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## **Photosynthetic potential of hybrids of sugar beet of different life-forms at changeover of moisture accumulation**

**Purpose.** To study the dynamics of photosynthetic activity of sugar beet plants of different breeding origin, depending on the humidity regime, and to find out the relationship between the magnitude of photosynthetic potential of plants and the formation of dry matter by the aboveground part and root crops. **Methods.** Laboratory, vegetative, statistical. The hybrids of Uladovsky One-Dairy 35, Ukrainian SS 70, Extra, Roberta and KV Zbruch were studied on the background of 3 modes of moisture supply of 45, 60 and 75% of the soil moisture. **Results** The dynamics of the intensity of photosynthetic activity during the growing season and the accumulation of dry matter by plants of varieties and hybrids of sugar beets of various biological forms are examined, depending on the modes of moisture provision. **Conclusions** The periods of formation of the maximum photosynthetic potential in sugar beet plants of domestic, foreign and joint selections for different moisture content have been established. Correlation between the photosynthetic potential of sugar beets of different biological forms and the content of dry matter in the leaves of plants is revealed.  $R^2 = 0,8059$ .

*Key words: sugar beet, hybrids, photosynthetic potential, dry substance, regime of moisture supply.*

The only factor that can not be regulated in the field is the energy of solar radiation. In order to increase the rate of use of photosynthetic active radiation (FAR), favorable conditions should be created for the growth and development of plants, in particular, to provide optimal water and air conditions, to plant plants rationally on an area with favorable optical-biological structure, and also to provide their need for nutrients [1, 3, 9, 10]. The size of the crop directly depends on the growth of the leaf surface, the intensity and productivity of its work. Thus, high yield of beet sugar is possible only with the provision of maximum photosynthetic performance throughout the growing season [2, 4]. Photosynthetic potential (AF) is the sum of daily values of leaf area per hectare over a certain period of time; it characterizes photosynthetic power, which is one of the most important indicators [5, 6]. Currently, in industrial crops of beet sugar, other than seeds of domestic breeding, a large proportion belongs to the seeds of foreign manufacturers [7, 8]. Each of the hybrids has specific features and response to the influence of agrotechnical factors, among which humidity mode. Therefore, it is important to study the change in the magnitude of the photosynthetic potential of sugar beet plants of various biological forms and the formation of the content of dry matter in them, depending on the moisture content. The purpose of the research is to study the dynamics of photosynthetic activity of sugar beet plants of different breeding origin, depending on the regime of moisture supply, and to find out the relationship between the magnitude of the photosynthetic potential of plants and the formation of dry matter. **Materials and methods of research.** The research was carried out at the vegetation site of the Agrochemistry Laboratory of the Institute of Bioenergetic Cultures and Sugar Beets of the NAAS in 2001-2003. Wagner vessels were used with a capacity of 14.5 kg of air-dry soil on a vessel filled with typical black earth with the following agrochemical characteristics: humus - 3.8 - 4.0%, pH of salt - 6.4 - 6.6, mobile phosphorus and exchangeable potassium by Chirikov - 184 - 197 and 81-89 mg / kg of soil, alkaline hydrolysed nitrogen - 159 - 163 mg / kg of soil ( Behind Cornfield) In the experiment, varieties and hybrids of beet sugar of various biological forms and breeding origin (factor A) were studied: Uladovsky perennial 35, Ukrainian SS 70, Extra, Robert and KV Zbruch, as well as variants of voluntary provision of soil (factor B): 45, 60 and 75% of the total field moisture content of the soil (APV).

1. Photosynthetic potential of sugar beets of different biological forms depending on moisture content, m2 days / vessel

Hybrid Date of record June July August September 45% OPB Уладдівський односемний 35 2,76 5,04 5,88 6,05 Ukrainian World Cup 70 2,60 5, 25 5.98 6.02 Extra 2.81 5.75 6.35 6.44 Roberta 2.89 5.85 6.65 6.65 KV Zbruch 2.51 5.40 6.05 6.07 60% Uladovsky perennial 35 3,63 7,49 8,78 9,04 Ukrainian World Emirate 70 3,96 7,86 8,92 9,19 Extra 4,32 8,59 9,74 10,21 Robert 4,44 9,01 10,36 10,65 KV Zbruch 3,69 8,38 9,90 10,55 75% APV Uladovsky perennial 35 3,61 8,03 9,39 10,54 Ukrainian World Emirate 70 3,48 8,07 9,59 10,88 Extra 3,52 8,40 9,85 11,16 Robert 3,86 9,04 10,19 11,28 K Zbruch 3,74 8,89 10,41 11,95 NIR05 factor A (hybrids) 0,61 1,16 0,52 0,65 factor B (SRW mode) 0,47 0,90 0,40 0,50 AB (Interaction) 1.05 2.01 0.90 1.12

2. Content of dry matter in sugar beet plants of different biological forms for changes in moisture content during harvesting, g / vessel

Full field moisture content of soil,% Hybrid 45 60 75 leaves root crops leaves root leaves leaf roots Uladovsky perennial 35 32.3 176.0 35, 9 197.3 38.9 211.5 Ukrainian SS 70 32.9 179.0 35.3 199.6 42.1 215.0 Extra 34.5 208.9 41.7 258.9 43.2 261.6 Kiva 33.8 202.2 38.8 233.3 44.7 251.6 KB Zbruch 35.8 200.8 38.9 233.7 44.0 273.4 NIR05 on sheets: A (hybrids) - 4, 9; In (the mode of the SRV) - 3.8; AB (interaction) - 8,5 NIR05 on root crops: A (hybrids) - 13,1; In (the mode of the SRV) - 10.2; AB (interaction) - 22.8

Seeds of beet sugar were sown in optimal terms. The area of the leaves was determined for further calculation of photosynthetic potential in the first decade of June, July, August and September according to MI methodology. Orlovsky The dry matter content was determined by drying the samples to a constant mass at a temperature of 105 ° C (thermostatically-weighted method). Photosynthetic potential of beet sugar was determined by the formula:  $FP = \Pi_1 + \Pi_2 / 2T$ , where  $\Pi_1 + \Pi_2$  - area of the leaf surface at the time of accounting,  $m^2$  / vessel; T - the length of the period between the records, the day. Research results. The researches have established that the photosynthetic potential of varieties and hybrids of sugar beets of different biological forms changes with increasing moisture content of the soil. Thus, in the first decade of June in the version with 45% of PPV photosynthetic potential was minimal in the experiment and amounted to 2.51-2.89  $m^2$  days / vessel. Increasing the total field moisture content of the soil to 60% contributed to a significant increase in the photosynthetic potential in all varieties and hybrids - 3.63 - 4.44  $m^2$  days / vessel. Further increase of the moisture level in the soil to 75% of the EWP for this period is not feasible since it does not contribute to increasing the photosynthetic potential (Table 1). At the first decade of July, the photosynthetic potential of varieties and hybrids of sugar beet grew 1.8 - 2.4 times compared to the previous record in all variants of water supply, which is explained by the intensive growth of the leaf surface during this period. At the same time, they remained minimal in the background of 45% PPV - 5,04-5,85  $m^2$  days / vessel. In early July, optimal conditions for the formation of plants with maximum photosynthetic potential were provided in an option with 60% of the PPV - 7.49 - 9.01  $m^2$  days / vessel. During this period, a rise in the level of moisture in the soil up to 75% of the ARV revealed only a tendency to increase the photosynthetic potential of the studied varieties and hybrids compared with the alternatives that provided 60% of the HPV. It was established that in the first ten days of August the photosynthetic potential of plants remained high and maximum values reached the humidity regime of 75% of the SRV - 9.39 - 10.41  $m^2$  days / vessel. At the same time, a significant difference between this indicator between variants from 60% and 75% of ARV was found only in varieties and hybrids of domestic and general selection - Uladovsky one-parent 35, Ukrainian SS-70, and KV Zbruch. The increase of moisture in the soil from 45 to 60% of the PPV reflected a significant increase (33-39%) of the photosynthetic potential of all sorts and hybrids of sugar beets in early August. In the conditions of the vegetative experiment, until the first decade of September there was a slight increase in photosynthetic potential in comparison with the beginning of August in all variants. Providing a level of moisture in vessels 60% of the PPV contributed to a significant increase of 33 - 42% of photosynthetic potential, compared with 45% of PPV. It has been established that the provision of beet plants with sugar moisture at 75% level during the period from August to the first decade of September contributes to a significant increase in the photosynthetic potential of plants, compared with 60% of poultry. During this period, high photosynthetic potential was noted in the HP Zbruch hybrid for 60% and 75% of the HPV, which was by 9.0 - 14.3% more compared to the Uladovsky single-parent 35 and the Ukrainian SS 70.

The result of photosynthetic activity is the accumulation of dry matter in different organs of plants, so it was investigated its content in the leaves and roots of sugar beets different dry matter in leaves, agricultural relationship between the size of photosynthetic capacity and dry matter content in the leaves of sugar beet breeding for the period of harvest. According to the research, the minimum content of dry matter in leaves

and roots was during the regime volohozabezpechennya 45% PPV - 32,3-35,8 g and 176.0 -208.9 g respectively. Increased moisture in vessels up to 60% PPV had a positive effect on increasing dry matter content, which grew by 7 - 17% in the leaves and 10.3 - 19.3% - in the roots compared with 45% PPV. With the provision of sugar beet plant moisture at 75% PPV was a further increase in dry matter content in plants compared with 60% PPV mode: 8.4 - 16.2% in leaves and 6.7 - 14.5% in the roots. The exception was a hybrid Extra, plants which observed only a tendency to increase the dry matter content in the leaves and roots for growth volohozabezpechennya from 60 to 75% PPV (Table. 2). Research has established that between indicators of photosynthetic potential of sugar beet various biological forms and dry matter content in their leaves dependence ( $R^2 = 0.8059$ ), confirming that with increased photosynthetic capacity of the dry matter content in the leaves increases (Figure). In the case of root crops, this dependence was not detected;  $K_2$  is 0.66478.

### Conclusions

In the conditions of vegetative experiment, the maximum increase in photosynthetic potential of 1.8-2.4 times for all modes of humidity occurs in the period from the first decade of June to the beginning of July. The optimal wetting option for providing maximum photosynthetic potential of all varieties and hybrids for the June and July period is 60% of the HPV, in August and September 75% of the HPV. The content of dry matter in the root crops of beet sugar increases with increasing level of moisture supply of soil. The relationship between the magnitude of the photosynthetic potential and the content of dry matter in the leaves of the plant varieties and hybrids of beet sugar of various biological forms,  $H_2 = 0.8059$ , was established.

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