-Oliyni increased to 24,2 and 21,7 thousand m^2/ha, respectively.

The flowering phase was more informative for comparing the effect of chelate

micronutrient fertilizers on leaf area formation by soybean sowings. Was found that, with using for feeding chelate microfertilizer Vuxal Oil Seed, which was applied at the beginning and at full flowering, the area of soybean leaves was higher on variants of the experiment without inoculation and reached 45,1 thousand m^2/ha in variety EC Mentor and 43,9 thousand m^2/ha in variety Cassidy. Soybean fertilizing by microfertilizer Quantum-Oliyni (without inoculation) ensured formation of assimilation surface varieties EC Mentor and Cassidy 44,7 and 43,6 thousand m^2/ha.

Inoculation of soybean seeds by Legum Fix was quite effective for increasing assimilation surface of soybean sowings with growing on sod-podzolic soils of Western Polesie. At variants of experiment with inoculation, the area of soybean leaves increased depending on the growth phase and fertilizing of sowings by 0,4-2,4 thousand m^2/ha in variety EC Mentor and by 0,4-2,3 thousand m^2/ha in variety Cassidy. Was found, that difference between soybean leaf area indices at variants of experiment with and without inoculation, was the largest in the seed swelling phase, which contributed to formation of higher productivity. The maximum values – 44,7 and 45,7 thousand m^2/ha of plants assimilation surface of both soybean varieties reached at flowering phase on the variant with extra-feeding by chelate microfertilizer Vuxal Oil Seed and seeds inoculation by Legum Fix.

Soybean variety EC Mentor had a slightly higher intensity of photosynthetic potential than Cassidy. Thus, in control variants of the experiment (without extra-feeding) without inoculation during budding-flowering, the photosynthetic potential in variety EC Mentor was 1,402 million m^2/ha, in Cassidy – 0,371 million m^2/ha. During the period of the end of flowering – full swelling of seeds at the same variant of the experiment, photosynthetic potential in variety Cassidy was lower and amounted 2,293 million m^2/ha, and in variety EC Mentor, with a higher plant height and leaf area 2,390 million m^2/ha. The maximum photosynthetic potential of sowings was formed during flowering – f ull sed swelling at experimental plots where soybean was grown with using seeds inoculation and fertilizing of sowings by chelate microfertilizer Vuxal Oil Seed. In the early ripening varieties EC Mentor and Cassidy it reached 2,450 and 2,445 million m^2/ha.

Conclusions. On sod-podzolic soils of Western Polesie, the bigger area of leaf surface and photosynthetic potential was formed by variety EC Mentor. Fertilizing of soybean sowings by chelate microfertilizer Vuxal Oil Seed at beginning and in full flowering (BBCH 60-66) with rate of consumption 2,0 l/ha and seeds inoculation by Legum Fix at the day of sowing with dose 2,5 kg of preparation per 1,0 t of seeds contributes to formation of maximum – 44,7 and 45,7 thousand m^2/ha of the assimilation surface of soybean sowings Cassidy and EC Mentor. Has been found, that fertilizing of soybean sowings by chelate microfertilizer Vuxal Oil Seed and seeds inoculation by Legum Fix creates the best conditions for formation of powerful photosynthetic potential of its sowings.