SUNFLOWER CULTIVATION: FOLIAR TOP-DRESSING WITH MIKROFERTILIZERS

Kovalenko Oleh Anatoliiovych
Doctor of Agricultural Sciences, Associate Professor of the Crop Science and Landscape Gardening Department
Mykolayiv National Agrarian University, Ukraine

Neroda Ruslan Sergeyovich
Postgraduate student
Mykolayiv National Agrarian University, Ukraine

Bahliuk Uliana Pavlovna
Student
Mykolayiv National Agrarian University, Ukraine

Summary. The article is devoted to the results of scientific research on the peculiarities of the productivity formation of sunflower hybrids Darius, NK Kamen, Tutti, depending on foliar top-dressing of micronutrients in soil and climatic conditions of the Mykolaiv region. There is a direct dependence of crop growth and its formation on the optimal combination of weather and climatic conditions and nutrients of crops.

According to the research results, it is recommended to carry out sowing in field crop rotations as the best option for NK Kamen sunflower hybrid under the condition of foliar top-dressing with Kvantum microfertilizer with a working fluid consumption rate of 4 l/ha in the culture phase of 6-8 leaves.

Key words: sunflower, microfertilizers, foliar top-dressing, plant height, leaf surface area, yield, seed quality, profitability.

Introduction. Sunflower is the basis of raw oil in Ukraine. In terms of sown areas and gross seed collection, our country is in the top four countries in the world. The high level of manufacturability of the visa process, the moderate level of production costs, high cheapness and good liquidity of products have led to a significant increase in sown areas of this crop.

But, despite the significant increase in sown areas, widespread introduction into the manufacturing of high-yielding hybrids, the gross harvest remains at the same level or increases insignificantly. This is due to reduced yields because of gross violations of technological measures. Therefore, one of the main tasks of modern agricultural production is to find new ways and means to increase yields and product...
quality. An effective way to resolve these issues is the use of foliar micronutrients. This agricultural measure makes it possible to provide plant nutrition under adverse soil conditions, to avoid chemical and biological binding of soil nutrients necessary for plants [1-4]. The degree and rate of nutrients absorption from fertilizers through the leaves are much higher than their absorption from fertilizers applied to the soil. Under the action of microfertilizers, the leaf surface area changes and the resistance of plants to adverse environmental factors improves [5, 6].

**Analysis of recent research and publications.** Nutrition is very important in the technology of growing field crops. This is an important agricultural measure of prompt and powerful plant care, used by our farmers by no more than 15-20%. In addition to macronutrients, trace elements also play an important role: boron, copper, iron, manganese, zinc, molybdenum, and others. After all, it is important to give the plant nutrients not only in the necessary time, but also in a balanced ratio. Deficiency of each of them can lead to metabolic disorders and physiological processes, which in turn can lead to lower yields and deterioration of its quality. Therefore, fertilizers for foliar top-dressing, containing trace elements, are becoming increasingly important.

Unbalanced introduction of macro- and microelements has a negative impact on plant development, harms the environment and leads to inefficient financial costs. Increased amount of basic fertilizers can not compensate for the lack of trace elements [7, 8].

Foliar top-dressing of plants is a method that can quickly and purposefully balance the imbalances of nutrients in plants. This method is used when due to adverse weather conditions and weakened soil conditions, the efficiency of nutrients absorption by the root system of plants is reduced. Foliar feeding is also a method of fast supply of nutrients at the time of greatest maximum need at certain stages of plant growth [9, 10].

Trace elements are part of enzymes and vitamins synthesized by plants, are involved in almost all physiological processes, they are often called “elements of life” [11, 12].

In arid climates, the use of humites helps to increase the resilience of crops to air and soil droughts, so more and more farmers are including them in the technology of cultivation, considering it an integral part [13].

Microfertilizers contain almost all trace elements necessary for the growth and development of agricultural plants. They increase the yield by 10-12%. Most microfertilizers are used in small quantities, as much as needed for a particular crop. For example, microfertilizers for sunflower contain small amounts of iron, zinc, copper, potassium and other minerals. The presence of these elements and their biological derivatives determine the best capabilities of these fertilizers. But these substances should be used reasonably with a great deal of responsibility!

**Conditions and methods of the research.** The land use area of the experimental field is located in the southern part of Mykolayiv region in the Southern Steppe of Ukraine, whose climate is characterized by severe aridity in the presence of significant thermal resources and limited rainfall, and the soil cover of the experimental field is represented by chernozem southern low-humus dusty-heavy loam. In the field experiment, sunflower cultivation techniques were generally
accepted for the area, except for the variants studied according to the experimental scheme. In all years of research, the predecessor of sunflower was winter wheat. In the variants where microfertilizers were studied, foliar feeding of sunflower hybrid plants was performed according to the experimental scheme.

In a two-factor field experiment during 2020-2021, the yield and seed quality of high-oleic sunflower hybrids depending on the timing of microfertilizers were studied.

The scheme of the field experiment included the following variants:

Factor A. Hybrids:
1. Darius (St);
2. NK Kamen;
3. Tutti.

Factor B. Microfertilizers:
1. Without trace elements (control);
2. Quantum (4 l/ha) in the phase of 6-8 leaves;
3. Sprout (4 l/ha) in the phase of 6-8 leaves;
4. Reacom (4 l/ha) in the phase of 6-8 leaves;
5. Nanomix (2 l/ha) in the phase of 6-8 leaves.

Crop treatment was performed with a knapsack sprayer at the rate of 300 l/ha of working fluid. The experiment was based on the method of splitting plots. The sown area of the plot was 56 m², the accounting area was 30 m², and the experiment was repeated four times [14].

Research results. Individual productivity of sunflower hybrids determines their yield and depends on their biological characteristics and growing conditions. To some extent, the parameters of individual productivity indicators (basket diameter, weight of 1000 seeds, husk) may also change due to the influence of technological measures, in particular, the level of mineral nutrition of macro- and microelements, and so on.

According to the results obtained, it can also be concluded that the effect of root fertilization with microfertilizers on the special productivity indicators has some differences: to a greater extent it is manifested by the introduction of quantum in the phase of 6-8 leaves, affecting other variants.

It is known that the level of sunflower yield in arid conditions of the South of Ukraine is determined by the ratio of mass between vegetative and generative parts of plants, which are formed, including under the influence of agrochemical measures. The yield of sunflower hybrids varied over the years, due to some differences in weather conditions during their growing season: it was slightly higher in 2021, which was characterized by more favorable hydrothermal conditions than in 2020. For example, the yield of NK Kamen hybrid in the variant under Reacom use in the phase of 6-8 leaves in 2020 was 2.30 ton/ha, and in 2021 - 2.64 ton/ha, which is 0.34 t / ha more. The observed regularity of the yield level in the years of research, depending on weather conditions, was established on all studied hybrids.

The influence of microfertilizers on the yield of the studied hybrids was also different: on average over the years the highest yield was formed by applying the microfertilizer Quantum in the phase of 6-8 leaves, and was: in the hybrid Darius 2.26 ton/ha, in the hybrid NK Kamen - 2.55 ton/ha and in the hybrid Tutti - 2.41
ton/ha; and the lowest yield was formed using Rostock in the phase of 6-8 leaves and was: in the hybrid Darius 2.12 ton/ha, in the hybrid NK Kamen - 2.40 ton/ha and in the hybrid Tutti - 2.29 ton/ha.

The products of all crops can be characterized by quantitative as well as qualitative indicators. Thus, the fat content in sunflower seeds depends on the following factors: biological characteristics of hybrids, soil and climatic conditions, levels of moisture and mineral nutrition and, in particular, the impact of microfertilizers. Reasonable regulation of these factors can increase not only the yield but also the quality of the seeds, in particular, the fat content in it. Knowledge of the fat accumulation process laws, as well as taking into account the impact of different measures on the fat-forming process - the basis for obtaining high quality seeds.

As a result of research, it was found that on average over the years of research the highest fat content was in the seeds of the hybrid NK Kamen; depending on foliar top-dressing with microfertilizers, it ranged from 49.2 to 52.7%.

Regarding the impact of microfertilizers, it was found that on average in 2020-2021 the highest fat content was observed in the seeds in the variant under the application of Quantum in the phase of 6-8 leaves. Thus, in the hybrid Darius it was 50.1%, in the hybrid NK Kamen - 52.7% and in the hybrid Tutti - 52.3%, which is more, compared to the use of Rostock in the phase of 6-8 leaves - by 0.6%, with the use of Reakom in the phase of 6-8 leaves - by 0.2%, and with the introduction of Nanomix in the phase of 6-8 leaves - by 0.4%. During the years of research, the fat content in the seeds of sunflower hybrids was different. In all studied hybrids, it was lower in 2020 compared to 2021, due to more favorable weather conditions.

The yield of oil per hectare was determined according to DST, based on the yield and oil content of sunflower hybrid seeds. Thus, on average over the years of research, the highest oil yield depending on foliar top-dressing with microfertilizers was obtained by applying Quantum in the phase of 6-8 leaves in the hybrid NK Kamen - at 13.4 cwt/ha, which is more than the control (without microfertilizers) by 2.2 cwt/ha, and the smallest - under the use of Rostock in the phase of 6-8 leaves, in the hybrid Darius, which amounted to 10.5 cwt/ha, which is more than the control of 1.2 cwt/ha.

On average, in 2020 - 2021, the highest yield of sunflower was formed in the hybrid NK Kamen under foliar top-dressing with microfertilizer Reacomin the phase of 6-8 leaves and amounted to 2.55 ton/ha, which is higher than the yield of hybrid Darius by 0.29 ton/ha, and for Tutti by 0.15 ton/ha (tabl. 1).

<table>
<thead>
<tr>
<th>Hybrid (factor A)</th>
<th>Microfertilizers * (factor B)</th>
<th>Year</th>
<th>The average for 2020-2021.</th>
</tr>
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<tr>
<td></td>
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<td>2020</td>
<td>2021</td>
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<td>4</td>
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<tr>
<td></td>
<td>5</td>
<td>1,99</td>
<td>2,32</td>
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Continuation of Tab. 1

<table>
<thead>
<tr>
<th>Hybrid (factor A)</th>
<th>Microfertilizers * (factor B)</th>
<th>Year</th>
<th>The average for 2020-2021.</th>
</tr>
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<td>NK Kamen</td>
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<td>Tutti</td>
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With the use of microfertilizer Nanomix in the phase of 6-8 leaves, the average yield for 2020-2021 for the hybrid NK Kamen was higher by 0.29 ton/ha, compared to the yield of hybrid Darius, and relative to the hybrid Tutti, respectively, higher by 0.12 ton/ha. The yield of sunflower hybrids varied to some extent depending on foliar top-dressing with microfertilizers. Thus, on average for 2020-2021, in the variant with the use of Nanomix in the phase of 6-8 leaves, the yield of the Tutti hybrid was 2.33 ton/ha, in the variant with Reacomin in the phase of 6-8 leaves, respectively, was 2.36 ton/ha. With the use of Rostok in the phase of 6-8 leaves, the yield of the Tutti hybrid was 2.29 ton/ha, which is 0.28 ton/ha more than for control, and with the use of Quantum in the phase of 6-8 leaves, the yield of the Tutti hybrid was 2.41, which is 0.4 ton/ha more than control.

The level of profitability of growing sunflower hybrids varied to some extent depending on foliar top-dressing. In the hybrid sunflower Darius, the level of profitability in the first repetition of the experiment was 174.1%, and the hybrid NK Kamen - 208.5%, and the increase in net profit of the hybrid was 23,880 UAH/ha and 29060 UAH/ha. In the second repetition, the level of profitability of the hybrid Darius was 213.7%, and the hybrid NK Kamen was 245.1%, the increase in net profit was 30790 UAH/ha, respectively, and amounted to 36220 UAH/ha. In the third repetition, the profitability of the hybrid Darius was 194.9%, and NK Kamen - 225.9%, so the increase in net profit for Darius was 28020 UAH/ha, and in NK Kamen - 33270 UAH/ha.

In the fourth repetition, the level of profitability of the hybrid Darius was 202.5%, and NC Kamen was 232.9%, the increase in net profit of Darius was 29,320 UAH/ha, and the hybrid NK Kamen - 34,560 UAH/ha.

**Conclusion.** So, according to the results of production and economic efficiency of our research, the best results were provided by growing sunflower hybrid NK Kamen and using foliar top-dressing of crops in the phase of 6-8 leaves with Quantum microfertilizer, which contributed to the highest yield (2.55 ton/ha) and profitability (245.1%).
SECTION XI. AGRICULTURAL SCIENCES AND FOODSTUFFS

References:


